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**Neonatal intensive care parent satisfaction: A multi-center study translating and validating the Italian EMPATHIC-N questionnaire**

Dall'Oglio, I; Fiori, M; Tiozzo, E; Mascolo, R; Portanova, A; Gawronski, O; Ragni, A; Amadio, P; Cocchieri, A; Fida, R; Alvaro, R; Rocco, G; Latour, JM

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1 **Neonatal Intensive Care parent satisfaction: A multicenter study translating and validating**  
2 **the Italian EMPATHIC-N questionnaire**

3

4 Immacolata Dall'Oglio, Martina Fiori, Emanuela Tiozzo, Rachele Mascolo, Anna Portanova,  
5 Orsola Gawronski, Angela Ragni, Patrizia Amadio, Antonello Cocchieri, Roberta Fida, Rosaria  
6 Alvaro, Gennaro Rocco, Jos M. Latour, and the Italian Empathic-N Study Group

7

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11 Immacolata Dall'Oglio: Pediatric RN, MSN, PhD student at University of Rome "Tor Vergata",  
12 Professional Development, Continuing Education and Nursing Research Service, Bambino Gesù  
13 Children's Hospital, IRCCS, Piazza S. Onofrio 4, 00165 Rome, [immacolata.dalloglio@opbg.net](mailto:immacolata.dalloglio@opbg.net),  
14 0039 0668592984.

15 Martina Fiori: RN, Professional Development, Continuing Education and Nursing Research  
16 Service, Bambino Gesù Children's Hospital, IRCCS, Rome; Plymouth University, Faculty of  
17 Health and Human Sciences, School of Nursing and Midwifery, Plymouth, United Kingdom,  
18 [martina\\_fiori@yahoo.it](mailto:martina_fiori@yahoo.it)

19 Emanuela Tiozzo: Pediatric RN, MSN, Professional Development, Continuing Education and  
20 Nursing Research Service, Bambino Gesù Children's Hospital, IRCCS, Rome, Italy,  
21 [emanuela.tiozzo@opbg.net](mailto:emanuela.tiozzo@opbg.net)

22 Rachele Mascolo: Pediatric RN, Professional Development, Continuing Education and Nursing  
23 Research Service, Bambino Gesù Children's Hospital, IRCCS, Rome, [rachele.mascolo@opbg.net](mailto:rachele.mascolo@opbg.net)

24 Anna Portanova: Pediatric RN, MSN, Department of Medical and Surgical Neonatology, Bambino  
25 Gesù Children's Hospital, IRCCS, Rome, Italy, [anna.portanova@opbg.net](mailto:anna.portanova@opbg.net)

26 Orsola Gawronski: RN, MSN, PhD student at University of Rome "Tor Vergata", Professional  
27 Development, Continuing Education and Nursing Research Service, Bambino Gesù Children's  
28 Hospital, IRCCS, Rome, Italy, [orsola.gawronski@opbg.net](mailto:orsola.gawronski@opbg.net)

29 Angela Ragni: Pediatric RN, Department of Medical and Surgical Neonatology, Bambino Gesù  
30 Children's Hospital, IRCCS, Rome, Italy, [angela.ragni@opbg.net](mailto:angela.ragni@opbg.net)

31 Patrizia Amadio: Pediatric RN, Department of Medical and Surgical Neonatology, Bambino Gesù  
32 Children's Hospital, IRCCS, Rome, Italy, [patrizia.amadio@opbg.net](mailto:patrizia.amadio@opbg.net)

33 Antonello Cocchieri: RN, MSN, PhD, Catholic University of Rome, Largo A. Gemelli, 00168  
34 Rome, Italy, [antonello\\_cocchieri@hotmail.it](mailto:antonello_cocchieri@hotmail.it)

1 Roberta Fida: Psycho.D, PhD, Norwich Business School, University of East Anglia, Norwich,  
2 United Kingdom Department of Psychology, R.Fida@uea.ac.uk

3 Rosaria Alvaro: RN, MSN, PhD, Department of Biomedicine and Prevention, Tor Vergata,  
4 University of Rome, Italy, rosaria.alvaro@gmail.com

5 Gennaro Rocco: RN, MSN, PhD, Centre of Excellence for Nursing Scholarship, Ipasvi Nursing  
6 College of Rome, Italy, genna.rocco@gmail.com

7 Jos M. Latour: RN, MSN, PhD, Plymouth University, Faculty of Health and Human Sciences,  
8 School of Nursing and Midwifery, Plymouth, United Kingdom, jos.latour@plymouth.ac.uk

9 Italian Empathic-N study group (the contributors are listed at the end of the manuscript)

10

11 **Corresponding author:**

12 Immacolata Dall'Oglio, Professional Development, Continuous Education and Nursing Research  
13 Service-Medical Direction, Bambino Gesù Children's Hospital, IRCCS P.za Sant'Onofrio 4  
14 00165 Rome, Italy. Tel. 0039 06 68592984. Fax: 0039 06 68592100 E-mail:  
15 immacolata.dalloglio@opbg.net

1 **ABSTRACT**

2 **Background:** In Neonatal Intensive Care Units (NICUs), parent satisfaction and their experiences  
3 are fundamental to assess clinical practice and improve the quality of care delivered to infants and  
4 parents. Recently, a specific instrument, the EMpowerment of PArents in THE Intensive Care-  
5 Neonatology (EMPATHIC-N), has been developed in the Netherlands. This instrument investigated  
6 different domains of care in NICUs from a family-centered care perspective. In Italy, no rigorous  
7 instruments are available to evaluate parent satisfaction and experiences in NICU with family-  
8 centered care. The aim of this study was to translate and validate the EMPATHIC-N instrument into  
9 Italian language measuring parent satisfaction.

10 **Methods:** A psychometric study was conducted in nine Italian NICUs. The hospitals were allocated  
11 across Italy: four in the North, four in Central region, one in the South. Parents whose infants were  
12 discharged from the Units were enrolled. Parents whose infants died were excluded.

13 **Results:** Back-forward translation was conducted. Twelve parents reviewed the instrument to  
14 assess the cultural adaptation; none of the items fell below the cut-off of 80% agreement. A total of  
15 186 parents of infants who were discharged from nine NICUs were invited to participate and 162  
16 parents responded and returned the questionnaire (87%). The mean scores of the individual items  
17 varied between 4.3 and 5.9. Confirmatory factor analysis was performed and all factor loadings  
18 were statistically significant with the exception of item 'Our cultural background was taken into  
19 account'. The items related to overall satisfaction showed a higher trend with mean values of 5.8  
20 and 5.9. The Cronbach's alpha's (at domain level 0.73-0.92) and corrected item-total scale  
21 correlations revealed high reliability estimates.

22 **Conclusions:** The Italian EMPATHIC-N showed to be a valid and reliable instrument measuring  
23 parent satisfaction in NICUs from a family-centered care perspective. Indeed, it had good  
24 psychometric properties, validity, and reliability. Furthermore, this instrument is fundamental for  
25 further research and internationally benchmarking.

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28 **Keywords:** multicenter study; neonatology; parents; satisfaction; translations; validity

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# 1 **Introduction**

2 Patient satisfaction has become an important quality indicator in healthcare[1–3]. Patient opinions  
3 reflect their personal preferences, expectations and experience on the care received. Their  
4 perceptions contribute to measure the quality of the delivered care offering opportunities of  
5 improvement[4]. In Neonatal Intensive Care Units (NICU), parent satisfaction and their experiences  
6 become fundamental to assess clinical practice and improve the care of infants and parents[5–  
7 8].Furthermore, healthcare staff should deliver care recognizing the needs and the experiences of  
8 the family[9,10].

9 Several neonatal parent satisfaction instruments have been published but the majority were not  
10 developed following the standards of validity, reliability or were not conducted with methodological  
11 rigor[7,11]. Recently, a specific instrument for parent satisfaction in NICU has been developed and  
12 validated following psychometric measures in the Netherlands[7]. The EMpowerment of PArnts  
13 in THe Intensive Care-Neonatology (EMPATHIC-N) investigates different domains of NICU care  
14 from a family-centered care (FCC) perspective and measures the delivered care as perceived by  
15 parents. This instrument covers a wide range of care aspects; therefore, it could be used in every  
16 NICU, even in those where FCC is not completely applied.

17 Various definitions of FCC are available. Overall, FCC can be summarized as a clinical  
18 practice approach including the following principles: respect and understanding; provision of  
19 information and education to family; coordination of care attained by means of effective  
20 communication; physical and emotional support and involvement of parents in decision making and  
21 in care.[5]

22 In Italy, no rigorous instruments are available to evaluate parent satisfaction and experiences  
23 in NICU with FCC. Furthermore, considering that FCC was ranked as the second research priority  
24 domain in NICUs across Europe[12], and was identified as a priority in pediatric critical care  
25 research by international experts[13], a validated instrument to measure outcomes and benchmark  
26 parent satisfaction is needed.

1 A validated parent satisfaction instrument offers the opportunity to compare and optimize  
2 FCC in NICUs from a broad perspective and might contribute to share FCC outcomes among NICUs  
3 nationally and internationally. Therefore, the aim of this study was to translate, cultural adapt, and  
4 validate the original Dutch EMPATHIC-N instrument into Italian language.

5

## 6 **Materials and Methods**

### 7 **Design**

8 This multi-center study used a psychometric design with the rigorous approach to translate and  
9 culturally adapt the original Dutch EMPATHIC-N instrument.

### 10 **Settings**

11 The study was conducted in nine Italian level III NICUs. The NICUs were located in different types  
12 of hospitals; four academic children's hospitals; one university hospital; four general hospitals. The  
13 hospitals were allocated across Italy: four in the North, four in Central region, one in the South. The  
14 number of beds in NICUs ranged between 6 and 10. In 2012, the infant discharge rate varied between  
15 146 and 499 (mean 302.85; SD109.7) and the mean discharge rate of very-low-birthweight infants  
16 (birth weight <1.5 kg) ranged between 22 and 154 (mean 85.14; SD51.1).

17 Data were collected between November 2013 and August 2014.

### 18 **Sample**

19 Study participants were parents whose children were discharged from NICU or transferred to a high  
20 dependency neonatal ward. Only parents able to read and understand the Italian language were  
21 included. Parents with multiple births received only one Italian EMPATHIC-N instrument if all  
22 their infants were discharged. Parents whose infants died were excluded. Parents who had been  
23 already enrolled were excluded in case their infant was readmitted in NICU.

24

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1 **Ethical considerations**

2 The medical ethical review board of the Bambino Gesù Children’s Hospital approved the study  
3 (protocol n. 604.13) and the other centers obtained similar ethical approval. Parents were informed  
4 regarding the study objectives and were asked to provide written informed consent.

5 **Data collection**

6 Parents were enrolled and received the EMPATHIC-N instrument on the day of discharge or within  
7 the first three days after discharge. A demographic sheet was used by researchers to collect  
8 information regarding infants (e.g. gestational age, and birth weight) and parents (nationality, and  
9 education level). A study number was sequentially assigned to the enrolled parents to ensure  
10 anonymity. Parents who did not responded received a phone call after two weeks. Parents who  
11 completed the EMPATHIC-N could deliver the survey in a sealed envelope in a special box on the  
12 wards or returned it via mail.

13 **The EMPATHIC-N instrument**

14 The Dutch EMPATHIC-N is a parent satisfaction questionnaire composed of 57 items concerning  
15 neonatal intensive care and is divided into five domains: information, care and treatment, parental  
16 participation, organization, and professional attitude. The rating scale of the items is a 6-point scale;  
17 1 “certainly no” to 6 “certainly yes”. The instrument measures also the overall satisfaction through  
18 four questions asking to parents if they would recommend the NICU to others, if they would come  
19 back to the unit if needed, and about the physicians’ and nurses’ overall performances (10-point  
20 rating scale). The instrument has a demographic section and a free space to allow parents to write  
21 their experiences[7].Congruent validity, reliability, internal consistency, non-differential validity  
22 were performed by the developers of the Dutch EMPATHIC-N and showed satisfactory results[7].

23 **Translation process**

24 The translation of the Italian version of EMPATHIC-N followed a structured method consisting a  
25 10-step process, including forward and backward translation[14].Two independent translators  
26 presented translations of the instrument in Italian, and backward in Dutch and the instrument

1 developer assessed the faithfulness of the translations to the original version. Cognitive debriefing  
2 was performed with twelve parents (one non-native speaker) whose infants were hospitalized in two  
3 participating NICUs and they were asked to review the translated version of the EMPATHIC-N  
4 instrument. The final version was proofread by the authorsto check any spelling error, and by  
5 clinical nurses to assess its cultural consistence.

## 6 **Data analysis**

7 Participants' socio-demographic characteristics were analyzed using descriptive statistics. As a  
8 preliminary analysis the items normality was examined computing the skewness and kurtosis  
9 indices, values of these indices higher than 1.0attested for the non-normality of the item.  
10 Confirmatory factor analysis (CFA) was conducted to examine the validity of the EMPATHIC-N.  
11 In line with the Dutch EMPATHIC-N instrument[7],five latent variables have been defined:  
12 information measured by items from Q1 to Q12, Care & Treatment from Q13 to Q29, Parental  
13 Participation from Q30 to Q37, Organization from Q38 to Q45, and Professional Attitude from Q46  
14 to Q57. The goodness of the factor structure was evaluated considering the following fit indices: (a)  
15 chi square, (b) Comparative Fit Index [15] (CFI;), (c) Root Mean Square Error of Approximation  
16 (RMSEA), and (d) Standardized Root Mean Square Residual (SRMR)[15-16]. According to a multi-  
17 faced evaluation of the fit a model has a good fit if CFI is higher than 0.95,RMSEA is lower than  
18 0.06,and SRMR is below 0.08[17–19].Reliability of each factor was examined by internal  
19 consistency computing the Cronbach's alpha coefficient. Congruent validity was examined by  
20 correlating the domains of the questionnaire with the four overall satisfaction indicators. The data  
21 were analyzed using IBM SPSS (version 15.0; Chicago, IL) and the statistical modelling program  
22 Mplus 7.11.[20] The level of significance was set at <0.05.

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25

26



1 **Results**

2

3 **Translation and cultural adaptation of EMPATHIC-N**

4 The Italian translation of EMPATHIC-N was conducted as described previously. Few suggested  
5 modifications were needed: some verb tenses and some terms were changed to better adapt the  
6 instrument to the Italian syntax and vocabulary. Only 5 items did not reach complete consent by  
7 the twelve parents reviewing the instrument but none fell below the cut-off of 80% agreement and  
8 needed revision. The statement “the correct medication was always given on time” was modified  
9 in “the right drugs were always administrated on time” with the instrument developer approval,  
10 considering “drugs” as a synonym for medication.

11 **Characteristics of parents and infants**

12 During the study period, 186 parents of infants who were discharged from nine NICUs were  
13 invited to participate. A total of 162 parents responded and returned the questionnaire (87%). The  
14 instrument was completed by mothers (n=70, 43.2%), fathers (n=13. 8%) and by both  
15 (n=79,48.8%). Characteristics of the infants and parents are presented in Table 1.

16

1 **Table 1.** Characteristics of infants and parents

<b>Variables - Infants</b>	<b>N</b>	<b>Median</b>	<b>P<sub>25</sub> – P<sub>75</sub></b>
Length of stay in NICU (days)	159	14	6-30
Gestational age (weeks)	159	31	28-35
Birth weight (gr)	159	1420	1020-2300
Ventilation days	158	5.5	6-30
<b>Variables - Parents</b>	<b>N</b>	<b>%</b>	
<i>Nationality</i>	158		
Italian	143	90.5	
Not Italian	15	9.5	
<i>Cultural background</i>	162		
Italian	144	88.9	
Romanian	4	2.5	
Albanian	3	1.9	
Others	3	1.9	
More choices	8	4.9	
<i>Educational level fathers</i>	159		
Elementary school	2	1.3	
Middle school degree	31	19.5	
High school degree	68	42.8	
Bachelor's degree	14	8.8	
Master Degree	44	27.7	
<i>Educational level mothers</i>	159		
Elementary school	2	1.3	
Middle school degree	16	10.1	
High school degree	80	50.3	
Bachelor's degree	16	10.1	
Master Degree	45	28.3	

2

3

4 Regarding the gender of infants, there was a slight majority of male infants (n=85, 53.5%).

5 A total of 49 infants (30.2%) required invasive ventilation, 48 infants (29.6%) underwent both

6 invasive and non-invasive ventilation, 38 (23.5%) underwent non-invasive ventilation, and 24

7 (14.8%) infants have not been subjected to any mechanical ventilation technique.

8 The characteristics of the non-responders group were tested among the responders group

9 on five variables of the infants (sex, length of stay, gestational age, birth weight, length of stay and

10 day, and type of mechanical ventilation) and two variables of parents (nationality and education

11 level). The non-responders group did not differ from the responders group on these variables (p>

12 0.05).

13

1 **Validity and reliability of the Italian version of EMPATHIC-N**

2 The mean scores of the individual items varied between a minimum of 4.3 (Q46) and a maximum  
3 of 5.9 (Q39). The items related to overall satisfaction (Q58 and Q59) showed a higher trend with  
4 mean values of 5.8 (Q58) and 5.9 (Q59) (Additional file 1: Table S1)

5 The analysis of the correlation between the items of the Italian Empathic-N version and the  
6 overall scores obtained from physicians and nurses showed that most of the items correlate with  
7 these two assessments overall (Additional file 1: Table S1).

8 Confirmatory factor analysis was performed using Mean and Variance-adjusted Maximum  
9 Likelihood (MVML) as method of estimation and the items were specified as categorical, since  
10 almost all items were not normally distributed. The model examined fits the data well  $\chi^2(1529) =$   
11  $1937.38$ ;  $p < .001$ ; RMSEA = .041 (CI: 0.035 0.046)  $p = 1.000$ ; CFI = .97; WRMR = 1.057. All the  
12 factor loadings were statistically significant with the only exception of item Q55 ('Our cultural  
13 background was taken into account'). Since all factors were highly correlated (Additional file 2:  
14 Table S2), the model was re-specified by defining a second order factor measured by the five  
15 domains of the questionnaire (Information, Care & Treatment, Parental Participation,  
16 Organization, Professional Attitude). Even in this case the model fits very well the data  $\chi^2(1534) =$   
17  $1956.83$ ;  $p < .001$ ; RMSEA = .041 (CI: 0.036 0.047)  $p = 1.000$ ; CFI = .97; WRMR = 1.073. Table  
18 2 presents the factor loadings per item.

19

20

1 **Table 2.** Confirmatory factor analysis

Information		Care & Treatment		Parental Participation		Organization		Professional Attitude	
Q1	.773	Q13	.757	Q30	.895	Q38	.769	Q46	.513
Q2	.932	Q14	.674	Q31	.834	Q39	.794	Q47	.882
Q3	.733	Q15	.668	Q32	.962	Q40	.962	Q48	.709
Q4	.858	Q16	.699	Q33	.556	Q41	.663	Q49	.702
Q5	.812	Q17	.743	Q34	.735	Q42	.460	Q50	.926
Q6	.764	Q18	.858	Q35	.830	Q43	.618	Q51	.652
Q7	.830	Q19	.791	Q36	.836	Q44	.587	Q52	.873
Q8	.765	Q20	.818	Q37	.597	Q45	.755	Q53	.801
Q9	.679	Q21	.881					Q54	.918
Q10	.054	Q22	.816					Q55	.174*
Q11	.044	Q23	.572					Q56	.747
Q12	.043	Q24	.839					Q57	.897
		Q25	.967						
		Q26	.866						
		Q27	.730						
		Q28	.799						
		Q29	.675						

2 Notes. All the loadings were significant for  $p < .01$  with the only exception of item Q55.

3 \* Not significant

4

5

6 The examination of the Cronbach's alphas and the corrected item-total scale correlations

7 confirmed the reliability of all factors measured by the Italian version of EMPATHIC-N.

8 Specifically, the Cronbach's alpha estimates ranged between 0.73-0.92 (Table 3).

9

10 **Table 3.** Mean, SD, Min, Max, and Cronbach's  $\alpha$  of the Italian version of the EMPATHIC-N

Domains (n. Items)	Mean	SD	Min	Max	$\alpha$
1. Information (12)	.64	.10	.43	.82	.90
2. Care & Treatment (17)	.63	.12	.47	.88	.92
3. Parental Participation (8)	.65	.09	.45	.68	.87
4. Organization (8)	.47	.05	.40	.55	.73
5. Professional Attitude (12)	.57	.20	.15	.75	.83

11

12 Congruent validity was obtained by correlating the domains of the questionnaire with the

13 four overall satisfaction indicators. All domains significantly correlated with each of the four

14 overall satisfaction indicators (Table 4).

15

16

1 **Table 4.** Congruent validity of scales and correlations among factors

2

Domains	Q58 Would you recommend this NICU to other parents in your situation?	Q59 Would you come back to this NICU if you should need it?	Overall satisfaction Physicians	Overall satisfaction Nurses
1. Information	.22**	.24**	.43**	42**
2. Care & Treatment	.34**	.33**	.51**	62**
3. Parental Participation	.28**	.33**	.31**	46**
4. Organization	.30**	.26**	.41**	36**
5. Professional Attitude	.28**	.34**	.44**	57**

3 \*\*  $p < 0.01$

4

5 The non-differential validity of the Italian version of EMPATHIC-N questionnaire was

6 assessed by calculating the standardized mean difference, Cohen's *d*, between the domains and

7 four population variables (Table 5).

8

9 **Table 5.** Nondifferential validity, differences between characteristics and domains

10

Characteristics /Domains	Yes			No			Cohen's <i>d</i>	p
	N	Mean	SD	N	Mean	SD		
<b>Mechanical ventilation</b>								
Information	135	5.39	.72	23	5.58	.69	.19	.25
Care & Treatment	135	5.47	.59	23	5.73	.44	.26	.05
Parental Participation	135	5.16	.93	24	5.50	.95	.35	.10
Organization	135	5.53	.56	24	5.67	.41	.14	.24
Professional Attitude	135	5.36	.74	24	5.69	.46	.33	.04
<b>Length of stay &lt;7</b>								
Information	48	5.47	.68	105	5.42	.66	.05	.67
Care & Treatment	48	5.55	.55	105	5.49	.58	.06	.56
Parental Participation	49	5.17	1.10	105	5.22	.87	-.05	.76
Organization	49	5.58	.53	105	5.54	.55	.05	.62
Professional Attitude	49	5.51	.67	105	5.36	.71	.14	.24
<b>Gestational Age &lt;30</b>								
Information	64	5.42	.67	94	5.42	.75	.00	.97
Care & Treatment	64	5.47	.63	94	5.53	.55	.06	.54
Parental Participation	64	5.28	.86	95	5.16	.99	.12	.45
Organization	64	5.53	.59	95	5.56	.51	.02	.78
Professional Attitude	64	5.35	.85	95	5.45	.61	.10	.37
<b>Italian culture</b>								
Information	142	5.40	.73	15	5.56	.58	.15	.43
Care & Treatment	142	5.50	.56	15	5.52	.75	.02	.90
Parental Participation	143	5.22	.92	15	5.06	1.12	.16	.52
Organization	143	5.54	.56	15	5.67	.38	.13	.38
Professional Attitude	143	5.42	.68	15	5.29	.98	.13	.51

11 *Cohen's d*=standardized mean difference; *p* value=Mann-Whitney test (two-tailed); item scoring range 1-6.

12

1 Results showed that no differences were statistically significant with the only exception of  
2 parents of infants with mechanical ventilation who had significantly lower mean values in the  
3 domain “professional attitude”.

## 4 5 **Discussion**

6  
7 The present study translated and adapted the Dutch version of the EMPATHIC-N instrument into  
8 Italian. This instrument aims to assess NICU parent satisfaction from a FCC perspective. This  
9 study showed that the Italian version has good psychometric properties, validity, and reliability.  
10 The internal consistency of all the domains showed a Cronbach’s alpha  $>0.7$  demonstrating the  
11 instrument as sufficiently reliable. The congruent validity of scales and correlations among factors  
12 showed adequate estimates. The mean scores of the last three items in information domain  
13 (communication, clarity, and information sharing) are all over 5. However, a low factor weight  
14 (less than 0.1) was observed in the confirmatory factor analysis. These results could suggest that  
15 knowledge sharing is not a significant factor in the information domain. This could be considered  
16 a weakness in the Italian EMPATHIC-N and would need further testing with a larger response  
17 group.

18 Our study demonstrated a high satisfaction rate on physicians and nurses attitude. We  
19 speculate that this evaluation may be independent by the unit organization and environment. The  
20 professional behavior of the staff does not depend directly by the NICU’s layout or by lack of  
21 service-oriented organizational culture. Even though the environment plays an important role for  
22 the parent satisfaction, the behavior of individual staff and the quality of parent-provider  
23 relationship still influence parent’s experience[21].

24 Our study was conducted in different hospitals located across Italy to recruit a  
25 representative sample of the country. The NICUs involved in the validation study had different  
26 organization and delivery of care. All NICUs practice a certain degree of FCC such as opening of  
27 unit to the parents, their involvement in the decisions and practical care or parental support in case

1 of emergency. Although FCC was practiced at various levels in the participating NICUs, we did  
2 not consider the different FCC practice levels as a bias for the validation of the instrument. In fact  
3 the instrument represents a broad range of items related to clinical practice including principles of  
4 FCC. After all, we aim to validate the EMPATHIC-N in order to have a validated instrument to  
5 benchmark clinical practice in Italian NICUs including FCC practice levels. In Italy, the North is  
6 as prosperous as central and northern Europe, but the South is much poorer economically[22,23].  
7 Italy has been a country characterized by internal cultural differences mostly varying from region  
8 to region. Furthermore, in the last years, a vast influx of migrants has increased the cultural and  
9 ethnic diversity. Perhaps the mix of both aspects explains the fact that the only item not  
10 statistically significant was ‘Our cultural background was taken into account’. Indeed, it might not  
11 be well understood by parents, and therefore it was changed, with the instrument developer  
12 approval, in ‘Our cultural background (both national and local) was taken into account’. The  
13 Brazilian adaptation of the EMPATHIC-N instrument had a similar issue. However the authors of  
14 the study initially decided to exclude this statement[24]. Instead, we believe that the cultural aspect  
15 is fundamental to meet all patient needs in every context. Culture may be a barrier influencing the  
16 levels of patient satisfaction and might influence the level of benchmarking satisfaction  
17 outcomes[25,26].

18 Our instrument was delivered to parents at NICU discharge day or in the following three  
19 days. Parents could return the completed questionnaire either the same day or after taking the  
20 instrument home and return by post. This timing differed by Latour and colleagues’ study in  
21 which the instrument was mailed to the parents 3-4 weeks after the discharge[7]. We opted for a  
22 different timing and a face-to-face recruitment to achieve the highest possible response rate  
23 considering Italian organizational issues and culture. Indeed, our study obtained a high response  
24 rate (87%). Likewise, the authors of the study that validated the Italian version of EMPATHIC  
25 instrument for Pediatric Intensive Care Units (PICU) distributed the instrument to parents at PICU

1 discharge and obtained also a high response rate (79%) compared with postal recruitment[27,28].  
2 In another Italian study, parent satisfaction was evaluated during hospital staying[29].

3 The NICU nurses were involved in the distribution of the instrument to the parents. In this  
4 way, the staff was stimulated to understand the importance of FCC, realize the possible need of  
5 change in their unit and find out the response rates in order to improve. We believe that staff  
6 motivation is a prerequisite to address changes in the organization and cultural background[2].  
7 Furthermore, the present study is the first of a series to investigate FCC in Italian NICUs. One of  
8 the next phases will be focused on NICU staff perception of FCC.

9 A limitation of our study is that it included only participants who could understand the  
10 Italian language and they may be not representative of the entire population. The non-Italian  
11 speakers could have been found to be less satisfied with medical care[27,28]. However, we  
12 considered that their satisfaction should be explored using instruments culturally developed and  
13 translated in their language. Thus, cultural and linguistic aspects strongly influence outcome  
14 expectation. A second limitation is that we did not perform a test-retest reliability to not burden  
15 parents with two instruments as Latour and colleagues reported[7]. Finally, the study timing was  
16 long, but every NICU began in a different time the enrollment of parents and often they needed to  
17 be excluded.

18

## 19 **Conclusions**

20 In NICU, the positive or negative experiences of parents may influence the lives of the parents and  
21 infants over time and healthcare providers might not have sufficient data to increase the awareness  
22 of the consequences of a NICU admission. Thus, assessing NICU parent satisfaction is crucial to  
23 inform new directions for change. The Dutch EMPATHIC-N is a validated instrument with  
24 sufficient psychometric properties designed to assess parent satisfaction with FCC in NICU. Our  
25 study translated and validated this instrument into Italian to provide a benchmark outcome measure.  
26 Thus, Italian NICUs have now a valid, reliable instrument to measure parent satisfaction regarding



1 FCC. This is fundamental for further research considering that FCC is one the most important issues  
2 identified by European researchers[12].  
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#### 5 **List of abbreviations**

6 CFA: Confirmatory factor analysis; CFI: Comparative Fit Index; EMPATHIC-N: EMpowerment of  
7 PArents in THE Intensive Care-Neonatology; FCC: Family-centered care; MVML: Maximum  
8 Likelihood; NICU: Neonatal Intensive Care Unit; PICU: Pediatric Intensive Care Unit; RMSEA:  
9 Root Mean Square Error of Approximation; SRMR: Standardized Root Mean Square Residual. .  
10

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11 **Availability of data and materials** The datasets generated and analyzed during the present study  
12 are available from the corresponding author.  
13

13

14 **Ethical approval and consent to participate** The medical ethical review board the Bambino  
15 Gesù Children's Hospital IRCCS approved the study (protocol n. 604.13). Informed consent was  
16 taken by each parent.  
17

17

18 **Consent for publication** The participating parents consented also for data publication  
19

19

20 **Competing interests** The authors declare no conflict of interest.  
21

21

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24

24

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1 **Authors' contributions**

2 *Contributors.* ID planned the study, involved the NICU participating at the study, coordinated the  
3 forward and backward translation process of Emphatic-N into Italian language, supervised data  
4 collection and analysis, drafted and revised the manuscript.

5 MF coordinated the forward and backward translation process of Emphatic-N into Italian language,  
6 performed cultural adaptation, coordinated data collection and imputation, collaborated in drafting  
7 and revision manuscript

8 ET cooperated in planning the study, helped establishing the study group, collaborated in cultural  
9 adaptation of Italian version of the instrument, and participated in drafting and revision of the  
10 manuscript.

11 RM helped in completing the data analysis, drafted and revised the manuscript.

12 AP, AR and PA collaborated in planning the study, helped performing cultural adaptation of Italian  
13 version of the instrument, participated in data collection, helped in drafting and revising the  
14 manuscript.

15 OG helped planning the study, revised the manuscript and collaborated in the linguistic revision.

16 AC helped performing cultural adaptation of Italian version of the instrument, participated in data  
17 collection, helped drafting and revising the manuscript.

18 RF helped planning the study, performed statistical analysis, helped in drafting and in revising the  
19 manuscript.

20 RA and GR helped planning the study, collaborated in drafting and revision of the manuscript.

21 JL planned the study, supervised the forward and backward translation process of Emphatic-N into  
22 Italian language, drafted and revised manuscript.

23 Italian Emphatic-N study group: performed data collection in their own NICUs.

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1 **Author details**

2 <sup>1</sup> Professional Development, Continuing Education and Nursing Research Service, Bambino Gesù  
3 Children's Hospital, IRCCS, Rome, Italy

4 <sup>2</sup>Department of Biomedicine and Prevention, Tor Vergata, University of Rome, Italy

5 <sup>3</sup>Plymouth University, Faculty of Health and Human Sciences, School of Nursing and Midwifery,  
6 Plymouth, United Kingdom

7 <sup>4</sup> Department of Medical and Surgical Neonatology, Bambino Gesù Children's Hospital, IRCCS,  
8 Rome, Italy.

9 <sup>5</sup> Catholic University of Rome, Rome, Italy

10 <sup>6</sup>Norwich Business School, University of East Anglia, Norwich, United Kingdom

11 <sup>7</sup>Centre of Excellence for Nursing Scholarship, IPASVI Rome Nursing College, Italy

12

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19

20 **List of members of the collective name** The Italian Empathic-N Study Group:

21 Luca Di Sarra<sup>1</sup>, Gina Ancora<sup>2</sup>, Sandra Lazzari<sup>2</sup>, Marilena Galeazzo<sup>3</sup>, Elisabetta Lolli<sup>4</sup>, Mariella  
22 Frongia<sup>5</sup>, Enrica Lupo<sup>5</sup>, Daniela Ammazzini<sup>6</sup>, Silvia Prunecchi<sup>7</sup>, Rosanna Bruno<sup>8</sup>, Antonella  
23 Raimondi<sup>8</sup>, Serena Rovei<sup>9</sup>, Liliana Vagliano<sup>10</sup>, Daniela Sebastianelli<sup>11</sup>, Loredana Bonafede<sup>11</sup>

24 <sup>1</sup>Neonatal Intensive Care Unit, Catholic University of Rome, Italy

25 <sup>2</sup>Neonatal Intensive Care Unit, "Infermi" Hospital, Rimini, Italy

- 1 <sup>3</sup>Nursing Management Department, Hospital of Padua, Italy
- 2 <sup>4</sup>Department of Woman's and Child's Health, Neonatal Intensive Care Unit, Hospital of Padua,  
3 Italy
- 4 <sup>5</sup>Division of Neonatology and Neonatal Intensive Care Unit, "V. Buzzi" Children's Hospital  
5 ASST-Fatebenefratelli-Sacco, Milan, Italy
- 6 <sup>6</sup>Nursing Management Department "Meyer" Children's Hospital, Florence, Italy
- 7 <sup>7</sup>Neonatal Intensive Care Unit "Meyer" Children's Hospital, Florence, Italy
- 8 <sup>8</sup>Neonatal Intensive Care Unit, San Carlo Hospital, Potenza, Italy
- 9 <sup>9</sup>Neonatal Intensive Care Unit, Department of Public Health and Pediatric, Turin University,  
10 Turin, Italy
- 11 <sup>10</sup>Department of Public and Pediatric Health Sciences, University of Turin, Turin, Italy
- 12 <sup>11</sup>Neonatal Intensive Care Unit, Sant'Eugenio Hospital, Rome, Italy
- 13

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1 **Supplementary materials:**

2 **Table S1.** Descriptive analysis levels of the 57 items and correlation with the general satisfaction of  
 3 physicians and nurses.

Items	N	Mean	SD	Overall Satisfaction Physicians	Overall Satisfaction Nurses
Q1 We had a daily meeting with physicians and nurses about the medication and the care of our child	161	5.43	1.09	0.34	0.25
Q2 Physicians and nurses answered our questions clearly	161	5.59	0.90	0.31	0.38
Q3 The information given by physicians and nurses were consistent with each other	159	5.30	1.19	0.29	0.38
Q4 We were immediately informed in case of worsening of our child health condition	130	5.52	0.94	0.27	0.45
Q5 Physicians and nurses provided us clearly information about our child illness.	144	5.61	0.85	0.42	0.30
Q6 Physicians clearly informed us about the consequences of the treatment that was administered to our child.	146	5.54	0.98	0.25	0.21
Q7 Physicians and nurses gave us comprehensible reports about medical examinations and interventions.	153	5.45	0.97	0.30	0.22
Q8 Physicians and nurses gave us clear information about drug effects.	150	5.12	1.35	0.39	0.27
Q9 Physicians informed us about the prospects for our child future health.	153	4.93	1.38	0.18	0.20
Q10 The informative material that was provided included clear and complete written information.	117	5.28	1.19	0.25	0.21
Q11 The information that physicians and nurses gave us were very clear.	158	5.45	1.00	0.30	0.39
Q12 Physicians and nurses provided us truly and honest information.	158	5.75	0.67	0.28	0.26
Q13 Physician - nurse collaboration was good.	157	5.73	0.63	0.38	0.40
Q14 The staff paid attention to prevention and pain care of our child.	151	5.60	0.72	0.31	0.34
Q15 Physicians and nurses are familiar with their work. They know what to do.	157	5.82	0.42	0.26	0.38
Q16 The proper medication was always administered promptly.	127	5.43	1.01	0.30	0.35
Q17 Physicians and nurses were aware about our child clinical history.	158	5.48	0.96	0.31	0.49
Q18 Physicians and nurses paid attention to our child development stage.	155	5.59	0.80	0.35	0.45
Q19 Physicians and nurses took promptly actions in case of worsening of our child clinical condition.	131	5.73	0.56	0.38	0.36
Q20 Our child needs were efficiently met.	154	5.60	0.71	0.30	0.51
Q21 The health staff worked to achieve a common objective: the best care and treatment for our child and us.	157	5.63	0.78	0.29	0.48
Q22 Physicians and nurses cared about our child well-being.	157	5.73	0.52	0.38	0.36
Q23 We were daily informed about the physicians and the nurses who were in charge of our child.	155	4.57	1.69	0.37	0.38
Q24 Physicians and nurses emotionally supported us in an appropriate manner.	154	5.16	1.30	0.36	0.47
Q25 Physicians and nurses well met our needs.	157	5.39	0.99	0.34	0.52
Q26 The health staff took care of our child and us.	158	5.58	0.72	0.37	0.42



Q27	A nurse has always supported us in case of emergency.	120	5.33	1.18	0.35	0.34
Q28	Nurses always cared about our child clearness/hygiene and that he/she was comfortable into the incubator.	160	5.64	0.89	0.33	0.47
Q29	The handover between NICU and other wards health staff took properly place.	121	5.53	0.91	0.38	0.19*
Q30	We were actively involved in the decision about our child care and treatment	146	4.89	1.56	0.33	0.45
Q31	We were encouraged to stay next to our child.	156	5.52	1.03	0.16	0.22
Q32	We have confidence in the health staff.	160	5.71	0.71	0.32	0.41
Q33	We can stay near our child also during intensive treatments.	140	4.58	1.84	0.14*	0.27
Q34	Nurses encouraged us to help them during our child care.	149	5.16	1.44	0.16*	0.20
Q35	Nurses helped us to develop an emotional attachment between our child and us.	157	5.41	1.18	0.14*	0.26
Q36	Nurses tough us how to take care of our newborn child.	151	5.43	1.09	0.15*	0.43
Q37	We received information about our child care before his/her transfer or discharge.	108	4.65	1.82	0.32	0.37
Q38	Ward/section of NICU stay gave us a safety sensation.	161	5.67	0.77	0.30	0.27
Q39	Our child incubator or the crib were clear.	161	5.90	0.37	0.35	0.24
Q40	The health staff worked in an efficiency manner.	161	5.75	0.66	0.43	0.51
Q41	The ward/NICU section staff were on call.	125	5.48	1.13	0.24	0.22
Q42	The space around the incubator/crib was enough.	161	4.81	1.56	0.22	0.13*
Q43	The ward/NICU section was clean.	161	5.82	0.51	0.17*	0.11*
Q44	Ward/NICU section noises were mitigated where possible.	159	5.30	1.20	0.18	0.16
Q45	The atmosphere in the ward/NICU section was cordial without hostilities.	160	5.65	0.69	0.30	0.29
Q46	Nurses and physician always identified themselves saying their name and their role.	158	4.34	1.84	0.23	0.40
Q47	We received sympathy from physicians and nurses.	161	5.49	1.02	0.43	0.47
Q48	The health staff worked following the hygiene rules.	160	5.76	0.73	0.23	0.43
Q49	The health staff cared about our child and our privacy.	157	5.62	0.84	0.25	0.30
Q50	The health staff showed respect towards our child and us.	160	5.74	0.70	0.31	0.44
Q51	Physicians and nurses do not have usefulness conversation near our child incubator/crib.	153	5.24	1.43	0.25	0.37
Q52	The atmosphere among the staff was pleasant.	162	5.64	0.77	0.43	0.49
Q53	We were warmly welcomed by the staff.	162	5.38	1.16	0.29	0.42
Q54	Physicians and nurses gave the proper attention to our child and us despite their workload.	161	5.50	0.96	0.37	0.49
Q55	It was taken in account our culture of origin.	106	4.77	1.93	0.07*	0.06*
Q56	Physicians and nurses always gave priority to our child health condition.	160	5.79	0.57	0.36	0.26
Q57	Physicians and nurses were always available to listen to us.	161	5.50	0.95	0.34	0.50

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*The correlations with the general vote to physicians and nurses are all significant for  $p < 0.05$  except for those indicated with \**

1 **Additional file 2, Table S2** Correlations among factors

2

3 **Table S2.** Correlations among factors

4

<b>Domains</b>	<b>1.</b>	<b>2.</b>	<b>3.</b>	<b>4.</b>	<b>5.</b>
1. Information	-				
2. Care & Treatment	89**				
3. Parental Participation	71**	82**			
4. Organization	81**	88**	73**		
5. Professional Attitude	83**	94**	80**	96**	-

5

\*\*  $p < 0.01$

6