RESEARCH DIRECTS in THERAPEUTIC SCIENCES

2023, Volume 2 (Issue 1): 2 OPEN ACCESS

The Effectiveness of Parental Education Programs within Neonatal Intensive Care Units: A Systematic Review

Review

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Open Access

Published: April 7, 2023

Research Directs in Therapeutic Sciences: *2023, Volume 2 (Issue 1): 2*

Abstract

Introduction: Parenthood brings stress and anxiety to new parents due to the dramatic role transition. Parents who have a newborn in the neonatal intensive care unit (NICU) experience an increased level of stress. Increasing parental competencies in complex infant care compounds stress; therefore, finding the most effective method of parental education may improve parental health, well-being, and quality of life. Enhanced knowledge prepares parents to transition home. The objective of this systematic review is to evaluate the effectiveness of parental education interventions conducted within the NICU.

Methods: CINHAL, Medline, PsychInfo, Web of Science, PubMed, and OT Search databases were searched to locate studies focusing on parental education, provided via healthcare workers, as a main intervention for parents with infants in the NICU. Articles were independently reviewed and selected based on defined inclusion criteria.

Results: 20 articles were included and synthesized according to the method of education, parental outcomes, and the provider of education.

Conclusions: Parental education is an effective way to facilitate positive parental outcomes. Utilizing combined methods to deliver education with repeated, consistent exposure, and checking for parent understanding is the best approach to minimize negative parental outcomes and improve preparedness for discharge.

Key Words: parents, parental confidence, satisfaction

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Introduction

Overwhelming excitement and anticipation accompany the transition to parenthood, which is paired with the necessary adaptation to care for a newborn. This substantial role transition to a full-time caregiver accounts for a significant portion of the new parent's routine, leaving decreased time for parental health and wellbeing, as infant care commands top priority.[1,2] This disorganized state of meaningful occupations and changing identity is known as occupational disruption.[3] The newly structured familial routine changes parental socialization. This may decrease sexual intimacy which contributes to declined couple satisfaction and psychological distress. Anxiety and depression may emerge in new parents while caring for their infant as they undergo drastic routine changes related to the intense temporal demands of parenting and caregiving. This alteration of routine, and decreased free time, results in relationship changes with friends and extended family members leading new parents to feel socially isolated from their support system.[1] In addition to the added stress of stark role transitions, parents with newborns who require care in the NICU experience additional anxiety and stress related to preparedness for discharge home as they become the

primary care provider to an infant with complex medical needs. NICU parents often question their ability to care for a premature infant upon NICU discharge.[4] Within the NICU, there is a need for effective communication and parental involvement throughout care. Providing information to the parents during their NICU stay is a crucial step in preparation for the transition home.[5] Information can be disseminated to parents through educational interventions provided by any member of the interprofessional healthcare team of specialists including physicians, neonatologists, nurses, dieticians, and occupational, physical, speech or respiratory therapists.

Occupational therapists serve as an integral part of the interprofessional team providing care in the NICU. [6] The occupational therapist in the NICU environment possesses advanced skills, knowledge, and competence to provide direct intervention to the infant, and support parents in their occupational role of caregivers. The role of the occupational therapist includes utilizing parental education as an intervention with focus on the family system, ensuring positive influences on the infant-caregiver relationship, and enhancing parental mental and physical well-being.[6] Occupational therapists are responsible for educating parents on numerous topics including, but not limited to, infant positioning, infant development, behavior states and cues, and feeding challenges.[7] The Occupational Therapy Practice Framework 4 (OTPF-4) and Occupational Therapy Scope of Practice are documents that outline practice boundaries for the profession. Within both documents, education is identified as a type of intervention.[8-9] The OTPF-4, defines education as an intervention as, "activities that impart knowledge and information about occupation, health, wellbeing, and participation resulting in acquisition by the client of helpful behaviors, habits, and routines…"[8] Education is also identified as a means of prevention. Through education efforts, the incidence of unhealthy conditions, risk factors, diseases, and injuries can be identified, reduced, or prevented.[8]

Early involvement in parental education has been identified to reduce negative consequences to first-time parents' occupational balance.[1] Although occupational therapists are health care professionals equipped to provide such parental education, there is limited evidence connecting parental education interventions to occupational therapy in the NICU. The objective of this systematic review was to evaluate the effectiveness of parental education interventions conducted within the NICU setting. Identification of the effectiveness of educational methods, and the impact of the education on parental and infant outcomes, despite the provider of the education, could begin to inform approaches to parental education in the NICU by occupational therapists.

Scientific Methods

Protocol

This systematic review was conducted following the PRISMA Guidelines for Systematic Reviews.[10] The studies included biological mothers and/or fathers above the age of 18 with an infant in the NICU. Within the included studies, structured education was delivered by a health care professional to parents as the primary intervention. Studies were excluded from this review if published prior to 2015 to ensure the current evidence was being evaluated. Studies were not included if unable to obtain the article in English, due to feasibility complications. All systematic, scoping, literature reviews, as well as program descriptions, and follow-up studies were excluded to retain focus on original studies on parent education. Studies were excluded if infants were not in the NICU, and if the outcomes of the study were not related to parental education provided as an intervention. Studies were excluded if they did not focus on parental education, reported healthcare professional's perceptions of education, hospital quality improvement projects, or focused on parental mindfulness training. Studies were excluded if below 4 level of evidence, as defined by Oxford Centre for Evidenced-Based Medicine.[11] Computerized searches were conducted between spring and fall 2022 for CINHAL, Medline, PsychInfo, Web of Science, PubMed, and OT Search. The search strategy was developed considering the target population, intervention, and various outcomes related to parental education. Derived from the research question, objectives, and key words, search terms were comprised including: "NICU," "neonatal intensive care unit," "special care," "baby unit," "newborn intensive care," etc. combined with "parent education," "parent training," "parent coaching and interventions," "best practices" "caregiver training," "therapy," "program," etc. Expanders, Boolean operators, and Medical Subject Headings (MeSH) were incorporated as appropriate per database to maximize the search results. An example of the search strategy is provided in Table 1.

Table 1. Sample search strategy for one database.

Database	Search Terms
CINAHL Complete	"NICU OR neonatal intensive care unit OR special care OR baby unit OR newborn intensive care AND parent education OR parent training OR caregiver training OR parent coaching AND interventions OR strategies OR best practices OR treatment OR therapy OR program OR management"

Following the completion of all searches, the principal investigator and secondary screener conducted independent title and abstract screens to evaluate each article related to inclusion and exclusion criteria. Articles passing the title and abstract screening were sought for full text screening and reviewed for inclusion. Article inclusion discrepancies were negotiated between reviews until a verdict was agreed upon. Data was extracted by the principal investigator individually with agreement from two additional researchers. The educational modality utilized in each study was identified to determine which method led to the most effective outcomes. The health care professional was specified to determine which member of the interdisciplinary NICU team was most frequently reported to provide parental education. The outcome measures were recorded in each study to document the heterogeneity of included studies, and to draw appropriate conclusion for clinical implications. The methods of education were divided into five categories: direct instruction, written instruction, technology-based, simulation, and combined methods to assist in comparison and synthesis. Bias was evaluated for each study utilizing Joanna's Briggs Institute (JBI) Critical Appraisal Checklists appropriate for each study design, which consisted of randomized control trails and quasi-experimental studies.[12] Studies below 60% were considered low grade studies, with potential for bias, 60-80% were considered moderate grade studies, and studies above 80% were considered high grade studies, as predetermined by the principal investigator.

Statistical Analysis

Effect sizes, utilizing hedges *g*, and 95% confidence intervals (CI) were computed for all studies with data available. Forest plots were created for similar outcomes to determine the effectiveness of the educational intervention. Studies with hedges *g* at 0.2 or lower were considered to have low effect, 0.5 was considered moderate effect, 0.8 and above were considered high effect.[13] To determine the strength of recommendation for this systematic review, the Cochrane Collaboration Back Review Group ranking was utilized.[14] A strong recommendation is reflected by consistent findings among multiple high quality randomized controlled trials. Consistent findings with low quality randomized controlled trials in combination with at least one high quality study were considered with moderate strength of recommendation is. Limited strength included one low quality randomized controlled trial.

Results

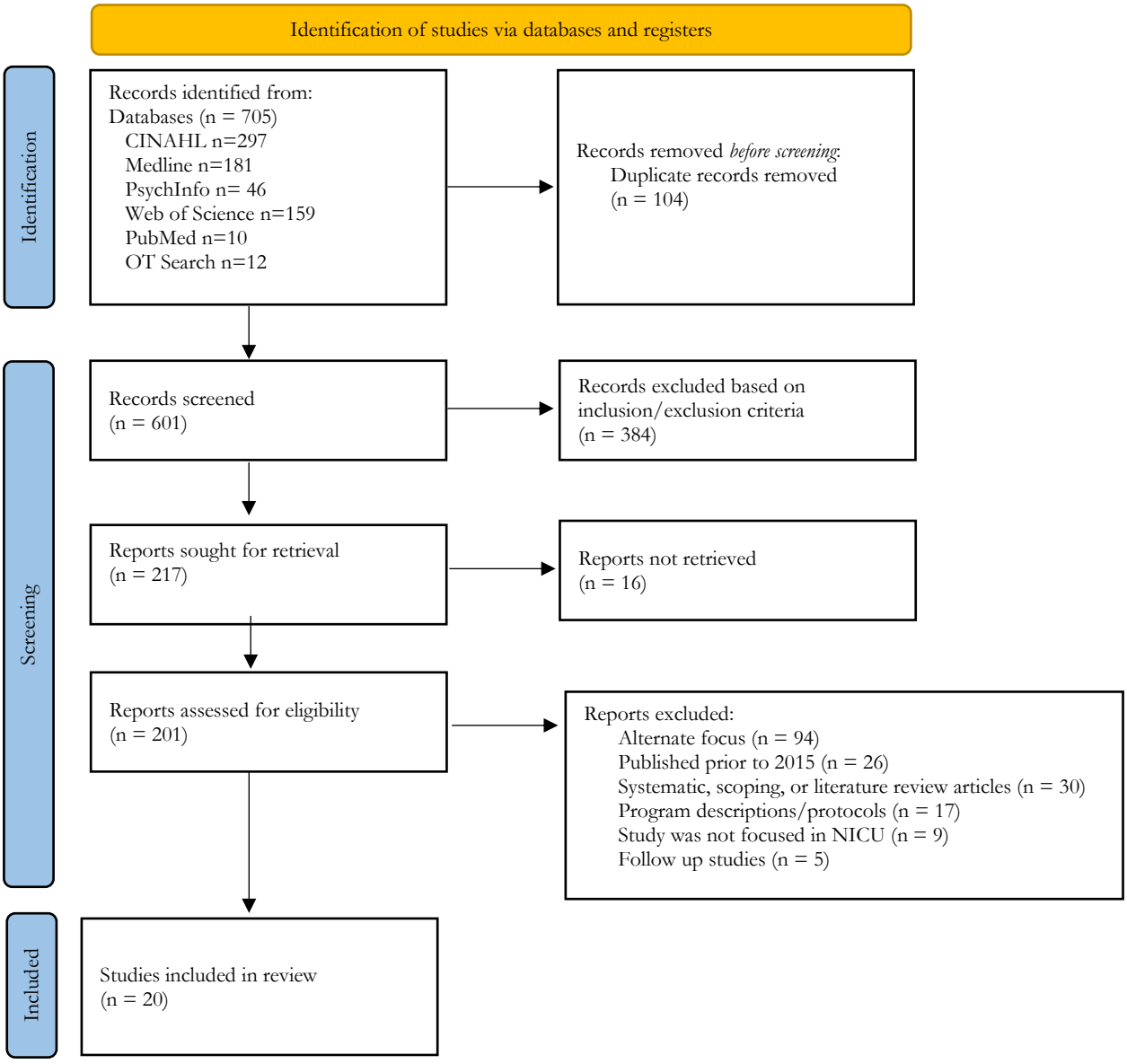
The search of identified databases resulted in 705 articles. After 104 duplicates were removed prior to screening, 601 articles were screened via titles and abstracts by two independent reviewers. A total of 201 studies were screened via full text[10], see Figure 1. A screen for the full text articles resulted in exclusion of 181 articles. An updated search conducted in November 2022 revealed no additional articles, resulting in a total of 20 studies for inclusion in this review.

The included 20 studies were categorized into five different methods or approaches to the educational interventions: direct instruction, written instruction, technology-based, simulations, or combined methods, as shown in Table 2. Direct instruction included education through face-to-face interaction between healthcare providers and parents to successfully educate. In total, seven studies utilized this modality to provide education to NICU parents.[15-21] Three direct instruction interventions were paired with additional reinforcements, such as brochures, reflective journaling, and practice opportunities.[16,20-21] Hesham et al[22] created and provided fathers with an information guide regarding their newborn's NICU admission with mothers. This form of education was categorized under written instruction where parents were provided with information via handout, brochure, or pamphlet.

Technology-based educational methods include electronic, internet, and mobile applications provided to parents at their convenience, with access and ability to be openly explored. Two studies used internet-based sources, an e-book and a website developed by the healthcare professionals, to share information regarding necessary care.[23,24] Another study used a 5-minute YouTube video to educate parents on the NICU environment. This video was found within the newborn's patient portal, available for parents to watch whenever needed.[25] The final technology-based educational

method was narrated slides.[26] Two studies utilized a simulated educational intervention incorporating infant mannikins and equipment to provide hands-on interaction and instruction. These simulations allowed for training and practice as a teaching method for infant handling.[27-28] The remaining category of educational intervention included mixed methods which comprised of a combination of instructional interventions that fell between the previous categories of direct instruction, written materials, videos, and other technology-based instruction. These studies utilized videos, reflective journaling, knowledge checks, a mobile app, question/answer sessions, and pictorial instructions to supplement the provided education. [29-34]

Figure 1. Visual representation of PRISMA Chart to illustrate the total number of articles collected from search strategy, articles excluded from the review with respective reasoning, and final articles included.



The healthcare providers that conducted research on education methods in the reviewed articles included nursing, physical therapy, psychology, allied health, midwife counselor, neonatal trainees, and self-directed learning. Self-directed learning included videos and educational modules completed asynchronous which allowed parents to facilitate

learning at their own pace. Among the studies, 15 of the education interventions were provided by a nurse[16-21,23,26,27,29,30,33,34], three were self-directed learning[24,25,34], three were provided by a physical therapist or allied health professional[30-32], and one each by psychologists[32], midwives[15], and senior neonatology trainees.[28]

Table 2. Articles are organized within categories based upon the appropriate method/approach to education. A summary of the main methods of each educational program included is described.

	Education Conducted
Direct Instruction[15-17]	Parental empowerment, audio tapes[18]
	Discharge training, brochure[19]
	Reflective journaling[20]
	Practice opportunities[21]
Written Instruction	Information guide[22]
Technology-Based	Internet-based[23-24]
	YouTube video[25]
	Narrated slide presentation[26]
Simulation	Infant simulation dolls[27]
	Parent bed-side simulation program[28]
Combined Methods	Video, reflection questions, session activities, knowledge checks, practice opportunities[32]
	Direct instruction, mobile app[30]
	Direct instruction, narrated slides, Q&A[29]
	iPad video, handout[34]
	Video, handout[33]
	Direct instruction, video, written/pictorial instructions[31]

Critical Appraisal was computed utilizing the Randomized Control Trial and Quasi-Experimental Checklists from the JBI.[12] A total percentage "grade" for each article was calculated by converting the number of items achieved in the checklist compared to the number of items. All twenty included articles achieved over 60% threshold on the respective critical appraisal checklist per the study design. Below 60% of (JBI) grade was considered low grade, resulting in increase of risk of bias. Five studies fell between 60-80% JBI Grade, meaning they were moderate grade studies and held a moderate risk of bias. Fifteen articles fell over 80% JBI Grade, resulting in a high grade and less risk for bias.

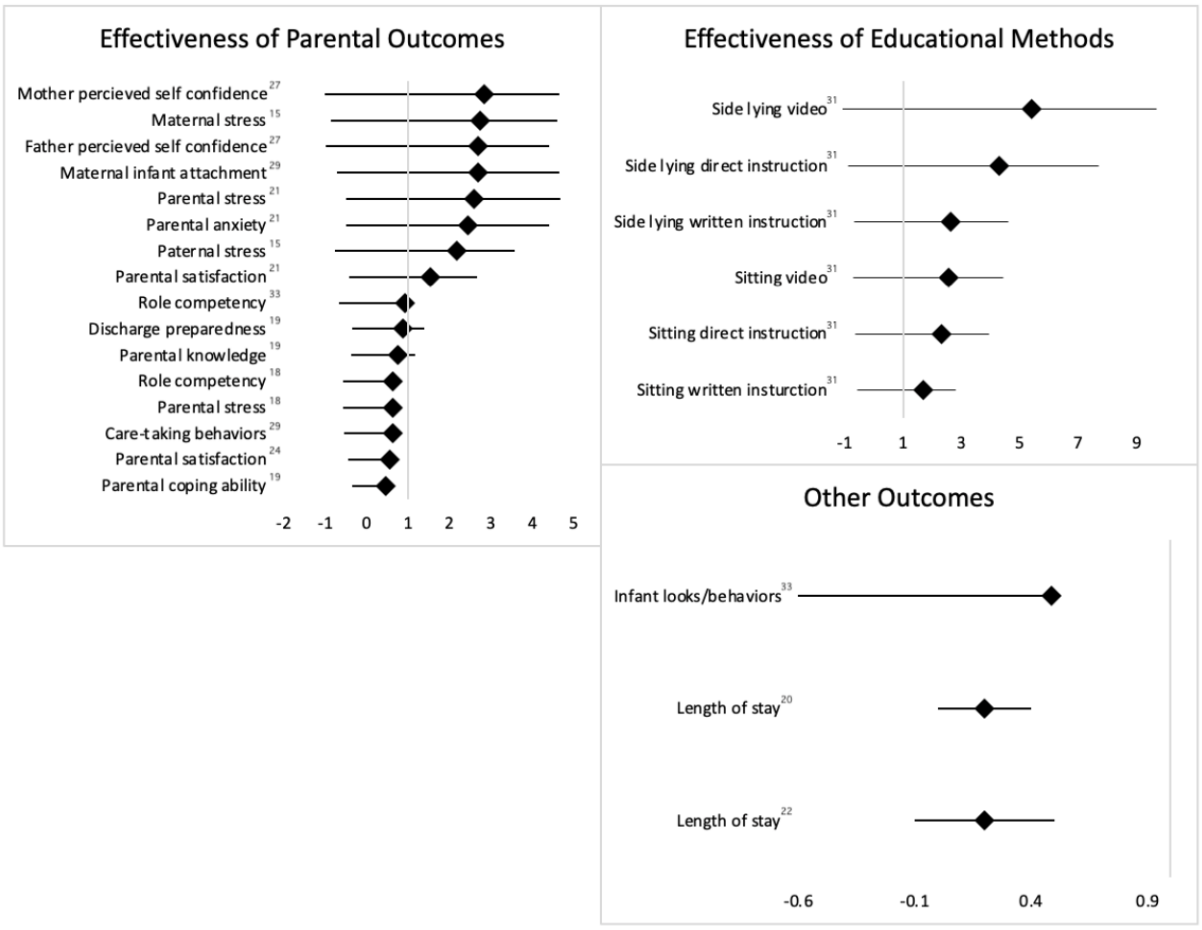
Included within this systematic review, 12 out of 20 studies reported appropriate data for calculation of effect sizes (hedges *g*) and 95% confidence interval based on the heterogeneity of studies. Study outcomes were organized into three categories: parental outcomes, educational method outcomes, and other outcomes. Two studies evaluated the impact of parental education on infant length of stay had low effect size of 0.2 or less.[20,22] A moderate effect size of 0.46-0.64 was calculated for six parental outcomes from five different studies.[18-19,29,33-34] Sixteen parental and educational method outcomes resulted in a high effect size, ranging from 0.76-5.4. Parental outcomes with high effect sizes were mother and father perceived self-confidence, parental stress, anxiety, parental satisfaction, parental role competence, and preparedness to discharge.[15,19,21,27,29,33] All education methods were effective with high calculated effect sizes. Video instruction was most effective, followed by direct instruction, with written instructions as the least effective educational method[31] as shown in Figure 2.

The most frequently reported educational method for parental education in the NICU was direct instruction to conduct parental education within the NICU. Combined educational methods was the second most often used category for educational interventions. Parental educational interventions were effective in improving parent confidence, role competence, satisfaction, knowledge, and preparedness, as well as reducing parental stress and anxiety in the discharge home process with an infant. Parental educational interventions were not as effective in decreasing the infant's length of stay within the NICU. All the included studies achieved at least a 60% or higher JBI grade, indicating reduced risk of bias within the respective study designs.

This review is not the full scope of educational interventions, which could introduce some bias to positive findings of studies included within the review. The strength of recommendation for educational interventions related to parental and educational method outcome is moderate in accordance with the Cochrane Collaboration Back Review Group

ranking.[14] The consistent findings in multiple low quality randomized control trials, clinical trials, and at least one high quality randomized control trial support this claim.

Figure 2. Displayed are the effect sizes of various outcomes, identified by the black diamond. The outcomes are separated into categories of parental outcomes, education methods, and other outcomes. The forest plot includes black lines to illustrate 95% confidence intervals related to each outcome.



Discussion

The purpose of this systematic review was to evaluate the effectiveness of parental education interventions conducted within the NICU. The review supports that all educational interventions in the NICU are effective at improving parental satisfaction, confidence, role competency, and discharge preparedness, while reducing parental stress, anxiety, and depression. Parental educational interventions did not change infant hospital length of stay. To prepare parents effectively for discharge, occupational therapists should be judicious in selecting the educational method to maximize outcomes. To effect parental outcomes, appropriate education method and healthcare provider should be considered. Although there is limited evidence of occupational therapy's involvement in educating parents in the NICU, this supports an opportunity for occupational therapy to increase their presence in this area.

Education Methods

Practitioners should strive for multimodal education when conducting occupational therapy educational interventions. Education in the NICU is an effective means of preparing parents for discharge despite the method selected; however, some methods appeared to be more effective than others. Direct instruction was the most used method of education to deliver information to enhance parental knowledge resulting in enhanced perceived self-confidence in mothers and fathers, facilitating positive changes in parental stress, increasing maternal-infant attachment, and increasing parental satisfaction.[15,18-19,21,24,27,29] Direct instruction includes face-to-face instruction provided to the parents from the healthcare professional. Direct instruction can be provided in the NICU through discharge training, brochures, practice opportunities, parental empowerment, and reflective journaling. [15-21] This method of instruction is conducted in

regular intervals within a designated timeframe dedicated to focused education.[18,21,29] Following direct instruction, it is crucial that parents verbalize understanding and consent to provided education to ensure generalization of knowledge. Written materials without another mode of education are reported on the least. Written instructions are delivered via discharge summaries, handouts, and information guides[22] that lacked face-to-face interaction with providers and families, which limits the ability for questions and confirmation of understanding. Therefore, when practitioners choose to use written instructions, they should consider pairing it with another method of education. Technology-based education was delivered via websites, YouTube videos, narrated slides, web-based modules, downloadable PDFs, community forums for questions and answers, and a mobile app.[23-26] Technology-based education could be a means of educating parents on several topics including bathing, feeding, massaging, positioning, CPR, and infant cues. With technology-based methods, parents are able to have access and refer to the education provided at their own convenience. An advantage of technology-based education is that families can access a variety of resources via smartphones, smart TVs, tablets, and computers. A disadvantage of technology-based education is that there is no means of verifying parental interpretation; therefore, it should be provided as a reinforcement for previously learned material or in conjunction with opportunities for questions and answers. Simulation methods were conducted through infant dolls and bedside simulation programs.[27-28] Parents were able to have practice opportunities led by healthcare providers in a controlled environment with realistic infant behaviors and cues to reduce error rates without consequences. An advantage of simulation education is that parents can begin to practice and refine skills without disturbing the infant's medical care. Combining different modes of education was the most promising method, which consisted of a combination of previously discussed education methods along with a mobile app, knowledge checks, question and answer sessions, and pictorial instructions. Practitioners should strive for multimodal education when conducting occupational therapy educational interventions. Providing multimodal instruction aligns with a variety of learning styles. When providing education, occupational therapists should consider pairing handwritten education with video modeling or coaching. For example, requesting parents take pictures for repositioning strategies, having a QR code to correspond with a supporting educational video, providing practice opportunities with feedback, and having parents take a video of interventions while adhering to organization and state regulations.

Parental Outcomes

This systematic review focused on the effect of education interventions on parent outcomes. Consistent with previous findings, providing parental education in the NICU is effective in enhancing parental outcomes.[5] Education interventions are effective in increasing parental confidence, satisfaction, maternal-infant attachment, preparedness for discharge, knowledge and caretaking behaviors while decreasing parental stress and anxiety.[19,21,24,27,29]

The reduction in parental stress and anxiety leads to increased discharge preparedness and role competency as primary caregiver. With newfound knowledge upon discharge, hospital readmission and occupational imbalance are likely to decrease, fostering an optimal environment to raise an infant. Drawing conclusions regarding the effectiveness of education interventions on parental outcomes is difficult due to the heterogeneity of the outcomes reported from a wide variety of studies. Conducting education aligning with parents' new roles as primary caregivers for their infant in the NICU reduces parental depression, anxiety, and stress. The studies within this review support previous claims that education specific to responding to infant cues and behaviors is effective in reducing depression, anxiety, and stress of new parents.[15,18,21,33] Incorporating a consistent message, designated timeframe, and frequent sessions demonstrates best generalized knowledge to reduce parental anxiety and depression.[15,21] Addressing psychosocial factors is in the occupational therapy scope of practice, therefore, occupational therapists should prioritize parental mental health when providing educational interventions to ensure effective outcomes in reducing parental depression, anxiety, and stress. Education interventions have been utilized as a solution to parent's questioning their abilities to care for their infant upon discharge from the NICU, a problem that has been previously outlined within the literature.[4] Several articles report changes in parental confidence related to education in the NICU, resulting in readiness for discharge.[19,21,27,33] Utilizing a hands-on approach with practice opportunities to read infant cues and provide direct care (bathing, feeding, massage, kangaroo care) leads to increased parental confidence and preparedness for discharge. Occupational therapists should incorporate repeated opportunities for hands-on practice when providing education to maximize parental confidence at discharge. This increased parental confidence leads to increased generalization of skills to the home environment. Parents are more satisfied when they are properly educated on caring for their infant. For example, articles in this review support claims from previous literature that education positively impacts parental satisfaction.[21,24,27,29,33] Parents report increased satisfaction while being educated on care-taking behaviors to enhance parental role competency.[21,24,27,29,33] Coinciding with a client-centered approach to care, occupational therapists should provide education on topics parents value and deem important. Education should be offered over several sessions,

include question and answer opportunities and knowledge checks to ensure parents are accurately interpreting information, are confident in their role, and satisfied with the education provided.

Education Provider

All education provided was effective in enhancing parental outcomes regardless of the healthcare provider conducting the educational intervention. The findings of this review supported that nursing has the most frequently reported educational interventions in the NICU. Other NICU providers have limited reports on educational interventions. Some of the reported educational interventions were attained through self-directed learning. Although occupational therapists are essential to the NICU interdisciplinary team and education as an intervention is outlined in the OTPF-4, occupational therapy education intervention for parents is not reported in the evidence. Occupational therapists provide essential education focusing on a variety of topics as part of standard care in the NICU; however, the findings of this review confirm it is not well-represented in the literature. It is crucial for occupational therapists to document their distinctive value including type of education, modality used, and outcome of education as a means of advocating for their role as a crucial member of the NICU interdisciplinary team.

Occupational Therapy Role in NICU Education

Occupational therapists address early caregiving, parental interaction with the infant, feeding, handling, positioning, bathing, diapering, dressing, skin-to-skin contact, calming, and parental recognition and response to infant behavior cues in the NICU.[6,8-9] As a qualified healthcare provider, occupational therapists can also address parental stressors, psychological distress, and other risk factors negatively impacting parental mental health through various interventions including providing education. Occupational therapists are skilled in using task analysis to adapt and modify education to meet parent and infant needs, allowing for the expansion of educational interventions[8] outside of a written handout. Providing client-centered practice opportunities and individualized education for parents, will improve caretaking behaviors, easing the parental role transitions to parenthood, and increasing parental preparedness at discharge.

Occupational therapists are currently conducting parental education within the NICU, but the specific methods of education are not clearly outlined to articulate and document occupational therapy's distinct value. Although there has not been clear evidence to show the effectiveness of occupational therapy education interventions in the NICU, occupational therapists can model and utilize the recommendations within this review to enhance parental education interventions. The results of this review contributes to occupational therapy's evidenced-based practice, demonstrating that parental education is an effective intervention to maximize parental wellness and mental health. To expand the literature and enhance evidence-based practice, occupational therapists should conduct research on the effectiveness of occupational therapy interventions currently provided to infants and families in the NICU. When occupational therapists are selecting education delivery methods, the most effective modalities appear to be using combined methods including video, direct instruction, and simulation.

Limitations

This review is not without limitations. The articles provided within this review do not evaluate occupational therapy's role in parental education interventions within the NICU due to the limited occupational therapy literature. Only studies available in the English language were retrieved, resulting in potential exclusion of key information from studies in other languages. Only 12 studies provided the proper data to calculate the effect size, which could introduce bias into review recommendations.

Conclusions

Overall, parental education within the NICU has been identified as an effective intervention to enhance parental confidence and reduce parental stress related to the role transition into parenthood as they become the primary caregiver for an infant with complex medical needs. Occupational therapists and related healthcare providers should continue to assess and document the effectiveness of parental education interventions on parental, infant, and hospital system outcomes and to align delivery to meet individual needs. When selecting delivery of educational interventions, the most effective method of education is to utilize combined methods including video, direct instruction, and simulation. Education provided with repeated, consistent exposure, and verification of parental understanding demonstrates best practice to minimize parental stress, anxiety, and maximize preparedness for discharge.

Acknowledgements

Lilly Bradley, Katherine Springer, and Bret Smalt for editing contributions.

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