

Family-Centered Care Scale in Neonatal Intensive Care Unit (FCCS-NICU): Development and psychometrics evaluation



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ABSTRACT

Purpose: The study was conducted to develop FCC Scale in Neonatal Intensive Care Units (FCCS-NICU) and to test its validity and reliability.

Methods: This methodological study was conducted with 484 mothers whose neonates were hospitalized in the NICU of four different hospitals in Konya, Turkey. Data were collected with the mother and neonate information form and FCCS-NICU, and analyzed with Items Analysis, Cronbach's alpha, Exploratory Factor Analysis, and Confirmatory Factor Analysis tests.

Results: A 48-item pool was created for the draft FCCS-NICU based on the family-centered care model. The Content Validity Index of the scale was found to be popular opinion 0.95. In the Exploratory Factor Analysis, a four-factor structure with 29 items emerged. These four factors explained 53.23% of the total variance. The subscales were named dignity and respect (7 items), information sharing (9 items), participation in care (5 items), and collaboration with the family (8 items). The parallel form correlation coefficient was 0.80, the test-retest correlation coefficient was 0.76 ($p < .001$). The Cronbach's Alpha was found 0.94 for a total scale. The Confirmatory factor analysis confirmed the four-factor structure.

Conclusions: We provide a valid and reliable scale to evaluate FCC and associated factors in NICU. FCCS-NICU can be used as a tool in descriptive research to assess FCC and identify associated factors.

Practice implication.

It can be used as a tool in experimental studies to develop FCC.

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Acronyms and abbreviations

NICU	Neonatal Intensive Care Unit
FCC	Family Centered Care
FCCS	Family Centered Care Scale
FCCS-NICU	Family-Centered Care Scale in Neonatal Intensive Care Unit

Introduction

The family is an open system with biological, psychological, economic, social, and cultural aspects. Family members have a mutual emotional attachment to each other. The illness and hospitalization of a family member or child affects this open system and the whole family. Until the 1960s, health professionals thought of children as separate from the family and ignored the family in the care of the hospitalized

child (Platt, 1959). The Platt report recommends that parents be allowed to visit their hospitalized children as much as possible and assist with care (Platt, 1959). Since then, the view that the family should participate in the care of their children started to be adopted. In the 1990s, the philosophy of family-centered care (FCC) has emerged as a philosophy of care (Bozkurt et al., 2021). Today FCC has become one of the most important care philosophies of pediatric nursing and is accepted as a pediatric health care standard (Bozkurt et al., 2021; Franck et al., 2021).

FCC is a holistic care approach that deals with the physical, emotional, social, intellectual, cultural, and spiritual aspects of the infant/child and family (Arslan et al., 2019; Bozkurt et al., 2021; Davidson et al., 2017; Dur et al., 2016). The Institute for Patient and Family-Centered Care (IPFCC) defines the FCC as mutually beneficial partnerships between healthcare providers (HCPs), patients, and families in the planning, delivery, and evaluation of healthcare (IPFCC, 2022). The FCC has been proposed to meet the needs of not only the patient but also family members (Kokorelias, Gignac, Naglie, et al., 2019). FCC includes four basic concepts (dignity and respect, information sharing,

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participation, and collaboration). Dignity and respect mean that HCPs respect the family's choices and ideas stemming from the family's values, beliefs and culture and integrate these family differences into the care plan (IPFCC, 2022). Family involvement in care includes encouraging them to participate in the care of their patients and to make decisions about care, taking their wishes into account (Boztepe et al., 2019; Davidson et al., 2017; Griffin, 2006). Finally, collaboration with the family means the HCP's collaboration with the family in the planning, implementation, and evaluation of health care (Davidson et al., 2017; IPFCC, 2022).

Literature review

Infants born prematurely or with health problems are separated from their families and hospitalized in NICU (Axelin et al., 2020; S. Balcı & Yıldırım Balkan, 2019; Kutahyalıoğlu et al., 2022; Vittner et al., 2022). Unfortunately, the NICU was not initially planned to enable FCC to meet the family's needs. NICUs have since been reconfigured to support infant neurodevelopment and family-infant communication. Today, these renovations, which extend to family and infant room designs, enable FCC in the NICU (Balcı & Yıldırım Balkan, 2019; Beck et al., 2009).

The studies on FCC show that in NICU, FCC has positive effects on infants and parents (Raiskila et al., 2014; Van Riper, 2001). Van Riper (2001) found that the satisfaction of mothers who do not participate in the care of their infants decreased, whereas mothers who perceived high FCC had higher psychological wellbeing and satisfaction with care. Raiskila et al., (2014), in a study conducted with 295 families of preterm infants between 2001 and 2012, found that the participation of the family in the care of the infant had a positive effect on the weight gain of the infants (Raiskila et al., 2014). Eren Balcı and Geçkil (2021), found that as the frequency of visiting and hugging their infants in the NICU increases, the level of maternal attachment is positively affected (Eren Balcı & Geçkil, 2021). According to Goral and Geçkil (2022), the family-centered comprehensive support program in the NICU decreased mothers' stress levels. In these studies, attention was drawn to the importance of FCC and its need to be developed.

The literature reveals that FCC provides positive effects on children/infants, parents, and healthcare professionals, and HCPs argue that FCC is important and necessary, but this care model is not sufficient in practice (Bozkurt et al., 2021; Boztepe et al., 2019; Griffin, 2006; Vittner et al., 2022). In addition, studies show that nurses lack training on FCC (Weber et al., 2022; Yayan et al., 2018) and thus further training should be provided (Franck, Bisgaard, et al., 2021; Şadiye, Gözen, & Bilgin, 2016; Toivonen et al., 2021). Kutahyalıoğlu et al. (2022) revealed that nurse empowerment is a strong predictor of FCC, and recommended that nurses in NICU be empowered through education and policies (Kutahyalıoğlu et al., 2022). The first step in developing family-centered care in the NICU is the evaluation of current practices. This assessment can be done by HCPs providing the service and parents receiving the service. There are significant studies examining the perspectives of HCPs on the implementation of family-centered care in the NICU (Franck et al., 2021; Franck et al., 2022; Kutahyalıoğlu et al., 2022; Vittner et al., 2022; Weber et al., 2022). On the other hand, there are few tool development studies in pediatric nursing that allow the evaluation of FCC from a parent's perspective (Arslan et al., 2019; Curley et al., 2013; Shields & Tanner, 2004; Uuksulainen et al., 2021). A specific assessment tool for the evaluation of FCC in the NICU has not been found in the literature prior to this study. However, in 2020, Axelin et al. developed the DigiFCC tool to assess FCC quality in the NICU (Axelin et al., 2020). DigiFCC is answered by both nurses and parents, and is a 7-point Likert-type scale and includes the following criteria: active listening to the parents; parents' participation in infant care; individualized support by staff; parents' participation in decision making on infant care; parents' trust in staff's infant care; parents' participation in medical rounds; parents' trust in the staff; individualized information

based on parents' needs and background; emotional support given to parents. Parents and nurses respond to a messaged question each day for DigiFCC (Axelin et al., 2020; Toivonen et al., 2021). As well as DigiFCC, the Empowerment of Parents in the Intensive Care-Neonatology (EMPATHIC-N) scale developed by Latour et al. (2012) measure parents' satisfaction with care in the NICU reflects a family-centered perspective (Latour et al., 2012). However, the scale aims to measure parents' satisfaction with the care in the NICU rather than measuring the level of family-centered care in the NICU. In addition to measuring family-centered care in NICUs, DigiFCC also measures parent-infant closeness. Also, it may not be a suitable tool for parents who cannot use digital apps. This study was planned to develop the FCCS-NICU that basing the family-centered care model and test its psychometrics. FCCS-NICU will contribute to evaluating the level of family-centered care in neonatal intensive care units from a parent's perspective. The following questions were addressed in this study, which was carried out to evaluate the FCCS-NICU's validity and reliability.

Research questions

1. Is FCCS-NICU a valid measurement tool?
2. Is FCCS-NICU a reliable measurement tool?
3. Does the model resulting from Exploratory Factor Analysis confirm the Confirmatory Factor Analysis?

Material and methods

Design: In this methodological scale development study, a scale development model consisting of three phases and ten steps was used (Slavec & Drnovšek, 2012). Three phases and ten steps used in scale development are summarized in Fig. 1.

Scale development phases and steps

Phase 1: In this phase, construct and theory of scale are created, consisting of three steps.

Step 1: In order to define the scope of the scale, it is recommended to review the literature, obtain opinions from experts in the field, and conduct a focus group interview. In this study, the literature on FCC in NICU was reviewed (Altıparmak & Arslan, 2016; Beck et al., 2009; Curley et al., 2013; Davidson et al., 2017; Dur et al., 2016; IPFCC, 2022; Latour et al., 2012), and individual interviews were conducted with 20 nurses, 3 physicians working in the NICU, and 30 mothers whose infants were hospitalized in the NICU. Some items, which were also found in previous scales, were adapted for infants. Eg. General statements such as "Nurses explain to me about their nursing care" were converted to some specific items "Nurses inform me about the treatments for my neonate", and "Nurses inform me about taking care of my neonate (feeding, bathing, changing diapers)".

Step 2: The item pool is created in this step. A large item pool will give more information about the situation to be measured. It is recommended to start with an item pool that is at least three or four times the number of items to be included in the draft scale (Slavec & Drnovšek, 2012). In this research, 86 items were written as a result of the literature review, the opinions of the nurses and physicians working in the field, and the opinions of the mothers. Afterward, these items were reviewed by the researchers, and repetitive or closely related items were removed. At the end of this step, a draft scale consisting of 48 items was created.

Step 3: Content validity was performed. In this process, the 48-item draft scale was submitted to expert opinion and the suitability of the items was evaluated. The draft scale was submitted to the opinion of 12 experts working in the field of FCC and scale development. An expert panel was conducted according to the Lawshe technique (Lawshe, 1975). Content Validity Index (CVI) was calculated (Polit & Beck, 2006). Two types of CVIs were calculated. The first type consists of the

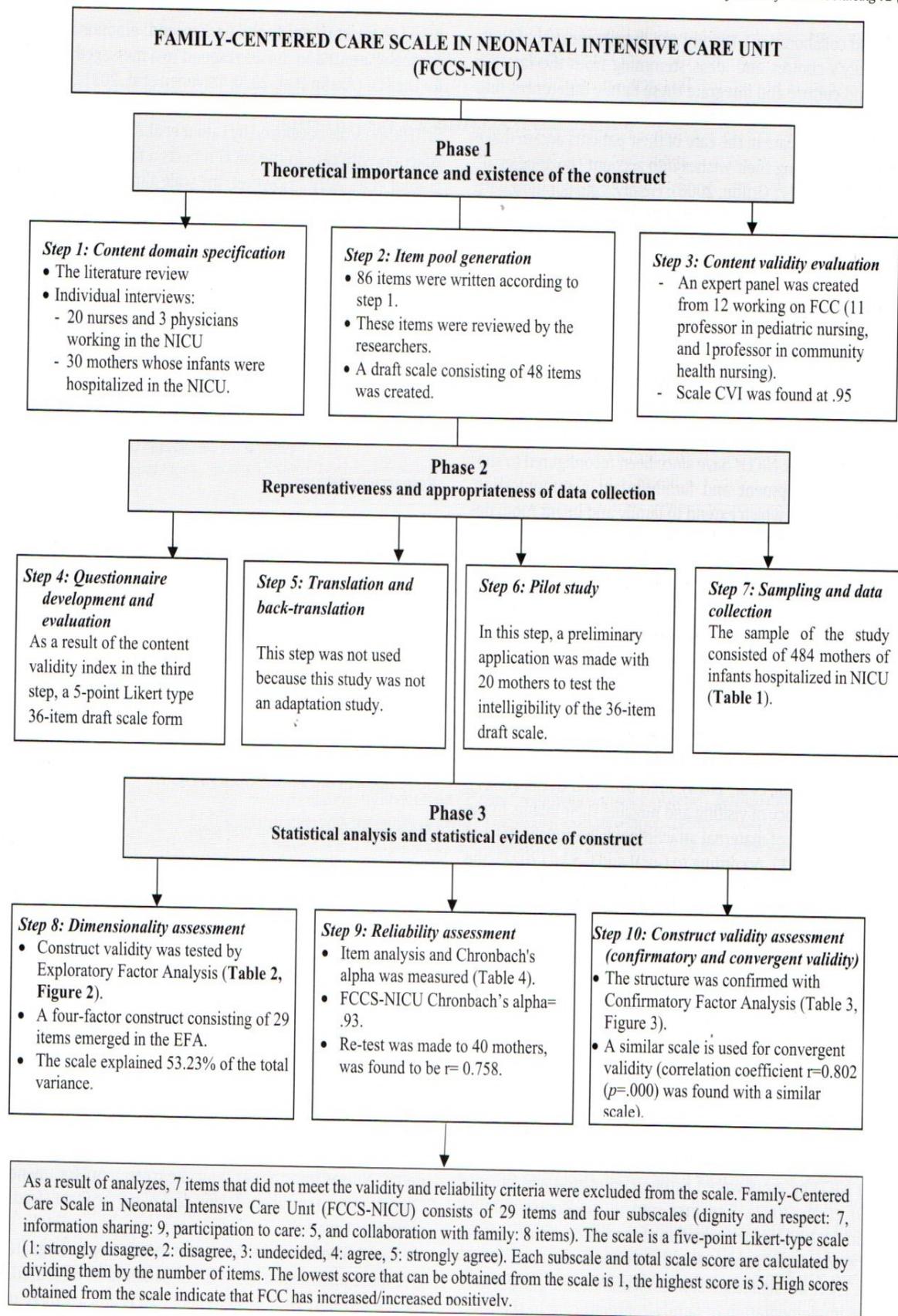


Fig. 1. Summary of the method of study.

content validity of individual items and the second consists of the content validity of the overall scale. Firstly, the item-level CVI (I-CVI) was calculated. The panel of content analysis experts was asked to rate each scale item in terms of its relevance to the underlying constructs. The expert panel labeled every item as "1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, 4 = highly relevant". Then, for each item, the I-CVI was calculated as the number of experts giving a rating of either 3 or 4 (thus dichotomizing the ordinal scale into relevant and not relevant), divided by the total number of experts. The items with a CVI value above 0.80 were included in the scale. Twelve items were excluded from the scale because the CVI was

lower than 0.80, and subsequently, the draft scale consisted of 36 items. Also, S-CVI (Scale-CVI) was calculated for the total of the scale. S-CVI was calculated as the proportion of items on the scale that achieved a rating of 3 or 4 by all the content experts. Scale CVI was found at 0.95.

Phase 2: In this phase, which consists of four steps, data are collected with appropriate methods, and the ability of the sample to represent the universe is tested.

Step 4: In this step, the draft scale form is developed and evaluated. As a result of the content validity index in the third step, a 5-point Likert type 36-item draft scale form was created.

Step 5: The step used in scale adaptations. In this step, the original language of the scale is translated into the target language, and then the original language is back-translated. This step was not used because this study was not an adaptation study.

Step 6: This is the pilot work step. The draft scale form created in this step is tested. In this step, a preliminary application was made with 20 mothers to test the intelligibility of the 36-item draft scale. It was seen that the items of the scale were understood by mothers.

Step 7: In this step where sampling and data collection are done. In this step, a highly representative sample group should be created in order to generalize the data. The sample of the study consisted of 484 mothers of infants hospitalized in NICU (Table 1).

Phase 3 is the last three-step phase in which statistical analyzes are conducted and evidence is presented.

Step 8: Construct validity was tested by Exploratory Factor Analysis (EFA). EFA results are shown in the results section (Table 2, Fig. 2).

Step 9: Reliability analyzes are performed in this step. The reliability of the developed scale was evaluated with internal consistency analysis (item analysis and Chronbach's alpha coefficient) and test-retest consistency reliability. Internal consistency analysis results are shown in the results section (Table 4). For the test-retest, two methods are used, either intermittent or continuous. In the intermittent method, 2–4 weeks are expected between two tests (Esin, 2014). In this study, it was not possible to wait for 2 weeks as the infants could be discharged. For this reason, the continuous method was used for test-retest (Esin, 2014). Re-test was conducted with 40 mothers with an interval of one hour and the consistency between the two tests was examined. The test-retest correlation coefficient, which was used to test the time consistency of FCCS-NICU, was found to be $r = 0.758$.

Step 10: Construct of the scale is confirmed. In this step, the structure that emerged as a result of EFA was confirmed with Confirmatory Factor Analysis (CFA). CFA findings are shown in the results section (Table 3, Fig. 3). A similar form is used for convergent validity. In this study, the 7-item FCC scale (for pediatric population) developed by Curley et al. (2013) and adopted to Turkish by Altıparmak and Taş Arslan (2016) was used as a similar form (Altıparmak & Arslan, 2016; Curley et al., 2013).

The correlation coefficient between the 7-item FCC scale and FCCS-NICU was found $r = 0.802$ ($p = .000$). FCCS-NICU has good convergent validity.

Participants

Participants consisted of mothers of infants hospitalized in the NICU of four hospitals in the city center of Konya, Turkey. Konya has a population of 2,277,017 and is a large city in Turkey, ranking 6th in terms of population density. Three of the studied hospitals are university hospitals and one is a state hospital, both of which serve rural and urban areas of the community. In this context of the study, this increased the power of the participants of the research to represent society. In determining the sample size, the criterion of reaching 5–10 times more people per item recommended for scale development is taken into account (Çokluk et al., 2021). As a sample size, 50 is very poor, 100 is poor, 200 is moderate, 300 is good, 500 is very good, and 1000 is excellent (Çokluk et al., 2021). There are 36 items in the draft scale. For this reason, the sample size was planned to be approximately 500. The sample of the study consisted of 484 mothers, 244 in the Exploratory Factor Analysis stage and 240 in the Confirmatory Factor Analysis stage. Mothers who are literate in Turkish, over the age of 18, without a diagnosed mental illness, whose infant has been hospitalized for at least three days, stayed in the hospital, or participated in the care of the neonate at least three times, were included to study. The convenience sampling method was used.

Data collection

Researchers visited the NICUs twice a week and interviewed mothers who met the inclusion criteria. The mothers were informed about the study and those who volunteered to participate filled out the data collection forms. Ten mothers did not give their consent to participate in the study because they did not want to spare time for the study. The mothers filled out the questionnaires in the mother's room under the supervision of a researcher. The time to fill out the questionnaires varied between 15 and 20 min. An additional explanation was given to the mothers who were to be part of the test-retest, and the second test was administered one hour later.

Research data were collated through a mother-infant information form, FCCS-NICU, and FCC scale (Altıparmak & Arslan, 2016; Curley et al., 2013). The mother-infant information form included questions such as the mother's age, education level, mode of delivery, staying in hospital participation in care, infant's gender, birth week, and medical diagnosis.

Family-centered care scale in neonatal intensive care unit (FCCS-NICU)

FCCS-NICU coverage is based on the family-centered care model (IPFCC, 2022). The components of the FCC model, Dignity and Respect, Information Sharing, Participation to Care, and Collaboration with family, were determined as subscales of the scale (IPFCC, 2022). The items were generated from literature (Arslan et al., 2019; Balcı & Yıldırım Balkan, 2019; Beck et al., 2009; Boztepe et al., 2019; Davidson et al., 2017; Griffin, 2006; IPFCC, 2022; Kokorelias et al., 2019) and interviews with experts. After validity and reliability tests, a scale with a 29-item and 4-subscale was obtained. Dignity and respect subscale consist of 7 items (1, 2, 3, 4, 5, 6, and 7), information sharing 9 items (8, 9, 10, 11, 12, 13, 14, 15, and 16), care participation 5 items (17, 18, 19, 20, and 21), and cooperation with family 8 items (22, 23, 24, 25, 26, 27, 28, and 29). The FCCS-NICU is a 5-point Likert scale (1: strongly disagree, 2: disagree, 3: undecided, 4: agree, 5: strongly agree). Each subscale and total scale score are calculated by dividing the total score by the number of items. The lowest score that can be obtained from the scale is 1, the highest score is 5. High scores obtained from the scale indicate that FCC has increased/increased positively.

Table 1

Demographic characteristics of the mother and infants ($N = 484$).

Characteristics	n	%
Education		
Literate or primary school graduate	168	34.7
Secondary school graduate	147	30.4
High school graduate	118	24.4
University graduate	51	10.5
Type of birth		
Vaginal delivery	134	27.7
Cesarean section	350	72.3
Is mother in hospital?		
Yes (mother hotel of NICU)	436	90.1
No	48	9.9
Number of mothers participating care		
At least 3 times	37	7.6
3–10 times	94	19.5
>10 times	353	72.9
Gender of infants		
Male	260	53.7
Female	224	46.3
Medical diagnosis of the neonates		
Breathing problem	94	19.4
Prematurity	71	14.7
Prematurity and breathing problem	65	13.4
Hyperbilirubinemia	64	13.2
Other problems	190	39.3
	Minimum-Maximum	Mean
Mothers' age (year)	18–44	28.50 ± 5.95
Infants' gestational age (week)	25–42	34.90 ± 4.18

Table 2
Results of exploratory factor analysis (n = 244).

FCCS-NICU Items	Factor 1	Factor 2	Factor 3	Factor 4
6. Nurses respect my cultural differences.	0.68	0.12	0.33	0.08
1. Nurses respect me as a parent.	0.65	0.11	0.32	0.17
7. Nurses respect my religious needs.	0.62	0.18	0.30	0.12
4. Nurses are nice to me when I want to ask something.	0.61	0.19	0.37	0.12
5. Nurses show interest in my problems.	0.61	0.19	-0.08	0.36
3. Nurses act good-humoredly to family members.	0.58	0.16	0.32	0.14
2. Nurses greet me when they see me.	0.51	0.26	0.14	0.26
9. Nurses explain to me about my neonate's health in a way I can understand.	0.13	0.77	0.13	0.15
14. Nurses inform me about my neonate's growth and development in the clinic.	0.23	0.77	0.18	0.10
16. Nurses inform me about my neonate's regular follow-up and vaccinations	0.12	0.77	0.18	0.08
10. Nurses inform me about the treatments for my neonate.	0.12	0.74	0.17	0.34
8. Nurses inform me about my neonate's illness.	0.23	0.72	0.01	0.22
13. Nurses inform me about taking care of my neonate (feeding, bathing, changing diapers).	0.15	0.72	0.19	0.11
15. Nurses inform me about neonate care at home.	0.25	0.68	0.18	0.14
11. Nurses inform me about my neonate's test and laboratory results.	0.08	0.61	0.01	0.49
12. Nurses explain to me about the medical devices (monitor, serum, probe) used for my neonate.	0.13	0.59	0.26	0.23
18. Nurses encourage me to talk/communicate with my neonate.	0.20	0.23	0.69	0.08
17. Nurses encourage me to contact (touch, hug and give kangaroo care) my neonate.	0.17	0.26	0.67	0.10
20. Nurses allow me to take part in my neonate's care (bathing, changing diapers, dressing).	0.14	0.11	0.67	0.31
21. Nurses allow me to take an active part in my neonate's nutrition.	0.25	0.05	0.67	0.30
19. Nurses encourage me to be confident when caring for my neonate.	0.17	0.33	0.64	0.19
25. Nurses ask my preference about being with my neonate during painful procedures.	0.11	0.23	0.22	0.65
23. Nurses get my opinion on my neonate's care plan.	0.28	0.23	0.13	0.64
22. Nurses allow me to review my neonate's medical records	0.20	0.12	0.06	0.61
26. Nurses ask about my observations about my neonate.	0.11	0.15	0.40	0.59
27. Nurses consider my suggestions about my neonate.	0.21	0.28	0.30	0.55
29. Nurses collaborate with me on my neonate's discharge plan.	0.06	0.14	0.22	0.55
24. Nurses allow me to watch my neonate while they are taking care of them.	0.13	0.01	0.39	0.54
28. Nurses allow me to attend visits related to my neonate.	0.18	0.18	0.19	0.54
Eigenvalues of factors	4.19	5.93	4.04	4.99
The rate of variance explained by the factors (%)	11.64	16.48	11.23	13.87
Kaiser-Mayer-Olkin (KMO) = 0,923				
Bartlett's Test of Sphericity Chi Kare = 4825.33				
Degree of freedom = 630; p = .000				

Data analysis

In the study, the descriptive characteristics of the participants and the scale scores were analyzed by number, percentage, mean and standard deviation. Compliance of numerical data with normal distribution was evaluated by Skewness and Kurtosis. The validity of the scale was tested by the

Content Validity Index (CVI), Explanatory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Pearson Moment Correlation Coefficient. Chronbach Alpha reliability coefficient and test-retest correlation coefficient were used for reliability. Data was analyzed in SPSS 22.0 and LISREL 8.8 programs (Çokluk et al., 2021; Geçkil & Tikici, 2015; Lawshe, 1975; Polit & Beck, 2006). Statistical significance level was accepted as $p < .05$.

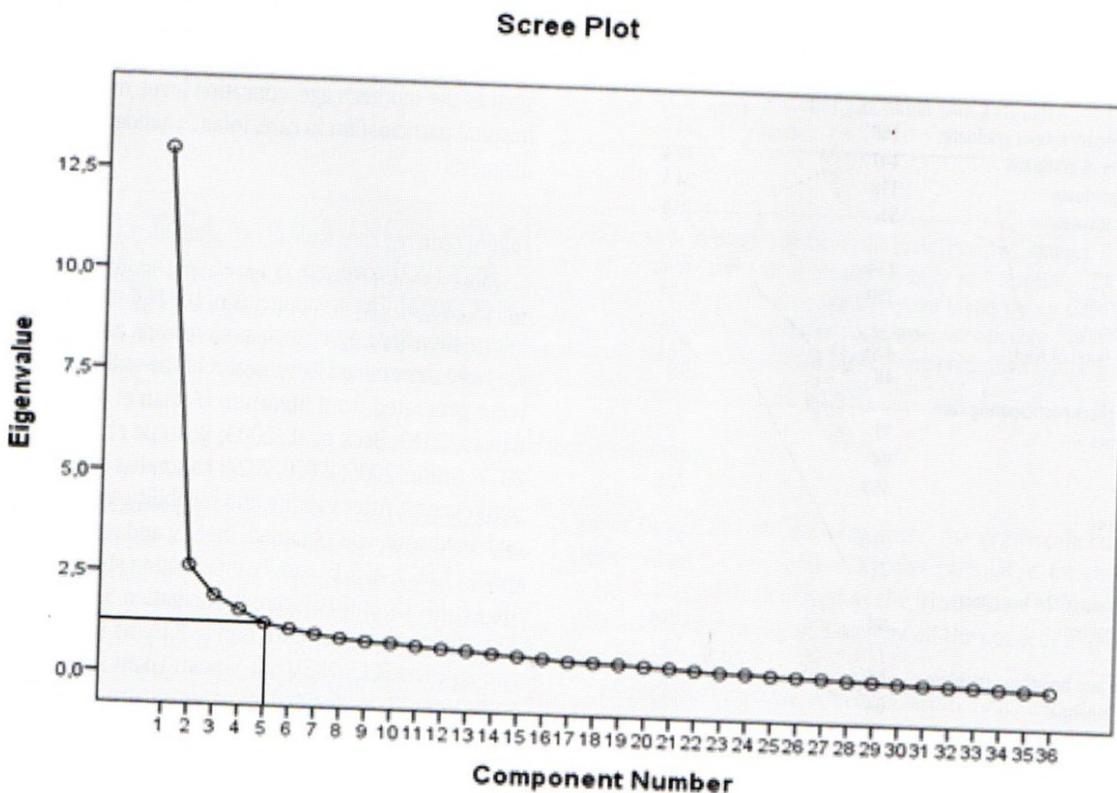


Fig. 2. Eigenvalue and scree plot of neonatal family centered care scale in neonatal intensive care unit.

Table 3
Confirmatory factor analysis fit index values of FCCS-NICU (n = 240).

Confirmatory Fit Index	Fit Index Values
Chi-square; p value	850.62; p = .00 (p < .05)
Degrees of Freedom	364
Chi-square /degrees of freedom	850.62:364 = 2.34*
RMSEA	0.075 (p < .05)**
SRMR	0.085
CFI	0.96***
NNFI	0.95***
GFI	0.80
AGFI	0.76

RMSEA: Root Mean Square Error of Approximation; SRMR: Standardized Root Mean Square Residual; CFI: Comparative Fit Index; NNFI: Non-Normed Fit Index; GFI: Goodness of Fit Index; AGFI: Adjusted Goodness of Fit Index.

*** Perfect Fit.
** Good Fit.
* Acceptable Fit.

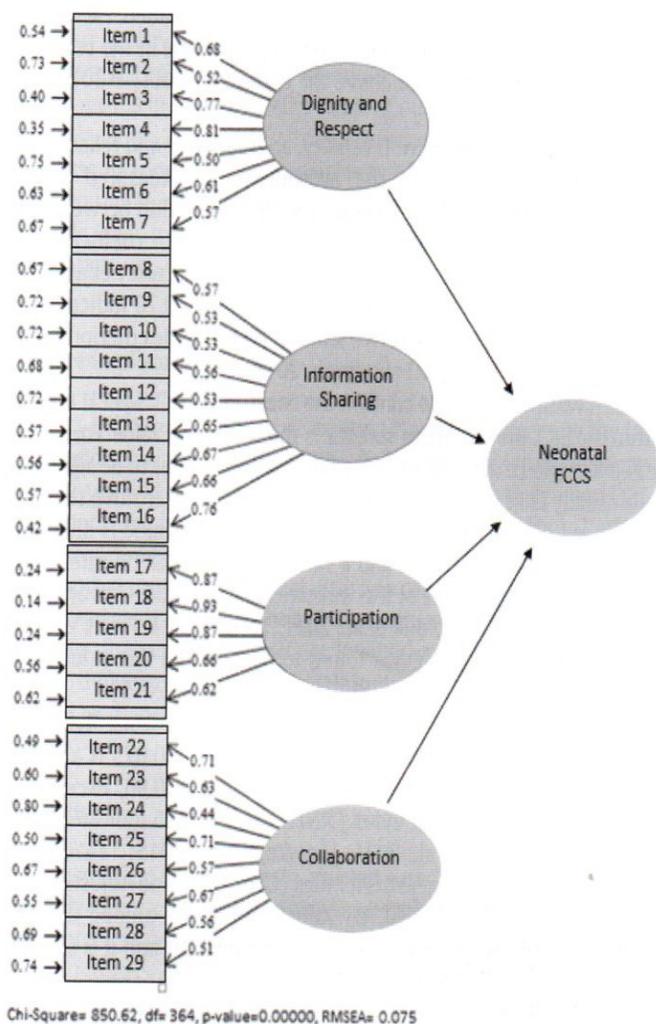
Ethical considerations

The study was approved by The Ethics Committee of Necmettin Erbakan University Medical Faculty Hospital and approved by the hospitals in which the studies were conducted. Informed consent was also obtained from the mothers in line with the principle of voluntariness.

Results

Descriptive characteristics of mothers and neonates are shown in Table 1.

One-third (34.7%; n = 168) of the mothers are literate or primary school graduates and 30.4% (n = 147) are secondary school graduates.



Chi-Square= 850.62, df= 364, p-value=0.00000, RMSEA= 0.075

Fig. 3. Path Diagram of Family Centered Care Scale in Neonatal Intensive Care Unit.

Approximately three-quarters (72.3%; n = 350) of the mothers experienced cesarean section. Most of the mothers (90.1%; n = 436) stayed in the mother hotel close to the NICU. All mothers participated in the care of the infants. 53.7% (n = 260) of the infants are male, and most of them are hospitalized due to respiratory problems, prematurity, and related problems (Table 1).

Result of validity

Results of exploratory factor analysis are shown in Table 2.

Kaiser-Meyer-Olkin (KMO) was 0.923, Bartlett's Test of Sphericity was $\chi^2 = 4825.33$ (p = .000). These values showed the adequacy of the sample size for exploratory factor analysis (Table 2).

As seen in Table 2, a four-factor construct emerged in the EFA performed with Principal Components Analysis and varimax rotation method. Factor 1 included 7 items and the factor loadings of the items varied between 0.51 and 0.68. Factor 2 included 9 items and the factor loads of the items were between 0.59 and 0.77. Factor 3 consisted of 5 items and the loadings of the factors were between 0.64 and 0.69. Factor 4 included 8 items and the factor loads of the items were between 0.54 and 0.65. The scree plot in which the factors of the scale were shown as a result of EFA is shown in Fig. 2. The scree plot showed that the factor number of the scale was a 4-factor construct.

In naming the factors, the scale items and the theoretical model of FCC were taken into account. Accordingly, the first factor was named "dignity and respect", the second factor "information sharing", the third factor "participation to care", and the fourth factor "collaboration with family" subscale. The eigenvalues of the factors ranged from 4.04 to 5.93, and the variance rate they explained varied between 11.64% and 16.48%. It was determined that the scale explained 53.23% of the total variance (Table 2).

Five items of FCCS-NICU were removed from the scale because of overlapping. Two items were also removed because they had factor loadings <0.40 and did not have sufficient loading on any of the factors. The factor loads of the remaining 29 items in the scale were found between 0.51 and 0.77 (Table 2).

FCCS-NICU CFA fit indexes are shown in Table 3 and the CFA path diagram is shown in Fig. 3.

As a result of FCCS-NICU CFA, the chi-square fit statistical value was 2.34, RMSEA 0.075, SRMR 0.085, CFI 0.96, NNFI 0.95 (Table 3). The path coefficients of the scale items with their own subscales were between 0.50 and 0.81 for dignity and respect, 0.53 and 0.76 for information sharing, 0.62 and 0.93 for participation in care, 0.44 and 0.71 for family cooperation (Fig. 3). The error variances of all items were found to be below 0.80 (Fig. 3).

Result of reliability

Table 4 shows the item means, item-subscale and item-total correlations, and Cronbach's Alpha coefficients for reliability analysis.

The item-total score correlations of all items were found to be between $r = 0.49$ and 0.70 (p < .001). Item-subscale correlations were $r = 0.65$ to 0.76 in the dignity and respect subscale, $r = 0.67$ and 0.79 in the information sharing subscale, $r = 0.77$ and 0.83 in the participation in care subscale, and $r = 0.61$ in the collaboration with the family subscale 0.76 (p < .001, Table 4). The alpha reliability coefficients, if deleted, were found to be 0.94 for all items (Table 4).

Discussion

This study was carried out to develop a scale to be used to measure the level of family-centered care in NICU and to test its psychometrics. The study was conducted with 484 mothers whose neonates were hospitalized in the NICU. The demographics of infants and mothers were consistent with other studies in the region (Eren Balcı & Geçkil, 2021; Goral & Geçkil, 2022).

Table 4
Item analysis of FCCS-NICU total and subscales (n = 484).

Subscales	Items	Mean ± Standard Deviation X ± SS	Item-Subscale	Item-Total	If item deleted Alpha	Cronbach's Alpha
Dignity and Respect	Item 1	4.04 ± 0.76	0.58	0.73	0.94	0.82
	Item 2	3.10 ± 1.14	0.57	0.67	0.94	
	Item 3	4.02 ± 0.78	0.59	0.71	0.94	
	Item 4	4.05 ± 0.74	0.62	0.76	0.94	
	Item 5	3.39 ± 1.06	0.51	0.65	0.94	
	Item 6	3.86 ± 0.87	0.56	0.73	0.94	
	Item 7	4.03 ± 0.71	0.56	0.69	0.94	
Sharing Information	Item 8	3.61 ± 1.03	0.65	0.77	0.94	0.89
	Item 9	3.76 ± 0.95	0.65	0.77	0.94	
	Item 10	3.70 ± 0.94	0.70	0.79	0.94	
	Item 11	3.04 ± 1.12	0.64	0.72	0.94	
	Item 12	3.75 ± 0.96	0.59	0.67	0.94	
	Item 13	4.17 ± 0.84	0.60	0.70	0.94	
	Item 14	3.76 ± 1.01	0.65	0.77	0.94	
	Item 15	3.92 ± 0.90	0.62	0.70	0.94	
	Item 16	3.95 ± 0.84	0.64	0.76	0.94	
Participation of Care	Item 17	4.22 ± 0.66	0.55	0.83	0.94	0.87
	Item 18	4.18 ± 0.71	0.56	0.83	0.94	
	Item 19	4.21 ± 0.73	0.62	0.82	0.94	
	Item 20	4.23 ± 0.76	0.57	0.79	0.94	
	Item 21	4.29 ± 0.64	0.57	0.77	0.94	
Collaboration of Family	Item 22	2.95 ± 1.09	0.58	0.68	0.94	0.84
	Item 23	3.40 ± 0.95	0.64	0.70	0.94	
	Item 24	3.93 ± 0.90	0.51	0.61	0.94	
	Item 25	3.14 ± 1.04	0.62	0.73	0.94	
	Item 26	3.60 ± 0.96	0.61	0.72	0.94	
	Item 27	3.49 ± 0.96	0.67	0.76	0.94	
	Item 28	3.26 ± 1.07	0.53	0.68	0.94	
	Item 29	3.55 ± 1.01	0.49	0.63	0.94	
Total Scale		3.74 ± 0.90	0.59	0.72		0.94

In the scale development process, the construct of the scale was determined by reviewing the literature, interviewing nurses working in the relevant field, physicians, and mothers whose infants were hospitalized in the NICU (Arslan et al., 2019; IPFCC, 2022; Kokorelias et al., 2019). It was decided that the scale should consist of four subscales (dignity and respect, information sharing, participation to care, and collaboration with family) according to FCC model. Items were created by researchers and evaluated by the expert panel. The CVI score of the total scale was found to be 0.95, exceeding the acceptable value of above 0.80 (Polit & Beck, 2006).

The fact that the KMO (0.923) and the Bartlett test (4825.33) are significant ($p < .05$) as a result of the EFA performed to test the construct validity indicates that the sample size was sufficient (Çokluk et al., 2021; Esin, 2014). When deciding on the number of factors, it is recommended that the Eigenvalue is above 1 (Çokluk et al., 2021). As a result of EFA, a four-factor structure emerged with eigenvalues ranging from 4.04 to 5.93. The variance explained by the factors is between 11.64% and 16.48%, and the four factors explain 53.23% of the total variance. It is accepted that the rate of variance explained in social issues is between 40 and 60% (Çokluk et al., 2021). It was determined that the four-factor structure of the scale was compatible with the four-component theoretical structure of FCC model. The factors were named dignity and respect, information sharing, participation to care, and collaboration with family after reviewing both the components of FCC model and the items they contain (Arslan et al., 2019; IPFCC, 2022; Uuksulainen et al., 2021).

Factor loading indicates the strength of the relationship between the item and the factors (Çokluk et al., 2021; Geçkil & Tikici, 2015). It is desirable that the load value in the factor in which an item is included is high (Çokluk et al., 2021). The factor load of an item should be >0.30 (Özdemir, 2018), but it is recommended that this value be >0.40 (Çokluk et al., 2021). Adequate factor load was accepted as 0.40 in this study. Two items were removed from the scale because their factor loadings were <0.40 and none of the factors had sufficient loadings. An item that gives a high load value in more than one factor and has <0.10 difference between the load values in the factors is defined as a

double load item (Çokluk et al., 2021). Five items in this scale were removed from the scale because they were double-loaded. Factor loads (between 0.51 and 0.77) of the remaining 29 items in the scale after the items were found to be above the accepted level (>0.30) (Çokluk et al., 2021).

While testing the criterion validity, another valid and reliable measurement tool related to the attitude to be measured is used (Özdemir, 2018). For criterion validity, the correlation between FCCS and FCCS-NICU was examined and the correlation coefficient was found to be $r = 0.802$ (Altıparmak & Arslan, 2016; Curley et al., 2013). The fact that this correlation coefficient is above 0.70 indicates that the relationship between the two scales is high and the criterion validity is good (Çokluk et al., 2021; Özdemir, 2018).

CFA was performed to confirm the construct of FCCS-NICU resulting from the EFA. Chi-square fit statistic is the most used value. For a model to be acceptable, the chi-square value is expected not to be significant, but usually is in practice because this value is very sensitive to sample size (Çokluk et al., 2021). Instead, the chi-square value is divided by the degree of freedom (df), and a value of two or less indicates a good model, and a value of five or less indicates that the model has an acceptable goodness of fit (Çokluk et al., 2021; Tabachnick & Fidell, 2019). In this study, chi-square/df was found to be 2.34 and this value shows that the model is an acceptable one (Jöreskog et al., 2015).

Among other frequently used goodness-of-fit tests, Root Mean Square Error of Approximation (RMSEA) value of 0.075 is a good fit (<0.080), Comparative Fit Index (CFI) value is 0.96, excellent fit (>0.95), Non-Normed Fit Index (NNFI) value of 0.95 indicates perfect fit (>0.95) (Çokluk et al., 2021; Jöreskog et al., 2015; Tabachnick & Fidell, 2019). The Goodness of Fit Index (GFI) (0.80) and Adjusted Goodness of Fit Index (AGFI) (0.76) values, which are among the other goodness-of-fit tests, were found close to the limit and it is seen that there is a poor fit (Çokluk et al., 2021).

Path coefficients showing the relationship of the items with the subscale are recommended to be at least 0.30 and above (Çokluk et al., 2021; Özdemir, 2018; Tabachnick & Fidell, 2019). Path coefficients

between item and subscale varied between 0.44 and 0.93 in all subscales. The correlation of each item with its subscale was higher than 0.30, which is an acceptable level.

The reliability of a measurement tool expresses the level of consistent, error-free, and stable measurement of the variable to be measured (Çokluk et al., 2021; Geçkil & Tikici, 2015). The most basic analysis to test reliability is internal consistency and test-retest consistency reliability (Çokluk et al., 2021; Tabachnick & Fidell, 2019). Firstly, the internal consistency of the scale was examined by item analyses (item-total, item-subscale, and subscale-total scale correlations). It was found that the item-total score correlation coefficients of all items of FCCS-NICU varied between $r = 0.49$ and 0.70 , and it was positive and statistically highly significant ($p < .001$). When the item-subscale relationships are examined, the correlation coefficients vary between $r = 0.65$ and 0.76 in the subscale of dignity-respect, $r = 0.67$ and 0.79 in the information sharing, $r = 0.77$ and 0.83 in the participation in care, and $r = 0.61$ and 0.76 in the collaboration with the family. The correlations were positive and statistically highly significant ($p < .001$). It is desirable that the item-total or item-subscale correlation coefficient be above 0.30 (Çokluk et al., 2021; Tabachnick & Fidell, 2019). The higher the correlation coefficient, the higher the reliability of the items. The correlations of FCCS-NICU between subscales and total scale scores ($r = 0.71$ to 0.86) were also positive, strong, and statistically highly significant ($p < .001$). It can be said that FCCS-NICU measures family-centered care consistently because the item-total correlations are satisfactory high.

The internal consistency of the scale is measured with Cronbach's alpha coefficient. The high value of Cronbach's Alpha indicates that the scale expressions are consistent with each other (Çokluk et al., 2021; Özdemir, 2018). In Likert-type scales, the Cronbach's alpha coefficient should be above 0.70 and as close to 1 as possible (Özdemir, 2018). FCCS-NICU total and subscale Cronbach's alpha values were found to be high (between 0.82 and 0.93). If deleted, item alpha reliability coefficients were also found 0.94 for all items. This shows that there is no item that negatively affects the reliability of the scale.

Test-retest reliability is the ability of the measurement tool to give similar results in measurements made at different times (Çokluk et al., 2021; Özdemir, 2018). A test-retest correlation coefficient above 0.70 and close to 1 indicates the consistency of measurements at different times. In this study, the test-retest correlation coefficient was at an acceptable level. It shows that FCCS-NICU's ability to measure FCC does not change with time.

Practice implications

FCCS-NICU can be used in descriptive studies to determine the level of FCC and associated factors in NICUs. In addition, this scale can be used as a pre-test and post-test in interventional research to develop FCC. It can support the improvement of the quality of care by contributing to the measurement and development of FCC in NICUs. By evaluating and improving the FCC, neonatal nurses can help reducing mothers' stress, increasing mother-infant attachment, improving infant nutrition, and early discharge from the NICU. In addition, the adaptation of FCCS-NICU to different cultures may enable international studies and comparisons to be made.

Limitations

Although the FCCS-NICU was created based on the global principles of family-centered care, the scale was developed on Turkish mothers. Therefore, it is possible that the scale was influenced by local factors such as mothers' expectations from nurses or health institutions, levels of evaluation of family-centered care, and family-centered care practices offered in the unit. It will be useful for researchers who will adapt the scale to different languages to consider cultural differences.

Conclusions

The results of this study revealed that FCCS-NICU is a valid and reliable measurement tool that can be used in the evaluation of family-centered care in neonatal intensive care units. The development of FCC, one of the most important care philosophies of pediatric nursing, can help improve parent-nurse relationships and reduce parents' stress levels. With these positive outcomes, FCC can positively affect parental satisfaction with care in the NICU. All of these may contribute to the increase of nurses' satisfaction and job satisfaction.

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Ethical approval

The study was approved by The Ethics Committee of Necmettin Erbakan University Medical Faculty Hospital (Approval number: 2017/797). The hospitals, the study was conducted, was approved the study. Written informed consent was also obtained from the mothers in line with the principle of voluntariness.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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