Refinement, scoring, and validation of the Family Satisfaction in the Intensive Care Unit (FS-ICU) survey*

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Objectives: **To refine the Family Satisfaction in the Intensive Care Unit (FS-ICU) survey and develop a validated method for scoring the instrument.**

Design: **Instrument development study, using data from two prospective cohort studies.**

Setting: **Intensive care units in seven university-affiliated hospitals (six Canadian, one United States).**

Subjects: **Family members of ICU patients.**

Interventions: **Based on *a priori* criteria, items were tagged for potential removal and discussed with the FS-ICU developers. Factor analysis was used to test the conceptual structure of the instrument and develop a scoring method based on scales and subscales. The new scoring method was validated in the U.S. cohort using the Quality of Dying and Death (QODD) instrument and nurse-assessed quality indicators.**

Measurements and Main Results: **A total of 1,038 family members completed the FS-ICU across seven sites. Fifteen items were initially tagged for possible removal. After consensus with the developers, ten items were dropped (and 24 were retained in the final instrument). Factor analysis explained 61.3% of the total variance using a two-factor model. The first factor pertained to satisfaction with care (14 items). The second factor encompassed satisfaction with decision making (10 items). A scoring method was developed based on this conceptual model. In validity testing, the FS-ICU was significantly correlated with the Family-QODD total score (Spearman's .56, $p < .001$) as well as individual QODD items such as quality of care by all providers (.64, $p < .001$). The FS-ICU also correlated significantly with multiple nurse-assessed quality indicators.**

Conclusions: **The shortened FS-ICU measures two main conceptual domains—satisfaction with care and satisfaction with decision making. Scores on the FS-ICU show good validity against other indicators of ICU quality. The instrument holds promise as a useful outcome measure in studies that attempt to improve this component of ICU care. (Crit Care Med 2007; 35:271–279)**

KEY WORDS: critical care; family research; family satisfaction; consumer satisfaction; reliability and validity

As organizations strive to improve the quality of care in the intensive care unit (ICU), they require tools that measure the various dimensions of quality. According to the Institute of Medicine, quality care is safe, timely, efficient, effective, equitable, and patient-centered (1). Improving quality of care requires tools that accurately measure these attributes. In the ICU, patient-centered care includes family-centered care (2). Since most ICU patients cannot make decisions for themselves (3, 4), families are often involved as surrogate decision makers. Therefore, the perspectives of family and other surrogate decision makers are especially important in the critical care setting, and family satisfaction is an important outcome measure.

The Family Satisfaction in the ICU survey (FS-ICU) was developed and validated for assessing family satisfaction with care in the ICU (5). The instrument has been successfully administered in a multiple-center study across Canada, suggesting good potential for widespread use (6). Others have also successfully used the FS-ICU to lead quality improvement initiatives and study surrogate decision making in the ICU (7, 8). More recently, a modified FS-ICU was used by the American College of Chest Physicians in a multiple-center intervention study (9–11). The instrument has also been translated into Spanish, German, and French (12). Overall, the FS-ICU is a comprehensively developed, widely available, and well-tested tool for measuring family satisfaction in the ICU.

In addition to the FS-ICU, two other validated instruments are available for measuring the quality of care delivered to families in the ICU. The best known tool for assessing family needs in the ICU is the 14-item Critical Care Family Needs Inventory (13, 14). Although this important instrument has been rigorously evaluated during the past 20 yrs, meeting family needs does not necessarily guarantee high family satisfaction (6). For this reason, developing a tool to specifically measure family satisfaction is an important undertaking for both research and ICU quality improvement. The Critical Care Family Satisfaction Survey is a 20-item questionnaire designed to measure family satisfaction in the ICU (15). Although a recent study showed that one domain of this instrument correlates well with family ratings of end-of-life care (16), research experience with this tool is still limited.

Despite the popularity of the FS-ICU, a systematic method for computing a total

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***See also p. 324.**

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FS-ICU score has not yet been undertaken. In addition, the instrument's psychometric properties have not been rigorously evaluated in a non-Canadian ICU population. The purpose of this article was two-fold: a) to develop a scoring method for the FS-ICU based on scales and subscales; and b) to validate the instrument and the new scoring method using a non-Canadian sample. These steps, if successful, could establish the FS-ICU as a potentially important outcome measure for randomized trials and quality improvement efforts.

MATERIALS AND METHODS

The Original FS-ICU

The FS-ICU was developed to measure family satisfaction with care provided in the ICU. A detailed description of the questionnaire's development, reliability testing, and validation has been published elsewhere (5). Briefly, the original FS-ICU consists of 34 items generated from conceptual frameworks of patient satisfaction, quality end-of-life care, research on needs of critically ill families, literature on family satisfaction with medical decision making, existing validated satisfaction surveys, and a pilot study. The questionnaire was designed with two conceptual sections—the first part focuses on satisfaction with overall care (18 items) and the second part assesses satisfaction with decision making (16 items). During development, items were pretested for clarity, readability, and content validity with clinicians and family members of critically ill patients at a Canadian academic hospital. Internal validity was assessed with 22 family members of mechanically ventilated patients who had been in the ICU ≥48 hrs. Cronbach's alpha (internal consistency) for the questionnaire's sections ranged from .74 to .95, and test-retest reliability with 25 family members at 7–10 days was 0.85 (5). Appendix 1 displays the individual FS-ICU items, and the full instrument is available online (12).

Populations and Settings

Our current study used a combined (Canadian/U.S.) population taken from two prior independent prospective studies. Both studies were approved by their respective hospitals' Institutional Review Boards.

Canadian Cohort. A prospective study to determine the level of satisfaction among families of critically ill patients in six tertiary Canadian hospitals has been previously described (6). Participating ICUs varied in size from eight to 24 beds. The eligible study sample included 891 consecutive consenting family members (next of kin or decision makers) of mechanically ventilated adult patients. The person who completed the FS-ICU had visited the patient at least once during the ICU stay. Family members were approached at the time of discharge from the ICU (for survivors) or by mail 4 wks after death (for nonsurvivors). The mailed packet included a cover letter that expressed sympathy and explained the study, the original FS-ICU, and a stamped return envelope. Four weeks later, a second questionnaire was sent to those who had not responded. The response rate for this study was 70% (n = 624). Following study closure (and publication), an additional 191 family members completed the FS-ICU. Our analyses use this total sample (n = 815).

U.S. Cohort. A prospective study to evaluate the quality of palliative care for ICU patients and their families was conducted at Harborview Medical Center, a 350-bed tertiary hospital affiliated with the University of Washington. The hospital has six distinct ICUs (medical, trauma, neurosurgical, surgical, coronary, and combined burn-pediatric). We prospectively identified patients who had been in the ICU for ≥6 hrs and administered the FS-ICU to their consenting family members (next of kin or decision makers). If the patient died in the ICU (or within 24 hrs of ICU transfer), we mailed a packet to the family member 4 wks after the patient's death. The mailed packet included a cover letter expressing sympathy and explaining the study, the original FS-ICU, the Quality of Dying and Death (QODD) questionnaire (17–21), and a stamped return envelope. A postcard reminder/thank-you was sent 2 wks after the original mailing and, if a questionnaire was still not returned, a second questionnaire (with cover letter) was sent 3 wks later. If the patient survived >24 hrs after ICU discharge, we gave the FS-ICU directly to the family member while the patient was still in the hospital or, if we did not make contact with the family, we mailed a packet to the family after discharge from the hospital using the same follow-up as described for family of patients who died. We also identified the nurse caring for the patient at the time of ICU discharge or death and administered surveys asking about nursing indicators of ICU quality (described subsequently). For nonsurvivors, we also surveyed the nurse caring for the patient during the shift before death, in case the nurse at the time of death did not have sufficient time to evaluate the patient's experiences. Nurse surveys were distributed within 72 hrs of ICU discharge or death. The number of family members recruited from each of the various ICUs ranged from 47 to 125, and the response rate was 223 of 510 (44%). The response rate for nurse surveys was 469 of 746 (63%).

Data Analysis, Objective 1

Objective 1 was to develop a scoring method for the FS-ICU based on scales and subscales. For this objective, five analytic steps were performed on the combined population: a) descriptive analysis; b) item reduction; c) factor analysis; d) reliability analysis; and e) developing a scoring algorithm. We used an iterative approach: Items were deleted based on findings from the descriptive, factor, and reliability analyses and we then repeated all five steps with the reduced set of items.

Descriptive Analyses. Item descriptive analyses were completed at individual sites and then across all sites combined. These included frequencies, percent ceiling/floor scores, percent missing responses, medians, and interquartile ranges (IQRs).

Item Reduction. Various approaches have been outlined for shortening questionnaires (22). One of our goals was to create a shorter instrument that can be more easily completed by families of ICU patients. However, we also wanted to preserve the measurement properties of the original FS-ICU. Based on *a priori* criteria, we identified items that challenged scale integrity and tagged them for possible removal. Our criteria included the following:

1. Global items that were designed for validity testing during instrument development
2. Items with high nonresponse rates, defined as >10% missing
3. Items with less discrimination, defined as >70% endorsement of the lowest (floor) or highest (ceiling) possible score
4. Redundant items, as suggested by item-scale Cronbach's $\alpha > .8$ (corrected for overlap)
5. Items measuring another construct, as determined by loadings <0.4 in principal component analysis

After tagging removable items, we emailed the original FS-ICU developers with a detailed explanation of our findings and other statistical results (described subsequently). Several weeks later, we discussed these issues via conference call with the FS-ICU developers and established consensus on a final shortened version of the instrument.

Factor Analysis. Principal component analysis was used to identify items for possible removal (23). Then we performed exploratory factor analysis for each site separately, using identical procedures for data imputation, factor extraction, and standard varimax orthogonal rotation. Since factor analysis cannot be performed with missing data, we used marginal median substitution for FS-ICU items with ≤15% nonresponse. To minimize the bias on our variance estimates, items with >15% missing were not imputed. Because factor analysis can be biased when variables are on an interval scale, we based our analyses on polychoric correlations, which assume that interval level data are representative of an underlying, continuous distribution (24). Before we performed factor analysis, five items with discontinuous response options were recoded into ordinal scales and were then linearly transformed to have the same response values as the rest of the FS-ICU items. Three items were recoded as dichotomous variables (numbers 26, 27, and 32) and two items were recoded to a Likert-3 scale (numbers 25 and 30). A detailed explanation of item recoding is available on the FS-ICU Website (12).

We decided *a priori* to extract the number of factors determined by 1,000 random data parallel analyses (25). Cattell's scree test was secondarily checked for agreement (26). Both approaches indicated that a two-factor model was appropriate. After running analyses separately on each site, we tested for similarity between individual factor structures using the coefficient of congruence (27). This confirmed we could combine sites, and the factor analytic procedures were rerun with all sites combined (n = 1,038 family members). Following item reduction, we repeated these analyses on the final shortened FS-ICU. The principal component and factor analyses were performed using MicroFACT 2.1 (Assessment Systems Corporation, St. Paul, MN).

Reliability Analysis. Based on the new factorial structure, we reevaluated internal consistency in the combined U.S./Canadian population, calculating item-subscale and item-total αs (28). To assess if the subscales could be combined into a total score, we checked univariate correlation between the two scales using the more conservative, nonparametric Spearman's correlation coefficient. We did not repeat test-retest reliability. After item reduction, we repeated all of these reliability analyses on the final set of items.

Scoring. Items were oriented so that higher values indicated increased satisfaction. We performed linear transformations to make item values more meaningful and to standardize the response scale across all items: transformed value = ([actual item value − lowest possible item value]/[possible item range]) × 100 (29). Thus, the transformed values ranged from 0 to 100. We calculated subscale and total scores by averaging available items, provided the respondent answered ≥70% of the items in the respective subscale/total. Scores were expressed as median and IQR to account for data skewness.

Data Analysis, Objective 2

Objective 2 was to validate the scoring method.

Conceptual Approach to Validity Analyses. Validity is a measure of the degree of confidence one can place in the inferences drawn from scores on an instrument (30). An underlying assumption is that delivering high-quality care improves family satisfaction in the ICU. We hypothesized that higher FS-ICU scores would correlate with higher scores on nursing and family indicators of ICU quality (selected *a priori*). These hypotheses were tested in the U.S. cohort because this was the cohort that completed the construct validation instruments.

To determine nursing indicators of ICU quality, nurses were asked to complete the previously validated nurse-assessed QODD (17–21). Nurses were also asked to complete three questionnaires assessing family-focused care in the ICU. These included a 17-item questionnaire assessing nursing activities performed for ICU families, a 14-item questionnaire assessing nurse perceived barriers to delivering care to family members, and a four-item questionnaire rating nurse satisfaction with meeting family needs. The full instruments are available online (31). Items in these instruments were generated through a review of the literature and ideas provided by focus groups with 21 critical care nurses (13, 14, 32). A description of the development of the first two questionnaires has been published (33), and all three questionnaires provide a total score using an approach that was recently validated with principal component analyses (34). When two nurses returned questionnaires for the same patient, we averaged scores between the respondents. We hypothesized that higher scores on the QODD, activities, and meeting needs questionnaires would be associated with higher scores on the FS-ICU. We hypothesized that increased barriers to delivering care would be associated with lower scores on the FS-ICU.

To determine family indicators of ICU quality, family members of nonsurvivors also completed the QODD. We used this instrument because it is a validated indicator of ICU quality with end-of-life care (17–21). We hypothesized that higher scores on the QODD would be significantly associated with higher scores on the FS-ICU. In addition to the total QODD score, we also examined four QODD items that we hypothesized would correlate significantly with the FS-ICU. Those items were pain control, breathing comfort, care by doctors, and care by all providers. We expected that the FS-ICU would have a stronger association with the Family-QODD than with the Nurse-QODD, given the different perspectives and experiences of family members and nurses. We also hypothesized that QODD items would correlate more strongly with the Satisfaction with Care subscale than with the Satisfaction With Decision Making subscale.

Statistical Analysis for Validation. Because the distributions of questionnaire scores were nonnormally distributed, we used the nonparametric Spearman correlation coefficients to test our validation hypotheses. Acknowledging the multiple comparisons in these explor-

Table 1. Characteristics of all patients and family respondents (n = 1,038)

Characteristics	Patients	Family
Age, yrs, mean (SD)	61 (17.9)	54.2 (14.4)
Female, no. (%)	414 (39.9)	631 (60.8)
Race/ethnicity, no. (%)		
White	922 (88.9)	
Asian/Pacific Islander	39 (3.8)	
Native American/Alaskan	31 (3)	
Black/African American	8 (0.8)	
Hispanic	1 (0.1)	
Other/unknown	37 (3.6)	
Primary diagnosis, no. (%)		
Cardiovascular	188 (18.1)	
Respiratory	280 (27)	
Neurologic	133 (12.8)	
Sepsis	82 (7.9)	
Trauma	132 (12.7)	
Gastroenterology	131 (12.6)	
Other	92 (8.9)	
APACHE II, mean (SD)	22.9 (8)[a]	
ICU LOS, median days (range)	8.3 (1–138)	
Relationship to patient, no. (%)		
Spouse or partner		481 (46.3)
Child		279 (26.9)
Parent		108 (10.4)
Sibling		91 (8.8)
Other		79 (7.6)
Lives with patient, no. (%)		602 (58)
Level of education, no. (%)		
8th grade or less		126 (12.1)
High school		340 (32.8)
Post secondary (college or graduate)		511 (49.2)
Other/unknown		61 (5.9)

APACHE, Acute Physiology and Chronic Health Evaluation; ICU, intensive care unit; LOS, length of stay.

[a] Only available for Canadian cohort (n = 815). Totals may exceed 100% due to rounding.

Table 2. Descriptive statistics and internal consistency for individual FS-ICU items (n = 1,038 respondents)

Item	% Missing	% Floor	% Ceiling	Median Score	IQR	Mean Score	SD	Corrected Item-Subscale Cronbach's
1 Courtesy, respect, and compassion toward patient.	0.4	0.6	70.2	100	75–100	90.9	16.2	.73
2 Management of pain.	3.9	0.6	60.5	100	75–100	88.0	18.0	.68
3 Management of breathlessness.	10.1	0.9	58.0	100	75–100	87.9	19.3	.64
4 Management of agitation.	10.8	1.5	50.3	100	75–100	84.0	22.3	.68
5 How well staff considered family needs.	1.3	1.9	55.5	100	75–100	83.9	22.6	.76
6 How well staff provided emotional support toward family.	2.9	2.1	49.3	100	75–100	81.0	24.0	.74
7 How well staff met family spiritual/religious needs.	28.3	2.2	33.8	75	75–100	77.7	26.5	[a]
8 Coordination and teamwork by staff.	1.3	0.3	60.3	100	75–100	86.7	19.6	.77
9 Courtesy, respect, and compassion toward family.	0.9	1.5	58.8	100	75–100	85.3	21.7	.79
10 Skill and competence of nurses.	0.8	0.2	71.7	100	75–100	91.5	15.3	.68
11 Communication by nurses.	1.0	1.2	58.4	100	75–100	84.9	22.0	.67
12 Skill and competence of doctors.	1.8	0.8	60.3	100	75–100	86.6	20.1	.62
13 Frequency of communication by doctors.	2.0	5.1	36.2	75	50–100	70.5	29.6	.66
14 How well social workers assisted and supported family.	36.5	4.3	26	75	50–100	72.8	30.1	[a]
15 How well chaplain assisted and supported family.	40.4	2.8	28.3	75	75–100	77.4	27.5	[a]
16 Care: atmosphere of the ICU.	1.7	1.2	43.6	75	75–100	79.4	22.6	.71
17 Care: atmosphere of the ICU waiting room.	4.6	7.6	24	75	50–100	62.2	30.7	.43
18 Overall satisfaction with ICU experience.	0.4	1.3	52.4	100	75–100	83.5	21.3	[a]
19 Willingness of staff to answer questions.	1.1	1.3	54.5	100	75–100	84.2	21.4	.69
20 Staff provided understandable explanations.	1.2	0.5	50	100	75–100	82.9	20.7	.70
21 Honesty of information provided about patient's condition.	1.2	2.1	54	100	75–100	83.2	23.0	.72
22 Completeness of information about what was happening.	1.3	1.9	51.6	100	75–100	81.9	23.8	.76
23 Consistency of information about patient's condition.	3.1	3.6	42.1	75	75–100	76.9	26.3	.74
24 Feel included in the decision-making process.	2.4	7.4	49.4	100	50–100	75.8	31.1	.48
25 Involved at right time in decision-making process.	8.7	3.7	79	100	100–100	91.2	23.7	[a]
26 Received appropriate amount of information.	7.3	11	81.7	100	100–100	88.1	32.3	[a]
27 Had enough time to think in decision-making process.	9.3	10.6	80.1	100	100–100	88.3	32.1	[a]
28 Feel supported during the decision-making process.	7.1	4.9	26.8	75	50–100	71.2	27.2	.52
29 Feel control over the care of the patient.	5.0	6.7	31.7	75	50–100	67.6	30.5	.56
30 Given right amount of hope patient would recover.	6.6	9.2	70.5	100	100–100	82.9	32.5	[a]
31 Agreement within family regarding care patient received.	4.9	1.1	41.5	75	75–100	79.1	23.5	[a]
32 Adequate time to address concerns & answer questions.	8.1	10.4	81.5	100	100–100	88.7	31.7	.38
33 Satisfaction with level or amount of care patient received.	1.9	2.7	49.8	100	75–100	82.0	23.3	.50
34 Overall satisfaction with decision-making.	4.7	4.3	38.1	75	50–100	75.0	27.0	[a]

IQR, interquartile range; ICU, intensive care unit.

[a] Dropped from survey during item reduction.

atory analyses, we defined a (two-tailed) $p \leq .01$ as statistically significant. Analyses were performed using SPSS 13.0 (Chicago, IL).

RESULTS

Objective 1: Scoring the FS-ICU

Descriptive Analyses. A total of 1,038 family members at seven medical centers (six Canadian, 1 United States) completed the FS-ICU (Table 1). The number of respondents at the individual sites ranged from 80 to 223. Table 2 presents the descriptive statistics for the 34 items from all sites.

Item Reduction. Fifteen items were tagged for possible removal and discussed with the original FS-ICU authors. These included five items that had missing responses for >10%: dyspnea management (number 3), agitation management (number 4), spiritual support (number 7), social work (number 14), and pastoral care (number 15). We dropped three (numbers 7, 14, and 15) and retained two of these items in the final instrument. We also reviewed seven items with ceiling scores endorsed at >70%: compassion and respect shown to the patient (number 1), satisfaction with nursing care (number 10), receiving the right amount of information in the decision-making process (number 26), having enough time to think about information provided (number 27), being involved at the right time in the decision-making process (number 25), being given the right amount of hope for recovery (number 30), and having enough time to address concerns and answer questions (number 32). We dropped four (numbers 25, 26, 27, and 30) and retained three of these items in the final instrument. A single item assessing agreement within the family (number 31) loaded weakly in principal component analysis (load 0.32) and was dropped. Last, we dropped two global rating items since they had been included for validity testing during instrument development and were redundant (numbers 18 and 34). The remaining 24 items were retained for factor analysis. The detailed rationale for each item's retention or removal is available online (12).

Factor Analysis. The final factor analysis model revealed that 14 of 24 items loaded on a first factor pertaining to satisfaction with care of the patient and family and the remaining 10 items loaded onto a second factor that encompassed satisfaction with decision making (Table 3). Together, these two factors explained 61.3% of the observed variance. We tested the robustness of our findings by performing a three-factor model, and this third factor only explained an additional 3.4% of the variance.

Table 3. Factor analysis using a two-factor model

Item	Factor 1	Factor 2	
1	**0.816**	0.288	Care: courtesy, respect, and compassion by staff toward patient.
2	**0.816**	0.166	Care: management of pain.
3	**0.773**	0.212	Care: management of breathlessness.
4	**0.780**	0.218	Care: management of agitation.
5	**0.707**	0.455	Care: how well staff considered family needs.
6	**0.682**	0.445	Care: how well staff provided emotional support toward family.
8	**0.799**	0.347	Care: coordination and teamwork by staff.
9	**0.749**	0.438	Care: courtesy, respect, and compassion by staff toward family.
10	**0.780**	0.279	Care: skill and competence of nurses.
11	**0.651**	0.458	Care: communication by nurses.
12	**0.618**	0.433	Care: skill and competence of doctors.
16	**0.692**	0.373	Care: atmosphere of the ICU.
17	**0.418**	0.323	Care: atmosphere of the ICU waiting room.
33	**0.521**	0.407	Care: satisfaction with level or amount of care patient received.
13	0.438	**0.628**	DM: frequency of communication by doctors.
19	0.186	**0.570**	DM: willingness of staff to answer questions.
20	0.585	**0.587**	DM: staff provided understandable explanations.
21	0.564	**0.619**	DM: honesty of information provided about patient's condition.
22	0.627	**0.624**	DM: completeness of information about what was happening.
23	0.538	**0.653**	DM: consistency of information about patient's condition.
24	0.122	**0.641**	DM: feel included in the decision-making process.
28	0.226	**0.623**	DM: feel supported during the decision-making process.
29	0.199	**0.651**	DM: feel control over the care of the patient.
32	0.186	**0.570**	DM: adequate time to address concerns and answer questions.

Care, satisfaction with care (first factor); ICU, intensive care unit; DM, satisfaction with decision making (second factor). *Boldface*, fourteen items load on the first factor (Satisfaction with Care), and ten items load on the second factor (Satisfaction with Decision Making).

Four items assessing information exchange (numbers 20–23) loaded equally on both factors. Although the instrument's developers had envisioned information exchange as a part of decision making (35), we felt that our finding made good conceptual sense because the degree to which a family's information needs are met in the ICU will also affect a family's satisfaction with care. When developing our subscales, however, we elected to uphold the original conceptual framework outlined by the instrument's developers for these items and we grouped them in the decision making subscale.

Reliability Analysis. The Cronbach's α coefficients were .92 and .88 for the Satisfaction with Care and the Satisfaction With Decision Making subscales, respectively. The two subscales showed good correlation with each other (Spearman's ρ 0.73, $p < .001$), suggesting that a single scale for the entire instrument was reasonable. Cronbach's α coefficient for this single scale was .94. Item-subscale correlations (corrected for overlap) ranged from .38 to .79 (Table 2). No items met redundancy criteria for removal (α > .8).

Scoring. Based on the two-factor model, we developed two subscale scores (FS-ICU/Care and FS-ICU/DM) and a total instrument score (FS-ICU/Total). The majority of respondents were satisfied with their overall ICU experience, and the median FS-ICU/Total score (IQR) was 85.4 (72.9–93.8). The median scores (IQR) for the FS-ICU/Care and FS-ICU/DM subscales were 88.5 (75–96.4) and 82.5 (70–92.5), respectively.

Table 4. Characteristics of patients and respondents in the U.S. cohort

Characteristics	Patients (n = 223) No. (%)	Family (n = 223) No. (%)	Nurses (n = 209) No. (%)
Age, yrs, mean (SD)	56 (21.4)	53.1 (13.3)	39 (8.2)
Female, n (%)	82 (36.8)	145 (65)	170 (81.3)
Race/ethnicity, n (%)[a]			
White	168 (75.3)	175 (78.5)	182 (87.1)
Asian/Pacific Islander	13 (5.8)	21 (9.4)	18 (8.6)
Native American/Alaskan	10 (4.5)	13 (5.8)	3 (1.4)
Black/African American	4 (1.8)	14 (6.3)	2 (1)
Hispanic	1 (0.4)	8 (3.6)	2 (1)
Other/Unknown	27 (12.2)	6 (2.7)	10 (4.8)
Primary diagnosis, n (%)			
Cardiovascular	23 (10.3)		
Respiratory	16 (7.2)		
Neurologic	60 (26.9)		
Sepsis	6 (2.7)		
Trauma	71 (31.8)		
Gastroenterology	19 (8.5)		
Other	28 (12.6)		
ICU LOS, median days (range)	4 (1–64)		
Hospital LOS, median days (range)	7 (1–113)		
Relationship to patient, n (%)			
Spouse or partner		86 (38.6)	
Child		56 (25.1)	
Parent		41 (18.4)	
Sibling		18 (8.1)	
Other		22 (9.9)	
Years known patient, mean (SD)		35 (17.4)	
Lives with patient, n (%)		124 (55.6)	
Level of education, n (%)			
8th grade or less		12 (5.4)	
High school		44 (19.7)	
Post secondary (college or graduate)		163 (73.1)	
Other/unknown		4 (1.8)	
Nurse level of training, n (%)			
Diploma			9 (4.3)
Associate degree			48 (23)
Baccalaureate			141 (67.5)
Master's			8 (3.8)
Other			3 (1.4)
Years of nursing, mean (range)			12.3 (1–34)
Years of critical care nursing, mean (range)			8.9 (1–29)

ICU, intensive care unit; LOS, length of stay.

[a] Sums may exceed 100% because individuals identify two racial/ethnic backgrounds.

Objective 2: Validation

Table 4 presents self-reported respondent and chart-abstracted patient characteristics for the U.S. cohort. There were no significant age or gender differences among patients of respondents and nonrespondents. Patients of respondents had slightly longer mean (±SD) ICU lengths of stay (8 ± 10 vs. 6 ± 9 days) and were more likely to be white (75% vs. 66%, $p = .03$).

Among 223 family members completing the FS-ICU, 125 family members also completed the Family-QODD because their loved one died in the ICU. Overall, the FS-ICU showed moderate to strong correlation with the total Family-QODD score as well as the individual items selected *a priori* (Table 5). As hypothesized, all individual QODD items correlated more heavily with the Care subscale than the Decision Making subscale.

The FS-ICU correlated significantly with several nurse ratings of the ICU quality, including assessments of meeting family needs and perceived barriers to care. The FS-ICU did not correlate significantly with the Nurse-QODD or the total number of nursing activities performed for families. As hypothesized, the FS-ICU correlated more highly with the Family-QODD than with nurse assessments of the ICU experience.

DISCUSSION

Family satisfaction is an important measure of the quality of ICU care (2, 36–38). In this population involving 1,038 families from seven medical centers, we describe psychometric properties of the FS-ICU, an instrument designed to measure family satisfaction in the ICU. We used factor analysis to develop an empirically supported scoring method for the FS-ICU based on a total score and two subscale scores. We then validated the FS-ICU as an indicator of ICU quality in a U.S. ICU population.

We confirmed that the FS-ICU measures two distinct constructs: satisfaction with care and satisfaction with decision making. Although the instrument's developers envisioned the FS-ICU as measuring these two domains (5), this is the first study to test this assumption. Based on our analyses, a summary score for the entire FS-ICU was also developed. We decided *a priori* that the numbers of factors would be determined by a parallel analysis on a random data matrix. Although various methods have been proposed for determining the numbers of factors, parallel analysis appears to be one of the most accurate (39). The agreement by a second method (the scree test) added robustness to our findings and model interpretation.

Our simple scoring method will facilitate use of the FS-ICU as an outcome measure in research. For example, an intervention specifically targeting satisfaction with care or satisfaction with decision making might use the appropriate subscale as a primary outcome. Despite the utility of the FS-ICU scores, feedback of individual item performance still seems to be the most effective way to identify actionable areas for improvement because it gives clinicians specific targets for improvement (7).

This is the first study to validate the FS-ICU in a U.S. ICU population. We demonstrated that the FS-ICU correlates well with the Family-QODD, a previously validated instrument for measuring ICU quality at the end of life (17–21). Overall, we found that individual QODD items had a higher correlation with the Care subscale than the Decision Making subscale on the FS-ICU. Since the QODD focuses on aspects of care at the end of life, this finding makes conceptual sense and lends additional credibility to our factor model and interpretation of the subscales.

Comparing the FS-ICU with various nurse assessments of ICU quality revealed weaker associations. In contrast to the Family-QODD, the Nurse-QODD did not correlate highly with the FS-ICU and did

Table 5. Comparisons of the FS-ICU against other intensive care unit (ICU) quality indicators

	Satisfaction with Care (FS-ICU/Care)		Satisfaction with Decision Making (FS-ICU/DM)		Total Score (FS-ICU/Total)	
	Correlation	*p*	Correlation	*p*	Correlation	*p*
Family QODD						
Pain control	.488	<.001	.378	<.001	.463	<.001
Breathing comfort	.301	.002	.256	.008	.317	.001
Care by doctors	.578	<.001	.505	<.001	.571	<.001
Care by all providers	.693	<.001	.513	<.001	.638	<.001
Total QODD score	.499	<.001	.517	<.001	.562	<.001
Nurse QODD						
Pain control	.016	.88	.128	.20	.075	.455
Breathing comfort	.045	.64	.176	.07	.128	.189
Care by doctors	−.005	.96	.174	.07	.088	.366
Care by all providers	−.075	.44	.122	.21	.025	.794
Total QODD Score	.220	.05	.248	.03	.258	.023
Nurse barriers						
Family angry	−.205	.008	−.252	.001	−.234	.003
Family unrealistic	−.169	.03	−.066	.4	−.124	.12
Total number of barriers	−.195	.01	−.154	.05	−.183	.02
Meeting family needs						
Emotional needs	.194	.01	.259	.001	.238	.003
Family communication	.188	.02	.204	.01	.201	.01
Overall needs met	.156	.05	.215	.007	.188	.02

FS-ICU, Family Satisfaction in the Intensive Care Unit survey; QODD, Quality of Dying and Death questionnaire.

Spearman correlation coefficients for the two FS-ICU subscales and total instrument.

not reach our cutoff for statistical significance of $p \leq .01$ (although it did achieve $p < .05$). A likely explanation is that nurses and families use different criteria for rating the quality of dying. For example, previous research with the QODD suggests that nurses are more critical of the quality of end-of-life care than family members (20). Based on the current study's findings, the nurse-assessed quality indicators for end-of-life care appear to measure a construct that is related to but also different from family satisfaction in the ICU.

We tagged items for possible removal based on pre-established criteria, but the final decisions regarding retention or removal were made after consensus with the instrument's developers. We believed this approach offered a practical balance of statistical guidance and expert opinion (22). Although our scales incorporated only the retained items, others may want to use the dropped items for their own evaluative and quality improvement efforts. For example, spiritual care and social work are important items for measuring the quality of ICU care with certain families (2). Therefore, we have published the original FS-ICU items along with the shortened 24-item FS-ICU online (12).

The current study has several important limitations. First, the FS-ICU was designed for a general ICU population whereas the QODD is only relevant for family members of patients who died. In addition, only half of the family members in the validation cohort returned questionnaire packets, and our study includes a predominately white population from a university hospital. Although respondent bias may affect the generalizability of our results, the internal validity of the FS-ICU should not be affected. Second, we used marginal median imputation for missing data, and this is a less rigorous approach than multiple imputation. However, the low rate of imputed values (<15% per item) likely minimizes this bias on our estimates. Third, validity testing not only measures a psychometric property of an instrument but also assesses the degree to which inferences can be made about the population that produced those results. Since factor analysis was conducted in a diverse ICU population, our findings may not apply in a specialized ICU with a less heterogeneous population (40). Fourth, we did not evaluate test-retest reliability of the shortened instrument and the original developers had only assessed this property in 25 family members (5). Therefore, it is important that future studies reevaluate test-retest reliability of the 24-item FS-ICU. Finally, we developed the FS-ICU scoring system so that it could be used as an outcome measure in future studies. It is important to remember, however, that the responsiveness of this instrument has not been demonstrated. Overall, FS-ICU validation is a continuous and evolving process that needs to be repeated and expanded with other population samples.

CONCLUSIONS

Our study suggests that the FS-ICU is a valid and reliable tool for assessing family satisfaction in the ICU. The instrument measures two main conceptual domains—satisfaction with care and satisfaction with decision making. We reduced the number of items and increased the instrument's feasibility for future administration. Tools that accurately measure quality are necessary in the ICU for both research and quality improvement. The usefulness of these instruments depends on their reliability, validity, responsiveness, feasibility, and clinical practicability. Given the importance of surrogate decision makers in the ICU, we anticipate that tools like the FS-ICU will be an essential part of the highly functioning ICU's "improvement toolbox" and an important outcome measure for randomized trials.

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Appendix Family Satisfaction in the Intensive Care Unit (FS-ICU) survey items

	Item
1	The courtesy, respect, and compassion your family member (the patient) was given.
2	How well the ICU staff assessed and treated your family member's pain.
3	How well the ICU staff assessed and treated your family member's breathlessness.
4	How well the ICU staff assessed and treated your family member's agitation.
5	How well the ICU staff showed an interest in your needs.
6	How well the ICU staff provided emotional support.
7[a]	How well the ICU staff met your spiritual/religious needs.
8	The teamwork of all the ICU staff who took care of your family member.
9	The courtesy, respect, and compassion you were given.
10	How well the nurses cared for your family member.
11	How often nurses communicated to you about your family member's condition.
12	How well doctors cared for your family member.
13	How often doctors communicated to you about your family member's condition.
14[a]	How well the ICU social workers assisted and supported you.
15[a]	How well the ICU chaplain assisted and supported you.
16	Atmosphere of the ICU.
17	Atmosphere of the ICU waiting room.
18[a]	Overall satisfaction with your experience in the ICU.
19	Willingness of ICU staff to answer your questions.
20	How well ICU staff provided you with explanations that you understood.
21	The honesty of information provided to you about your family member's condition.
22	How well ICU staff informed you what was happening to your family member and why things were being done.
23	The consistency of information provided to you about your family member's condition.
24	Did you feel included in the decision making process?
25[a]	Were you involved at the right time in the decision making process?
26[a]	Did you receive an appropriate amount of information to participate in the decision making process?
27[a]	Did you feel you had enough time to think about the information provided?
28	Did you feel supported during the decision making process?
29	Did you feel you had control over the care of your family member?
30[a]	Were you given the right amount of hope that your family member would recover?
31[a]	Was there agreement within your family regarding the care that your family member received?
32	When making decisions, did you have adequate time to have your concerns addressed and questions answered?
33	How satisfied were you with the level or amount of health care your family member received in the ICU?
34[a]	Overall satisfaction with your role in the decision-making related to the care of your family member in the ICU.

ICU, intensive care unit.

[a] Dropped from survey during item reduction.