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Reducing Hospital Expenditures With the COPE (Creating Opportunities for Parent Empowerment) Program for Parents and Premature Infants:

An Analysis of Direct Healthcare Neonatal Intensive Care Unit Costs and Savings

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Abstract

More than 500,000 premature infants are born in the United States every year. Preterm birth results in a multitude of negative adverse outcomes for children, including extended stays in the neonatal intensive care unit (NICU), developmental delays, physical and mental health/behavioral problems, increased medical utilization, and poor academic performance. In addition, parents of preterms experience a higher incidence of depression and anxiety disorders along with altered parent-infant interactions and overprotective parenting, which negatively impact their children. The costs associated with preterm birth are exorbitant. In 2005, it is estimated that preterm birth cost the United States \$26.2 billion. The purpose of this study was to perform a cost analysis of the Creating Opportunities for Parent Empowerment (COPE) program for parents of premature infants, a manualized educational-behavioral intervention program comprising audiotaped information and an activity workbook that is administered to parents in 4 phases, the first phase commencing 2 to 4 days after admission to the NICU. Findings indicated that the COPE program resulted in cost savings of at least \$4864 per infant. In addition to improving parent and child outcomes, routine implementation of COPE in NICUs across the United States could save the healthcare system more than \$2 billion per year.

Keywords

costs; parents; premature infants

Despite aggressive efforts to prevent prematurity, more than 500,000 premature infants are born every year in the United States.^{1,2} Findings from numerous studies indicate that premature infants experience a host of adverse physical, mental health/behavioral, developmental, and academic outcomes, which persist well into the school-age and adolescent years and impose great emotional and financial burdens to families, society, and the healthcare system.^{3–5} In addition, parents of premature infants experience a host of

negative outcomes that include depression, anxiety, posttraumatic stress disorder, and dysfunctional parenting patterns.^{6–10}

The costs associated with a neonatal intensive care unit (NICU) stay (ie, approximately \$1250–\$2000 per day) and increased medical utilization by these children are exorbitant. In 2005, premature birth cost the United States at least \$26.2 billion or \$51,600 for every infant born preterm, including (1) 16.9 billion (65%) for medical care, (2) 1.9 billion (7%) for maternal delivery, (3) 611 million (2%) for early intervention services, (4) 1.1 billion (4%) for special education services, and (5) 5.7 billion (22%) for lost household and labor market productivity.¹⁰ The average first-year medical costs, including both inpatient and outpatient care, are about 10 times greater for preterm infants (\$32,325) than for term infants (\$3325). Furthermore, the average length of stay for a term infant is 1.5 days in comparison with a preterm infant whose average length of hospital stay is 13 days (9 times that of a term infant).¹¹

Although the emotional, developmental, academic, and financial costs of preterm birth are staggering to families as well as to school and healthcare systems, early interventions to enhance mental health outcomes in parents of premature infants in order to improve both parenting and child outcomes as well as to reduce NICU stays and hospital/medical costs have not kept pace with the rapid technological advances to enhance survival in these high-risk infants. Therefore, in an attempt to improve parent and preterm infant outcomes as well as reduce NICU stay and associated hospital costs, the Creating Opportunities for Parent Empowerment (COPE) program, a manualized educational-behavioral-skills-building intervention containing information about premature infants and skills-building activities about how best to care and interact with preterms, was developed and pilot tested in a randomized controlled study with 42 mothers of low-birth-weight (LBW) premature infants and their mothers. Key findings indicated that COPE mothers, in comparison with mothers who received an attention control program, which contained standard information about the NICU environment and policies, reported less stress in the NICU and stronger beliefs about what behaviors and characteristics to expect in their preterm infants. The COPE infants had significantly higher mental development scores at 3 months' corrected age than did control infants, and this difference widened at 6 months' corrected age, with the COPE infants scoring 14 points higher.¹² Because of the positive outcomes demonstrated in this pilot study, a full-scale randomized controlled trial (RCT) with 260 LBW premature infants and their parents was conducted to determine the efficacy of the COPE program on infant, parent, and cost outcomes.

Description of the COPE program and key findings from the full-scale trial

The COPE program is a manualized intervention program comprising (1) audiotapes that provide parents with educational information about the appearance and behavioral characteristics of their premature infants (infant behavior information) and how parents can participate in their infant's care, meet their infant's needs, enhance the quality of interaction with their infant, and facilitate their infant's development (parent role information) and (2) workbook skills-building activities that assist parents in implementing the educational information (eg, learning how to read their infants' awake states and stress cues; keeping

track of important developmental milestones; determining what behaviors are helpful when their infants are stressed). The content of the COPE program and skills-building activities is guided by self-regulation theory¹³ and control theory.¹⁴ Parents listen to the audiotaped educational information as they read it in their workbook. The first intervention in the COPE program is delivered to parents 2 to 4 days after their infant is admitted to the NICU. The second COPE intervention is delivered 2 to 4 days after the first intervention, and the third intervention is delivered to parents 1 to 4 days prior to their infant's discharge from the NICU. Parents receive the fourth COPE intervention approximately 1 week after their infant is discharged from the hospital. The COPE educational tapes range from approximately 10 to 20 minutes in length. Each of the 4 audiotapes in the COPE program has corresponding skills-building activities that parents complete after they listen to the educational information on the tapes, which assists them with incorporating the information they receive into developmentally sensitive interactions with their infants. The NICU COPE program was adapted from other versions of COPE for parents of hospitalized and critically ill children, which have been found to improve parent and child outcomes both during and following hospitalization.^{15,16}

In the full-scale RCT that was conducted in 2 NICUs in Upstate New York beginning in 2001 (see Melnyk et al⁸ for a full-report of the findings), the sample comprised 260 families with premature infants, including 258 mothers and 155 fathers or significant others. Fifty-one percent of the mothers were in their first marriages, and one-third was on public assistance. Sixty-five percent of the mothers and 71% of the fathers/significant others were whites. Eighty-four percent of the mothers and 82% of the fathers/significant others completed high school.

The mean gestational age of the premature infants was 31.3 weeks and the mean birth weight was 1650 g. Seventy percent of the infants weighed 1350 to 2500 g at birth, 25% weighed 851 to 1350 g, and 2.7% weighed 701 to 850 g. One hundred twenty-six (48.5%) of infants were males and 134 (51.5%) were females. Mean discharge weight from the NICU was 2150.3 g. Total length of stay in the NICU averaged 35.2 days. Twenty-four percent of infants were transferred to another hospital before discharge to home.

Findings from the full-scale trial indicated that COPE mothers reported significantly less stress in the NICU and less anxiety and depressive symptoms at 2 months' corrected infant age than mothers who received the attention control program. Depressive and anxiety symptoms for the COPE mothers at their infants' 2-month corrected ages were reduced as a result of having stronger beliefs/confidence in what to expect behaviorally from their preterm infants and how best to parent them and support their development.¹⁷ Observers who were blind to study group rated COPE mothers and fathers as more positive and developmentally sensitive in their interactions with their infants compared with the attention control parents. Infants in the COPE program had a 3.8-day shorter hospital length of stay (mean of 35.2 days) than infants in the attention control group (mean of 39.2 days). The COPE infants weighing less than 1500 g at birth went home a mean of 8.3 days sooner than infants whose parents received the attention control program.⁸

Purpose of this study

The purpose of this study was to examine the incremental cost of the development and implementation of the COPE program as compared with an attention control program from the healthcare sector perspective (ie, direct healthcare costs). Cost analyses should be routinely performed in RCTs so that healthcare decision makers can factor in the benefits and costs of translating efficacious interventions into clinical practice.

METHODS

The United States Public Health Services Panel on cost-effectiveness in health and medicine has made recommendations regarding which costs to include in an economic analysis in relation to the perspective taken (eg, the healthcare sector, societal).^{18–21} This project's cost analysis followed the panel's recommendations. *Direct healthcare costs* were defined as costs associated with the intervention itself and the cost (or savings) related to other healthcare resource utilization (eg, NICU costs, outpatient visits, developmental services). Direct healthcare costs equaled the sum of the COPE intervention costs and the sum of infant healthcare costs. The COPE intervention costs equaled the sum of the production and implementation costs. Infant healthcare costs equaled the sum on the NICU length of stay times the cost per day in the NICU.

To estimate the expenses associated with days spent in the NICU, the number of days was multiplied by a cost of \$1250 per day (a conservative cost estimate reflecting median treatment costs that include accommodation and ancillary costs). Data were collected from (1) billing receipts related to the production of the COPE intervention (the cost of the audiotapes and written materials for all phases of the intervention), (2) infants' birth-related hospital records, and (3) adjusted NICU charges.

FINDINGS

The COPE intervention costs equaled the sum of the COPE production costs plus the sum of implementation costs. When this original study was done, the cost of the COPE program through NICU discharge was approximately \$136 per child that included the sum of production costs (ie, creating the audiotapes with educational information and producing the COPE parent workbooks) and implementation costs (ie, time that it took a nurse to deliver the COPE interventions to the parents). Infant direct healthcare costs/savings equaled the sum of the NICU length of stay in days times the cost per day in the NICU. A mean 4-day shortened length of stay for the COPE group at a conservative cost/savings estimate of \$1250/NICU day resulted in a savings of \$5000 per infant. Cost analysis for the COPE program is as follows:

$$\begin{aligned} \text{Direct healthcare costs} &= \sum \text{COPE intervention costs} + \sum \text{infant healthcare costs} \\ \text{COPE intervention costs} &= \sum \text{production costs} + \sum \text{implementation costs} \\ \text{Infant healthcare costs} &= \sum \text{NICU length of stay} \times \text{cost/day.} \end{aligned}$$

On the basis of these estimates, the net direct healthcare cost savings per infant through NICU discharge after deducting the cost of the intervention would be approximately \$4864.

Further subgroup cost analysis for the COPE infants weighing less than 1500 g who went home an average of 8 days earlier than attention control infants who weighed less than 1500 g resulted in an even greater net savings of \$9864 per infant.

DISCUSSION

Findings from this cost analysis indicated that hospitals could substantially reduce their costs associated with preterm birth if their NICUs would implement COPE as standard care with parents of premature infants. Routine implementation of COPE to all preterm infants born in the United States every year could save the American healthcare system from \$2.4 to \$4.9 billion. Although recognizing that the cost associated with implementing the COPE intervention in 2008 has increased and may vary by region (eg, staffing costs), the cost associated with the NICU length of stay has also continued to climb, which could result in even greater savings with routine implementation of the COPE program. In addition to the cost benefits of COPE, evidence from 2 rigorously designed RCTs indicates that parents who receive COPE experience less stress, anxiety, and depressive symptoms as well as have more positive interactions with their infants, which may have a long-lasting positive impact on both parents and their prematurely born children. Because COPE is manualized through tapes and a parent skills-building workbook, it does not take extensive training and time to implement. Nurses who care for preterm infants in the NICU can easily build the program into their care with families. Other alternatives would be for COPE to be delivered by developmental specialists, clinical nurse specialists, or social workers as part of a family-centered care program in the NICU. Parent support groups might also consider using COPE as a component of their family programs.

The Institute of Medicine has set a goal that, by 2020, 90% of all healthcare decisions will be evidence-based.²² In addition, the National Institutes of Health has established translation research as a high priority. Despite goals and mandates from federal agencies, professional organizations, insurers, and healthcare leaders that clinicians implement evidence-based care, there is a multitude of evidence-based interventions like COPE that have been deemed efficacious through clinical trials that are not being translated into clinical practice to improve healthcare quality and patient outcomes.²³ Adding cost analyses to experimental studies to provide evidence that certain interventions may reduce healthcare costs may assist in accelerating the speed at which efficacious interventions are translated into clinical practice. Further analyses are underway to determine cost outcomes for the COPE program over time, up to 3 years after discharge from the hospital, to evaluate whether the families that participated in the COPE full-scale trial have less direct health-care (eg, special medical services, emergency department visits) and nondirect healthcare costs (eg, missed work time by parents, child care) than families that received the attention control program.

SUMMARY AND CONCLUSIONS

The COPE program for parents of preterms not only improves parent mental health outcomes and parent-infant interaction but it reduces hospital length of stay and expenditures. Implementation of COPE as standard of care could result in substantial cost savings for the US healthcare system. Further research is now needed to determine the short

and more long-term efficacy of COPE on parental, child, and cost outcomes with more seriously ill, extremely LBW infants as well as culturally diverse families.

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