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Original article

The evolution of parental self-efficacy in knowledge and skill in the home care of preterm infants

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Abstract

Background: The American Academy of Pediatrics recommends the consideration of the ability and confidence of a caregiver to take care of a preterm infant before discharge (D/C).

Objective: To identify how parental self-efficacy as measured by the Infant Care Survey (ICS) evolves during their preterm child's Neonatal Intensive Care Unit (NICU) admission, and to identify conditions associated with caregiver confidence.

Methods: Prospective cohort study involving parents of infants ≤ 32 weeks gestation who were enrolled between 10-20 days of their infant's life. Parent/infant demographic, pregnancy, NICU, and D/C data was collected. Parents responded to the ICS at enrollment and D/C. Enrollment and D/C ICS scores were compared to one another using a Paired Samples t-test to assess the change in scores over time. Further, conditions which are thought to affect self-efficacy were compared to enrollment, D/C, and the change in total ICS scores to assess for correlations.

Results: Total ICS scores showed significant improvement from enrollment to D/C: (188.3 ± 60.5 vs. 235.9 ± 20.9). When comparing caregivers who did not have other children in the home to parents who did, caregivers without previous children had significantly lower ICS scores at enrollment (149.8 ± 64.0 vs. 221.7 ± 31.2); however, D/C ICS scores were similar (228.7 ± 23.1 vs. 242.1 ± 17.2). This was the result of a more profound improvement in self-efficacy amongst first time parents during their child's NICU admission (79.0 ± 68.1 vs. 20.3 ± 35.2).

Conclusion: Despite the stress and anxiety of having a child in the NICU, parental self-efficacy is likely to significantly improve during their child's hospitalization. This was most evident amongst first time parents. We suspect that parental participation in their infant's care and formal educational opportunities contribute to improvement in confidence over time.

Keywords

Self-efficacy, infant care survey (ICS), preterm, parent education, parenting skills, parenting knowledge.

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Introduction

It is important for parents to have appropriate self-efficacy during their child's transition to home after their birth admission. This can be an especially stressful time for parents. Therefore, the level of self-confidence the caregiver has may directly translate to how successful they may be in the home care of their newborn infant [1].

Self-efficacy is the belief that one will be able to perform tasks successfully and is highly individualized. Factors which can affect attainment of self-efficacy include experience, modeling, social persuasion, and psychological factors [2]. As it relates to parenting, self-efficacy has been shown to be a critical factor in parenting quality. High levels of parental self-efficacy has been shown to be associated with increased parental responsiveness and parental involvement [3].

In the updated American Academy of Pediatrics (AAP) guidelines on discharge of the high-risk neonate, it is stated that "Careful preparation for discharge and good follow-up after discharge may reduce these risks [hospital readmission or death]. It takes time for the family of a high-risk infant to prepare to care for their infant in a home setting and to obtain the necessary support services and mobilize community resources" [4]. Critical conditions experienced by mothers prior to delivery and admission of their infant to the Neonatal Intensive Care Unit (NICU) may affect how self-assured a parent is in the care of their newborn.

Early attachment and bonding between parent and child is achieved through direct contact and visualization of their newborn. However, this bonding, a crucial component to parental self-efficacy [5] is disrupted via early separation of the parent and infant in addition to prolonged hospitalization of the pre-term infant. Bonding may be further affected by the increased severity of illness experienced by some preterm infants which may affect a caregiver's confidence to be able to care for a potentially fragile child. All of these conditions can lead to increased distress, anxiety, and depression amongst parents of preterm infants [6].

Previous studies regarding parenting pre-term infants have identified obstacles in gaining caregiver skill, which will affect self-efficacy. These conditions include communication barriers, and poor human resources [7]. As a result, it is imperative that the medical staff provides guided interaction in order to bolster the confidence in skill and knowledge of parents prior to their child's discharge (D/C) to home.

Amongst mothers who were interviewed months after going home with their preterm infant from the NICU, it was found that their level of determination to succeed at keeping their babies healthy was contingent upon their own self-assurance regarding skills gained during their child's NICU stay [8]. Therefore, it is imperative that parents are well educated regarding potential complications of prematurity at home, how to identify signs of distress, as well as how to address such issues before their child's D/C home. Only then can we improve the self-efficacy that parents may have in caring for their complex child.

Objective

The primary objective of this study is to measure the change in self-efficacy in knowledge and skills amongst parents during the NICU stay of their very preterm (≤ 32 weeks gestational age [GA] at birth) infants, as measured by the Infant Care Survey (ICS) [9]. Secondarily, the aim is to determine how demographic, antenatal, and neonatal conditions are associated with enrollment and D/C ICS scores, as well as the evolution of parental self-efficacy as determined by the change ICS over time. Finally, the objective of the study is to evaluate how educational opportunities and NICU staff interactions may impact parental self-efficacy of knowledge and skill in the care of their preterm infant.

Methodology

This is a prospective cohort study including parents of infants less than or equal to 32 weeks of gestation admitted to the NICU at The Maria Fareri Children's Hospital, Westchester Medical Center, New York Medical College, New York, USA, who were expected to be discharged home with their biological caregiver or parent. Parents were excluded from the study if it was believed that their infant would not survive to discharge, or if they were not

expected to take their infants home upon D/C. Due to the fact that the ICS is only published in English, non-English speaking caregivers were excluded from the study as well.

Parents of preterm infants less than or equal to 32 weeks GA were approached between 10-20 days of life for enrollment. This delayed enrollment allowed for the establishment of survival potential to discharge home of extremely preterm and potentially critically ill infants. Amongst those enrolled in the study, we collected demographic information, including: number of previous children, ages of parents, parental education level, marital status, and race. Antenatal data was collected, including: maternal health issues, pregnancy complications (such as preeclampsia, gestational diabetes, preterm labor, abruption, placental bleeding), medications taken during pregnancy, and medications during labor. Delivery room information was collected, including: GA, the number of infants in the current pregnancy, birthweight, mode of delivery, Apgar scores, need for delivery room resuscitation (such as positive pressure ventilation, intubation) and medications administered, neonatal morbidities of prematurity (intraventricular hemorrhage [IVH], retinopathy of prematurity [ROP], bronchopulmonary dysplasia [BPD], necrotizing enterocolitis [NEC]), any surgery during the NICU stay, and infections. Other factors which may influence parental self-efficacy were recorded and considered as well: the frequency of parental visits of both father and mother; noted parental bonding, participation in the care of the infant; attendance at formal educational experiences, including classes or videos for cardiopulmonary resuscitation (CPR), sudden infant death syndrome (SIDS), and shaken baby syndrome. Finally, D/C conditions, including: medications at the time of D/C; equipment to be used at home such as apnea monitor, pulse oximeter, or home oxygen; and the number and type of follow-up appointments at D/C.

Mothers were asked to answer a standardized questionnaire, previously validated in the USA, known as the ICS [9] during two separate time windows. The ICS is composed of 51 survey questions divided into 6 sub-categories. The response for each assessment of self-efficacy within each subcategory is measured by a five point Likert scale [10], with 1 being the lowest level of self-efficacy in the task mentioned, ranging to 5 being the highest level of self-efficacy in the task mentioned. The maximum total score can therefore be 255, with a maximum score in each sub-category being 75 for health knowledge (15 survey questions), 25 for diet knowledge (5 survey questions), 35 for safety knowledge (7 survey questions), 70 for health skills (14 survey questions), 25 for diet skills (5 survey questions), and 25 for safety skills (5 survey questions). The first time window during which parents were asked to respond to the survey was between 10-20 days of their infant's life (enrollment score) and the second time window was at their infant's D/C to home (D/C score).

All of the above data was collected and entered into SPSS® V. 16.0 (SPSS Inc., Chicago, IL). Caregiver responses were summed for each subcategory to give 6 individual sub-category scores. Those subcategory scores were then added to one another to give an overall score. There were two sets of scores for each caregiver respondent consisting of an enrollment and D/C score. A paired samples t-test was used to compare the enrollment and D/C total ICS scores and each subcategory score to one another in order to assess the evolution of self-efficacy from enrollment to D/C. Further, the overall enrollment score was subtracted from the D/C score to quantify and qualify the change in self-efficacy over time. A t-test was used to identify the association of conditions which may affect self-efficacy to ICS score results at each time period (enrollment and D/C) in addition to the change in overall ICS score from enrollment to D/C. $P < 0.05$ was considered statistically significant. This study protocol was reviewed and approved by the Institutional Review Board of New York Medical College and Westchester Medical Center.

Results

A total of 48 potential caregivers were approached for participation in this study. 17 refused participation and 31 were enrolled. Three parents were removed from the study as they did not complete the D/C survey. The study population therefore included 28 subjects who completed both the enrollment and D/C ICS. There were two sets of twins resulting in 30 infants born to the 28 subjects. One infant who was a twin passed away on day of life 10. 82% of respondents were mothers. Their average age at delivery was 31 years. 43% of respondents completed high school or less and 46% had no other children in the home (**Tab. 1**). 43% of mothers had some type of antenatal medical issue such as ADHD, drug use, obesity, chronic hypertension, or depression. 93% of mothers had some type of pregnancy complication which contributed to the premature delivery of their infant such as preterm labor or an incompetent cervix, preeclampsia, or placenta previa or abruption.

Tab. 2 contains some complications of pregnancy experienced by the mother prior to delivery.

The average gestational age of the caregiver's infants was 29.1 weeks with an average birthweight of 1,333 grams. 70% of births were via C-section. 25 of the 30 infants required respiratory support in the delivery room. Only 27% of infants had grade 1 IVH. The one deceased infant had a grade 4 IVH noted on autopsy. 20% of infants had BPD and 13% had surgery during their NICU stay (**Tab. 3**).

All parents were reported to have attended at least one formal education class. These classes included cardiopulmonary resuscitation (CPR), sudden infant death syndrome (SIDS) training, and education regarding shaken baby syndrome. The majority of those who attended these formal educational classes found them to be helpful, and they were able to understand what was being taught to them. All caregivers actively participated in visitation, and it was documented that they participated in giving cares to their infant (such as diapering, feeding, or changing clothes) and bonding was noted (**Tab. 4**).

Table 1. Demographic information of Infant Care Survey (ICS) respondents.

Maternal age (mean ± SD)		31.0 ± 7.0
Marital status, n (%)	**Married**	11 (39%)
	Other	17 (61%)
Education level, n (%)	**Completed HS or less**	12 (43%)
	Completed above HS education	16 (57%)
Insurance type, n (%)	**Medicaid**	11 (39%)
	Private	17 (61%)
Other care givers in home, n (%)	**No**	3 (11%)
	Yes	25 (89%)
Care giver filling out survey, n (%)	**Mother**	23 (82%)
	Father	5 (18%)
Race, n (%)	**Caucasian**	14 (50%)
	All others	14 (50%)
Other children in home, n (%)	**None**	13 (46%)
	Yes	15 (54%)

Parents: n = 28.
HS: high school.

Table 2. Antenatal complications of pregnancy.

Preecalmpsia	9 (32%)
Gestational diabetes A1	2 (7%)
Intrauterine growth restriction	1 (4%)

Mothers: n = 28.

Only 1 child was discharged home with an apnea monitor. 35% of caregivers (10) were discharged with an infant who required medications at home. They were receiving 0 to 4 different types of medications. All parents had an infant with at least 2 follow-up appointments, and the number of different sub-specialty appointments ranged from 2 to 7 at the time of D/C.

Table 3. Newborn conditions amongst infants (n = 30; two sets of twins) of the parents (n = 28) in the study.

Gestational age at birth (mean ± SD)		29.1 ± 2.2
Birthweight in grams (mean ± SD)		1,333 ± 391
Mode of delivery, n (%)	**NSVD**	9 (30%)
	C/S	21 (70%)
IVH, n (%)	**None**	21 (70%)
	Grade 1	8 (27%)
	Grade 4	1 (3%)
BPD, n (%)	**No**	24 (80%)
	Yes	6 (20%)
Surgery during NICU stay, n (%)	**No**	26 (87%)
	Yes	4 (13%)

Newborns: n = 30.
C/S: C-section; NSVD: normal spontaneous vaginal delivery; IVH: intraventricular hemorrhage; BPD: bronchopulmonary dysplasia; NICU: Neonatal Intensive Care Unit.

Table 4. Parental attendance, satisfaction, and understanding of formal educational training, and bedside involvement in their child's care.

Attended CPR classes	27 (96%)
Found CPR classes to be helpful	24 (96%)
Understood what was being taught in class	24 (96%)
Attended SIDS training	16 (57%)
Found SIDS training to be helpful	16 (100%)
Understood what was being taught in class	16 (100%)
Watched shaken baby video	22 (79%)
Found training video to be helpful	21 (95%)
Understood what was being taught on the video	22 (100%)
Nursing documentation of bedside visitation	28 (100%)
Skin to skin care documented by nurses	24 (86%)
Documented participated in bedside cares	23 (82%)

Caregiver responses: n = 28.
CPR: cardiopulmonary resuscitation; SIDS: sudden infant death syndrome.

The evolution of the ICS score showed significant improvement from the time of enrollment (188.3 ± 60.5) to the time of D/C (235.9 ± 20.9) (**Tab. 5**). When comparing caregivers who did not have other children in the home to parents who did, caregivers without previous children had an initial total ICS score (149.8 ± 64.0) which was significantly lower than those who did (221.7 ± 31.2). However, at the time of D/C, those without other children in the home (228.7 ± 23.1) scored similarly to those which did (242.1 ± 17.2). This was the result of a more profound improvement in scores from enrollment to D/C amongst parents who did not have children in the home (change in score: 79.0 ± 68.1) when compared to those who did (change in score: 20.3 ± 35.2) (**Tab. 6**).

When considering other conditions which could potentially affect a change in self-efficacy, there was

Table 5. Comparison of the enrollment and discharge (D/C) Infant Care Survey (ICS) scores overall, and for each subcategory.

Test components	Enrollment (mean ± SD)	D/C (mean ± SD)	p-value
Total score (max score: 255)	188.3 ± 60.5	235.9 ± 20.9	< 0.001
Health knowledge (max score: 75)	54.5 ± 14.1	65.9 ± 9.4	< 0.001
Diet knowledge (max score: 25)	18.9 ± 8.5	23.2 ± 2.6	0.019
Safety knowledge (max score: 35)	29.3 ± 5.2	34.0 ± 1.6	< 0.001
Health skills (max score: 70)	52.5 ± 15.1	64.5 ± 6.0	< 0.001
Diet skills (max score: 25)	19.3 ± 6.6	23.8 ± 2.4	0.001
Safety skills (max score: 25)	20.6 ± 6.1	24.5 ± 1.3	0.001

Table 6. Association of Infant Care Survey (ICS) scores and change in score with potential confounding conditions.

	Condition	Initial total ICS (mean ± SD)	D/C total ICS (mean ± SD)	Change in total ICS (mean ± SD)
Parent answering survey	**Mother (23)**	191.7 ± 59.4	238.8 ± 19.0	47.1 ± 59.0
	Father (5)	172.8 ± 70.4	222.2 ± 26.0	49.4 ± 71.0
Insurance type	**Medicaid (11)**	197.5 ± 53.7	232.0 ± 25.3	34.5 ± 54.8
	Private (17)	182.4 ± 65.5	238.4 ± 17.9	55.9 ± 63.1
Other children in home	**None (13)**	149.8 ± 64.0[a]	228.7 ± 23.1	79.0 ± 68.1[a]
	Yes (15)	221.7 ± 31.2	242.1 ± 17.2	20.3 ± 35.2
Other care givers in home	**No (3)**	192.7 ± 77.0	215.3 ± 33.5	22.7 ± 72.2
	Yes (25)	187.8 ± 60.2	238.3 ± 18.4	50.5 ± 59.3
Race	**Caucasian (14)**	171.4 ± 63.0	237.2 ± 19.6	65.9 ± 62.1
	All others (14)	205.3 ± 54.9	234.5 ± 22.7	29.2 ± 53.6
Married	**No (17)**	177.0 ± 63.9	234.2 ± 21.7	57.2 ± 63.2
	Yes (11)	205.8 ± 52.8	238.5 ± 20.2	32.6 ± 53.7
Education status	**HS or less (12)**	186.1 ± 69.4	235.3 ± 25.1	49.2 ± 65.6
	Above HS (16)	190.0 ± 55.3	236.3 ± 17.9	46.3 ± 57.4
Maternal age (median is 32 years)	**At or below median (16)**	174.0 ± 68.1	233.4 ± 23.6	59.4 ± 67.5
	Above median (12)	207.3 ± 44.4	239.1 ± 17.0	31.8 ± 46.1
Gestational age (median is 29 wks)	**At or below median (15)**	192.9 ± 48.3	234.5 ± 22.1	41.7 ± 53.2
	Above median (13)	183.1 ± 73.9	237.4 ± 20.2	54.3 ± 68.3
Birthweight (median is 1,370 g)	**At or below median (14)**	175.3 ± 73.0	236.4 ± 20.1	61.1 ± 73.3
	Above median (14)	201.4 ± 43.7	235.3 ± 21.6	33.9 ± 41.0
Time between tests (median is 36 days)	**At or below median (14)**	205.0 ± 46.0	233.0 ± 25.1	28.4 ± 45.7
	Above median (14)	172.1 ± 70.5	238.8 ± 15.9	66.7 ± 67.5

HS: high school.
[a]$p < 0.05$ when comparing each enrollment ICS score to one another, each discharge (D/C) score to one another, and each change in total ICS score to one another for each potentially confounding condition.

similar improvement in self-efficacy over time for each condition.

Discussion

Preterm infants may be discharged with equipment such as apnea monitors, feeding tubes and oxygen. Parents have the added responsibility of understanding how to use any equipment which may be necessary for the safety of their child in the home, the administration of any medications needed for their care, and coordinating attendance at all follow-up appointments in addition to routine care. One study has shown that not all caregivers of preterm infants are "prepared" for home D/C of their preterm infant as rated by both the parent and the nurse at the time of D/C [11]. These results are likely indicative of the complexity in the coordination of the D/C of the high-risk neonate and the home care necessary for some preterm infants. Therefore, parental education relating to the care of complicated infants regarding utilization of medical equipment or administration of medications requires greater stress by the NICU staff [12].

A caregiver's belief of success in tasks they perform is referred to as self-efficacy. The pattern of self-efficacy is developed by reinforcement of knowledge and learning [13]. The factors which affect self-efficacy include experience, modeling, social persuasion, and psychological factors [2]. All of these factors can be experienced amongst caregivers of preterm infants during their child's NICU stay. With a higher level of self-efficacy, parents are more apt to take on tasks relating to their infant, as well as act quickly and appropriately in medical emergencies that may occur in the home after D/C [1, 3].

It was clear from our study that caregiver self-efficacy regarding knowledge and skills in the care of their preterm infant is likely to improve over time. This was evident in the significant improvement in all sub-category ICS scores as well as in the total scores. Additionally, we sought to identify conditions which may be associated with a significant change in confidence from the time of enrollment to the time of D/C. We found that conditions, including who filled out the survey or maternal age, the degree of prematurity, severity of illness in the delivery room or throughout the NICU admissions were not associated with any differences in change of perceived caregiver self-efficacy. Further, anticipated complexity of care at home as represented by NICU morbidities, the number of medications and follow-up appointments at the time of D/C were also not associated with the evolution of parental confidence over time.

What we did discover, however, was that, for those parents who did not have other children at home, there was a more profound increase in scores from the time of enrollment to D/C than amongst those parents who did have other children. These results suggest that even though this category of parents had low confidence upon enrollment they have the greatest potential for growth, and the capacity to improve their self-efficacy during their child's NICU hospitalization. Therefore, medical staff should be keenly aware of previous parental experience in order to be able to focus upon first time parents, and encourage their participation in patient care in order to cultivate their self-efficacy.

Since all parents who completed the survey at enrollment and D/C participated in some form of formal education, visited their infant frequently, and were involved in the care of their infant under the guidance of a bedside nurse, we were unable to compare how parental involvement during infant hospitalization might influence the improvement of confidence over time. However, given the dramatic improvement in self-efficacy (from enrollment to D/C) as shown by the difference in the overall and sub-category ICS scores, we feel that these interventions, especially education given at the bedside by the NICU staff, contributed to the increase in parental confidence during their child's admission.

The lengthy stay experienced by most preterm infants in the NICU provides ample educational opportunities for parents from the NICU staff. However, some parents may be hesitant to be involved in the care of their preterm infant [14]. NICU staff is therefore instrumental in both modeling and assisting with hands on guidance to gain knowledge and skills and to develop confidence as a caregiver of a preterm infant. Via supervised and assisted participation in the care of their preterm infant, the four factors which affect self-efficacy (experience, modeling, social persuasion, and psychological factors) will be fulfilled for parents prior to D/C. Further, formal education classes have been shown to ease the D/C process by preparing parents to recognize infant cues, know when to call the pediatrician, and develop parental skills [15]. These educational sessions in the NICU increase

parents' problem solving strategies and strengthen their preparedness to take their infant home [16].

Parental self-efficacy has been shown to be associated with conduct issues in children aged 2 to 8. Further, it has been associated with parental parenting style, discipline, and competence [17, 18]. Therefore, it is of paramount importance to promote self-efficacy amongst the parents of preterm infants in order to prepare them for the potentially stressful role of a caregiver of an infant with extensive medical issues. We have shown in our study that, through the engagement of NICU caregivers in both bedside and formal educational opportunities, improvement in caregiver self-efficacy can be accomplished.

The use of the ICS at both enrollment and D/C allowed us to evaluate how parental confidence can change during their preterm child's time in the NICU. Despite the small sample size, we were able to clearly demonstrate that self-efficacy can grow significantly over time. The collection of demographic, delivery room, and neonatal information, program attendance, parental visits and neonatal morbidities allowed us to assess what factors may contribute to the evolution of self-efficacy. The measurement of parental self-efficacy is unique and has not been previously reported in the literature for parents of preterm infants. Lastly, this study is the first time that the ICS has been used in a NICU setting, and its application proved successful.

Future research as well as clinical applications of the ICS may include its use upon admission to identify specific skills or knowledge in which a caregiver may lack confidence. This will allow the NICU staff to focus on such educational opportunities during their infant's stay. The survey may also be used at the time of D/C to identify any remaining areas in which the parent may continue to be apprehensive about, in order to ensure they are adequately addressed before the caregiver goes home with their infant.

Conclusion

Despite the stress and anxiety of having a child in the NICU, parental self-efficacy is likely to significantly improve during their child's hospitalization. This was most evident amongst first time parents. We suspect that parental participation in their infant's care and formal educational opportunities contribute to improvement in confidence over time.

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Declaration of interest

The Authors declare that there is no conflict of interest or funding for this paper.

Ethical statement

The procedures followed were in accordance with the ethical standards of the institutional committee on human experimentation. All participants in this study signed informed consent. This study was approved by the Institutional Review Board of both New York Medical College and Westchester Medical Center.

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