

Home oxygen therapy in infants with bronchopulmonary dysplasia: assessment of parental anxiety[☆]

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Abstract

Background: It is conceivable that a complicated recovery course in a high-risk premature infant managed at home generates apprehension and anxiety in parents. **Aims:** We attempted to define the evolution of anxiety levels in a population of parents of low-birth-weight premature infants with bronchopulmonary dysplasia enrolled in a prospective home O₂ therapy program. **Study design:** In the immediate pre-discharge [mean postnatal age 95 (45–158) days], a questionnaire (State–Trait Anxiety Inventory form Y) was given to all parents of the premature infants [mean birth weight 1106 (0.610–1.770) kg; mean gestational age 27.1 (24–31) weeks] present for the discharge. Subsequently, the parents were assessed twice, initially after a week from the discharge of their infants and then at the end of the oxygen therapy phase [mean postnatal age 185 (60–361) days]. They included 10 mothers and 10 fathers, aged 33.5 ± 0.5 and 37 ± 0.2 years, respectively. **Results:** Our results indicate that these parents present an increased state anxiety level upon hospital discharge of their oxygen-dependent premature infants, which decreases as the improvement of respiratory status and the cessation of oxygen-dependency become evident [mean \pm S.D. related to age (*T*) maternal values 47.1 ± 7.0 , 41.8 ± 5.6 , 39.1 ± 4.7 , respectively; mean \pm S.D. related to age (*T*) paternal values 42.2 ± 8.5 , 41.1 ± 8.1 , 40.5 ± 8.2 , respectively]. When assessed separately by parental gender, in the maternal group, state anxiety decreased significantly (ANOVA, $p < 0.05$). **Conclusions:** These data indicate that although neonatologists generally define the discharge of prematures with chronic lung disease based upon the acquired stabilization of vital parameters, in the oxygen-dependent group, they should also pay special attention to the emotional support of the parents who we have

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identified as being at increased risk for pre-discharge anxiety. © 2001 Elsevier Science Ireland Ltd. All rights reserved.

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In recent years, both pediatricians and neonatologists have necessarily increased their efforts to extend the care of high-risk premature neonates to the emotional support of parents as well. Identifying and alleviating this parental anxiety is beneficial to parents for additional reasons besides enhancement of psychological well-being, and a variety of interventions have been described and addressed in the pediatric literature to prevent or decrease the severity of untoward parental reactions in the psychoemotional interest of growing infants [1,2].

Bronchopulmonary dysplasia is the most frequent respiratory sequela of prematurity, characterized in the acute unresolved lung disease phase by cardiorespiratory symptoms, and in the subsequent reparative process phase by persistent supplemental O₂ requirement and poor growth with the consequent need for prolonged hospitalization [3,4]. Developments of technology, particularly in the O₂-releasing and monitoring systems, have led to earlier discharge on a home O₂ therapy program. In the past, or alternatively, these premature infants were discharged home when the PaO₂ levels were >55 mm Hg. Several studies suggest that optimal cardiopulmonary support requires the maintenance of Sat O₂ at 95% or greater [5]. The use of low flow O₂ delivered by nasal cannula to these infants, reducing the potential risks of hypoxaemia, allows a continuous O₂ therapy at home, resulting in a closer parent–infant relationship and in a reduction of overall costs [6].

In this prospective study, we aimed to define pre-discharge anxiety and to follow post-discharge levels in a population of parents of high-risk prematures with unresolved acute lung disease enrolled in a program of home oxygen therapy.

1. Material and methods

In the immediate pre-discharge period, and then twice subsequently, a week after the discharge of the infant and at the discontinuation of oxygen therapy, a questionnaire was given to all parents of oxygen-dependent prematures with bronchopulmonary dysplasia [3] admitted from birth in NICU at the Department of Pediatrics of Padua University, Italy for medical and surgical cares and enrolled in a prospective home O₂ therapy program [5]. Parents were separately asked to complete the questionnaire while they were visiting their child in a holding room before the discharge from NICU. The questionnaire was offered to one or both parents, if present and available. We used the State–Trait Anxiety Inventory (STAI form Y) [7], which is a standard tool used to assess situational anxiety. It consists of two 20-question scores, written on a sixth grade level, and generally takes about 5–10 min to complete. The first part measures the current emotional state of the subject, including immediate feelings of apprehension, nervousness, and worry. The

second set of questions measures the subject's personality trait or how the person generally feels and is used to compare baselines between groups. STAI is the leading measure of personal anxiety worldwide and has been used and validated by health professionals in a variety of different settings. An Italian edition adapted by Pedrabissi and Santinello [8] in 1989 is available.

The patients were discharged from NICU under the following conditions: post-conceptual age ≥ 40 weeks, O_2 dependency with a need of <0.5 l/min of O_2 with nasal cannula to maintain $Sat O_2 > 95\%$ in all activities, weight >2000 g, medical stability, breast or bottle feeding and acceptance by the parents and family pediatrician [5]. Usually in our NICU, the parents are free to approach their babies during the day and when enrolled in the home oxygen therapy program, they are encouraged to participate in nursing procedures. In particular, before discharge, a 2-week period of instruction with the aid of an ad hoc written guide reporting special nursing care and information on O_2 releasing and monitoring systems, was undertaken, and follow-up time was devoted to the parents by the physician and the nurse of the infant. After discharge, all infants were followed up at least until 1 year of age, with the combined support and monitoring in the community by the family pediatrician. Each child was examined at regular intervals during the home oxygen therapy period. Initially, the check-up took place every few days immediately after discharge and then the children were readmitted every 1 or 2 months in order to execute a complete physical examination to follow growth parameters, changes in O_2 requirements, and pulse oxymetry values. Chest X-ray and arterial blood gas analysis were performed as needed.

The source of O_2 for home therapy was liquid O_2 (Freelox, Vitalaire, Italy), and O_2 was delivered by nasal cannula with a low flow lower than 0.75 l/min. The system consisted of a 32-l reservoir tank (26 500 l of gaseous O_2) and a portable unit with 0.5–1.2 l which allowed a more than 12-h time independence from the reservoir tank. The reservoir tank was provided with a humidifier. These infants were regularly monitored to maintain O_2 transcutaneous saturations ($Sat O_2$) at 97% or more in all activities (both awake and asleep). We utilized the Nelcor N-180 pulse oxymeter (Hayward, CA, USA). The patients were weaned from O_2 when, considering a 4-h time period, 95% of the SaO_2 registrations

Table 1
Characteristics of the oxygen-dependent prematures with bronchopulmonary dysplasia

Mode of delivery	
Cesarean	6/10
Outborn	4/10
Male/female	6/4
Gestational age (weeks)	27 (24–31)
Birth weight (kg)	1.106 (0.640–1.770)
Mechanical ventilation (days)	31 (4–86)
Duration of hospitalization (days)	95 (45–158)
FiO_2 at discharge (%)	32.5 (25–40)
Weight at discharge (kg)	2.430 (1.920–2.970)
Home O_2 therapy duration (days)	90 (15–305)
Age at discontinuation of home O_2 therapy (days)	185 (60–361)

Results are expressed as means with ranges in parentheses.

was >95% both awake and asleep, with no significant increase in heart rate when breathing room air.

The protocol was approved by our Institutional Review Board. Informed consent was obtained from the parents of the infants.

Differences between pre- and post-discharge parental anxiety levels were tested using univariate-repeated measures of analysis of variance (ANOVAs). $p < 0.05$ was considered statistically significant.

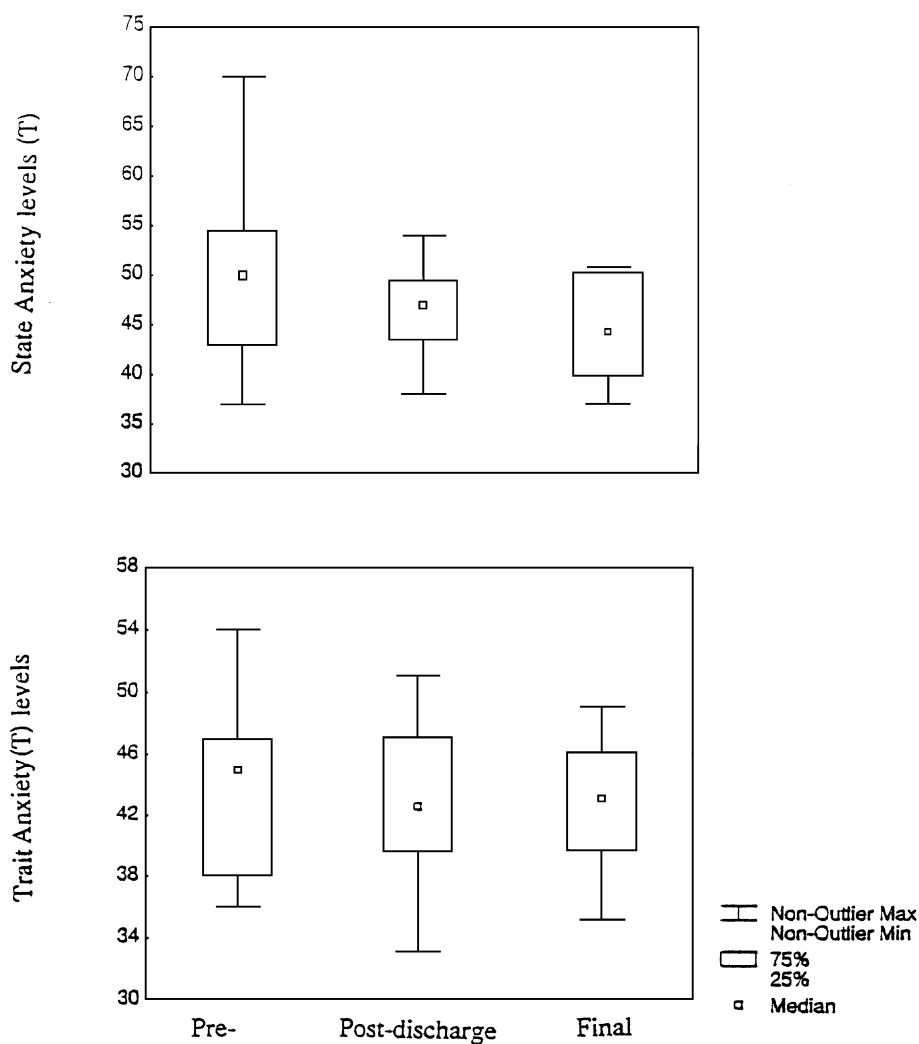


Fig. 1. Pre-, post-discharge, and final (at oxygen-dependency cessation) trait and state anxiety levels (T) in the fathers of prematures with bronchopulmonary dysplasia. Trait anxiety (T) levels are unaffected; state anxiety (T) levels decrease non-significantly (ANOVA).

2. Results

In the Department of Pediatrics of Padua University within over a 24-month period from January 1998 to December 1999, 12 infants with bronchopulmonary dysplasia were discharged from NICU receiving supplemental O₂ via nasal cannula. In the case of two of them, parental acceptance was not considered adequate.

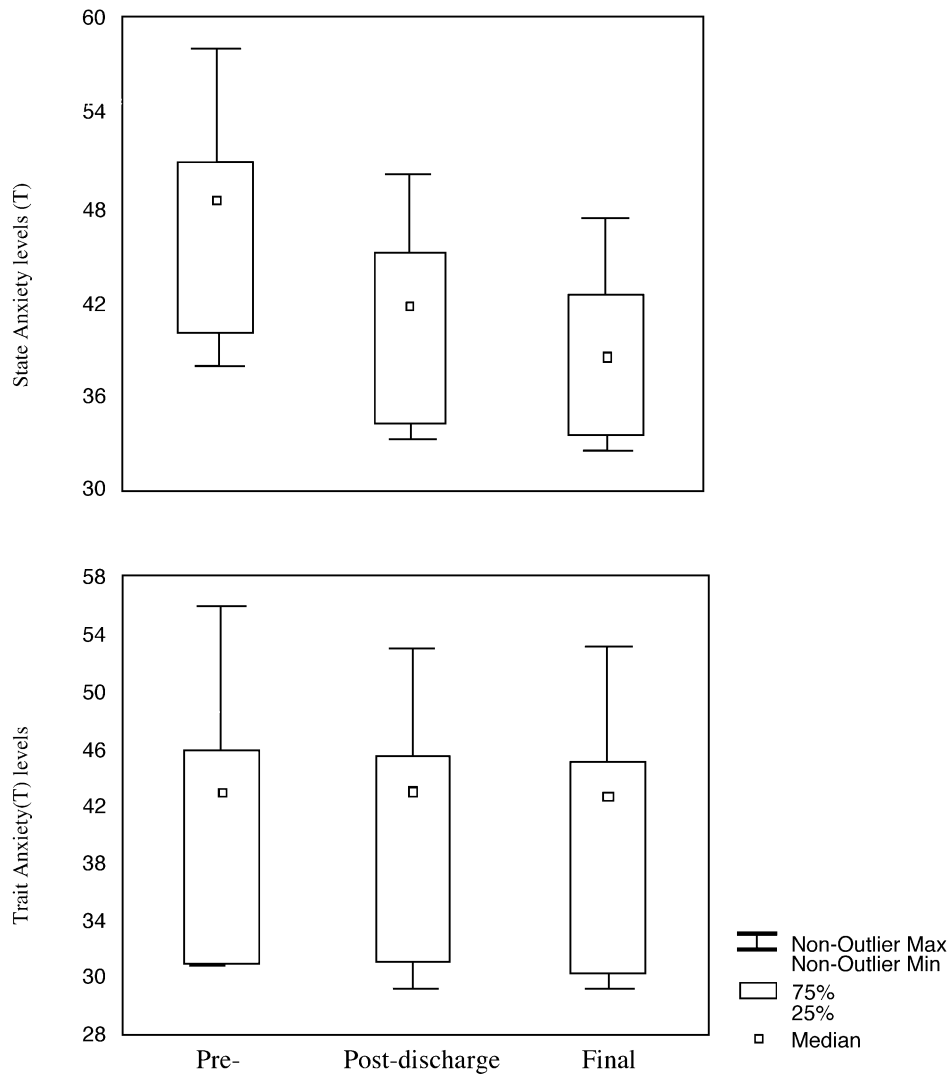


Fig. 2. Pre-, post-discharge, and final (at oxygen-dependency cessation) trait and state anxiety levels (*T*) in mothers of prematures with bronchopulmonary dysplasia. Maternal state anxiety levels decreased significantly along with cessation of oxygen-dependency (ANOVA, $p < 0.05$).

Twenty parents of 10 prematures, 10 mothers and 10 fathers, aged 33.5 ± 0.5 and 37 ± 0.4 years, respectively, participated in the pre-, post-discharge, and in the final STAI-Y form test after discontinuation of home oxygen therapy.

Perinatal anthropometric and clinical data of the oxygen-dependent prematures with chronic lung disease and the characteristics of parents are reported in Table 1. In particular, mean duration of home O₂ therapy of the prematures was 97 days (range 15–320 days) and the mean age of O₂ discontinuation was 6.9 months (range 3–14.7 months).

The pre-, post-discharge, and the final STAI-Y trait and state anxiety levels of parents (value related to parental age, *T*) are shown in Figs. 1 and 2. Our results indicate that the parents of prematures present higher state anxiety levels at the hospital discharge of their oxygen-dependent premature infants. Subsequently, post-discharge parental state anxiety levels decrease with improvement of respiratory insufficiency and with cessation of oxygen-dependency [mean \pm S.D. related to age (*T*) maternal state anxiety values 47.1 ± 7.0 , 41.8 ± 5.6 , 39.1 ± 4.7 , respectively; mean \pm S.D. related to age (*T*) paternal state anxiety values 42.2 ± 8.5 , 41.1 ± 8.1 , 40.5 ± 8.2 , respectively]. When assessed separately by gender, a higher significant state anxiety level was persistently found in mothers (ANOVA, $p < 0.05$).

3. Discussion

Advances in medical knowledge and technology have contributed in improving survival rates among critically ill prematures with respiratory distress syndrome, creating an increasing number of children with unresolved acute lung disease that remain O₂-dependent for long periods. In the past, it was a clinical practice to wean preterm infants from additional O₂ when average Sat O₂ was at 90% or higher. This attitude was favored because of the unavailability of suitable portable delivery systems for infants and because of the psychological needs of physicians and of parents who viewed O₂-dependent infants as being sicker and weaker than those who breath room air. Our experience [5] and previous studies [9–13] indicate that home O₂ therapy is an important aspect of the management of infants with bronchopulmonary dysplasia for several main reasons: it permits earlier discharge and a closer parent–infant contact which promotes the infant's development, it is safe and effective if based on thorough family preparation and collaboration between physicians and families, it is useful in preventing complications due to chronic hypoxia, and avoids unnecessary costs by shortening infant stay in the hospital [14,15]. Nevertheless, it is conceivable that a complicated recovery course in a high-risk premature infant managed at home can generate apprehension and anxiety and take an emotional toll on the parents. It seems thus important for neonatologists and associated professionals to also recognise and address the adverse effects on infants and families.

Recently, we found that in our Level III institution, almost 20% of low-birth-weight neonates with RDS admitted in NICU at birth developed bronchopulmonary dysplasia according to the definition proposed by Bancalari et al. [3]. Among them, about 30%, six to seven per year, met discharge criteria for the home O₂ therapy program.

Subsequently, we tried to evaluate whether parental anxiety would be an additional negative feature of the complicated postnatal course of sick premature neonates. There are two major reasons for this. The first is to identify, quantify, and then possibly institute preventive measures for addressing parental concerns. This reason alone broadens the neonatologist caretaker's role to the service of the parents of high-risk prematures. A second reason, extending beyond the enhancement of the psychological well-being of the parent and into the pediatric realm, concerns the impact of parental anxiety on the behavior, emotions, and possible outcome of the child. Consequently, further evidence to support the need for continuing psychological care for families is vital.

Unfortunately, limited longitudinal studies to date have attempted to correlate parental anxiety, *per se*, or varying levels of anxiety with fetal and neonatal behavior, development, or the emotional reactions of the prematures in the future ages [16–19]. Regarding the effect of maternal emotions on fetal behavior, however, classic observations have proved that mothers under severe emotional stress tend to have hyperactive fetuses [20]. Substantial maternal anxiety and emotional distress were also associated with abnormal labor, dystocia, and higher rates of fetal and maternal morbidity [20,21]. Furthermore, with regards to the influence of maternal emotions during pregnancy on neonatal and postnatal behavior, it is well-known that infants of emotionally disturbed women tend to have high activity levels after birth, irritability, poor sleeping, gastrointestinal difficulties, difficult temperament, deviant behavior on the Breazelon NBAS, and lower scores on the Bayley Scale. Even maternal state and trait anxiety were found to be correlated with fetal and also neonatal behavior [22,23]. A clear explanation of the findings and of the underlying mechanisms is still lacking, and as a consequence, other studies seem necessary.

Our results demonstrate that parents of prematures discharged with home oxygen therapy are especially prone to increase pre- and post-discharge anxiety. This represents another negative, psychoemotional event for growing premature infants, and a logical reason for preventing or reducing the severity of untoward psychological reactions in parents. In this study, we did not attempt to classify parents as either “anxious” or “calm,” based on a median split of their anxiety scores, and we did not investigate if premature infants of anxious women have more post-discharge complications. Nevertheless, these data could help neonatologists to identify parents who need increased pre- and post-discharge emotional support, and to determine whether a comparison of anxiety levels at discharge of similar high-risk groups will validate these results, which high-risk prematures would benefit from having their parents supported during the complicated recovery phase. Future studies, in fact, should evaluate pre-natal and post-discharge parental intervention and its impact on the emotional and behavioral well-being of the high-risk premature children.

In conclusion, we determined that parents of sick prematures with chronic lung disease have elevated anxiety lasting over the immediate perinatal period. We also determined that mothers of oxygen-dependent prematures discharged from Level III NICU are generally more anxious than fathers. We suggest that, in addition to defining the discharge of the high-risk premature based upon the acquired stabilization of vital parameters, neonatologists should also consider the emotional needs of

the oxygen-dependent group we have identified as being at increased risk for parental anxiety.

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