

Bracing in Ponseti Clubfoot Treatment

Improving Parental Adherence Through an Innovative Health Education Intervention

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Clubfoot is the most common musculoskeletal birth defect, characterized by abnormal tendon and muscle development, leading to abnormal bone alignment of the feet. The Ponseti method is considered the gold standard in clubfoot treatment, and consists of a series of plaster castings, followed by 4 years of brace use. The most common cause of clubfoot relapse is nonadherence with the bracing protocol by the child's caretakers. The purpose of this study was to design, implement, and evaluate an educational bracing program for parents of children with clubfoot in an effort to improve bracing adherence. The educational bracing program for parents of children with clubfoot was designed with incorporation of findings from previous research, adult teaching methodology, and parental feedback. An educational brochure and a practice doll were created for use in educational sessions with parents during routine treatment visits. Two educational sessions were conducted with a health educator, employing identical questionnaires to assess changes in parental knowledge and skills upon completion of the program. Thirty parents completed the educational bracing program, and the majority reported increased knowledge and self-efficacy regarding the bracing protocol of the Ponseti method. In addition, the health practitioners who conducted the educational sessions witnessed an improved ability of all parents to apply the brace as directed, and to recognize and correct improper fit. Completion of the educational program by the parents resulted in immediate improvements in knowledge and skills related to clubfoot bracing. Given that noncompliance to the bracing protocol is the most common cause of clubfoot relapse, these immediate effects of the educational program are promising not only because they encourage proper brace use, but because these immediate improvements have the potential to reduce future rates of clubfoot relapse.

Background

Clubfoot affects 150,000–200,000 infants worldwide every year, making it the most common musculoskeletal birth defect (Ponseti International Association, 2015). Clubfoot is a condition caused by abnormal develop-

ment of the tendons and muscles of the feet, resulting in abnormal bone alignment. If left untreated, the deformity causes joint stiffness, painful walking, and inability to wear normal footwear.

The Ponseti method, developed in the 1950s by Dr. Ignacio Ponseti at the University of Iowa, has become the standard of care in clubfoot treatment. Treatment with the Ponseti method can begin within the first few weeks of life, and is divided into the main phases of casting and bracing. The first phase involves a series of plaster castings that manipulate the foot over the course of 6–8 weeks. Before the final cast is applied, 90% of patients require a percutaneous Achilles tenotomy, a minor in-clinic procedure performed under local anesthesia that cuts the Achilles tendon. This allows the child to achieve the best flexibility and range of motion possible (Ponseti, 1996).

During the second phase of treatment, the child must wear a brace during the night for 4 years to ensure the foot does not relapse to the previous abnormal bone alignment. It is difficult to overstress the importance of adhering to the bracing protocol, as not adhering has proven to be the main cause of clubfoot relapse (Dobbs et al., 2004). If a child experiences a relapse, a minor surgery may be needed, and the bracing protocol will need to begin again.

Proper bracing protocol generally requires the child to wear the brace for 23 hours a day during the first 3 months after cast removal, followed by 4 years of nighttime bracing (Zionts & Dietz, 2010). Families who do not use the brace as prescribed are 183 times more likely to experience a relapse (Dobbs et al., 2004). The

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importance of bracing has been well-demonstrated in multiple studies, including an investigation conducted by Abdelgawad, Lehman, Van Bosse, Scher, and Sala (2007), which revealed an increase in bracing adherence was correlated with a lower occurrence of relapse. Although the brace is not painful to wear, “discomfort” is cited as the most common reason for not adhering to the protocol (Zhao, Liu, Zhao, & Wu, 2014). Adherence to the protocol is not affected by family education level, culture, or socioeconomic status (Ramirez, Flynn, Fernandez, Seda, & Macchiavelli, 2011). Although physicians play an essential role during the first phase of clubfoot treatment, it is important to recognize that the subsequent bracing phase is the responsibility of the parents, and requires education and dedication.

An educational program for parents to address previously identified barriers was created. Prior research with the target population revealed education is an important factor to address when attempting to improve brace adherence. In a qualitative study of interviews with 30 parents of children with clubfoot, the parents expressed confusion about both the treatment process and the subsequent bracing protocol, stating they would like more educational information (Paulsen-Miller, Dolan, Stineman, & Morcuende, 2011). Only 23% of parents believed they were solely responsible for adherence to the bracing protocol, and 27% suggested it would be helpful to emphasize the long-term goals of treatment at each appointment. The parents expressed interest in various methods of information conveyance, including conversations with healthcare practitioners during appointments, informational pamphlets or booklets, and instructional videos. The researchers stated the findings of the study could provide a good foundation for the creation of an educational program, and noted the importance of understanding adult learner characteristics, emphasizing parental involvement as a crucial component for success in an educational program.

Purpose

The purpose of this study was to measure changes in parent knowledge and capacity upon completion of an educational program designed to increase bracing adherence with the Ponseti method of clubfoot treatment. Specifically, this research sought to determine whether the program resulted in (1) parents demonstrating improved skills in applying the brace, (2) parents reporting increased self-efficacy for adhering to the bracing protocol, and (3) parents expressing increased understanding of the importance of bracing protocol adherence.

STUDY PROCEDURE

Parents and guardians of patients diagnosed with clubfoot and receiving treatment at the University of Iowa Hospitals and Clinics were approached for study participation. A total of 30 parents completed the two-session educational program. Although only one parent of each eligible child was needed to consent and complete surveys and training, all caretakers present at appointments were welcome to partake in the educational sessions.

During the first educational session, parents completed a self-designed survey and questionnaire. Researchers relied heavily on input from an expert panel of parents who had been through treatment and bracing, and could identify specific bracing issues that had confused them. Such issues included an understanding of the bracing protocol timeline, correct application of the brace, and recognizing signs of incorrect brace fit. The baseline survey examined parental attitudes and self-efficacy for using the brace, and contained a section with 11 questions that allowed parents to rate their confidence in conducting various tasks associated with the brace on a 10-point scale ranging from 1 (not at all confident) to 10 (very confident) (Table 1). The baseline questionnaire was specifically designed to measure the explicit knowledge of parents regarding the bracing protocol using a “yes, no, or unsure” answer choice system (Table 2).

The nurse (or other health practitioner) led the parents through the brochure, emphasizing the importance of bracing and the consequences of relapse. Proper brace application was demonstrated on a doll (see Figure 1), and the parents were then encouraged to practice applying the brace. The practitioner observed their performance, and any mistakes were explained and corrected (see Figure 2). During the second and final session, the skills practice was repeated and parents completed a posttest survey and questionnaire identical to those administered on the first visit.

EDUCATIONAL INTERVENTION

The bracing educational program employs innovative educational materials and consists of two visits with a health practitioner (such as a nurse, health educator, or physician), ideally occurring at the third and final casting appointments. The program design allows the involvement of all interested members of a healthcare team; in the pilot study, the team consisted of a nurse, two public health educators, and a physician. During the development of the program, multiple teaching modes and aids were used in order to maximize participant accessibility. The “teach-back method” is an evidence-based strategy that can be utilized by clinicians to improve a patient’s or caretaker’s understanding of medical instructions. The Agency for Healthcare Research and Quality offers a “teach-back” toolkit online (DeWalt, Callahan, Hawk, Broucksou, & Hink, 2010), and the method is recommended by the National Quality Forum (NQF, 2010). Health practitioners use the method to convey simply worded key information to patients in a safe and nonjudgmental environment. The patients are then encouraged to express their understanding of instructions and demonstrate skills that have been taught, thus allowing the practitioner to correct misunderstandings and ensure clear communication. “Teach-back” has been shown to improve learning and retention, which in turn are shown to improve odds of adherence with the instructions (Negarandeh, Mahmoodi, Noktehdan, Heshmat, & Shakibzadeh, 2013).

Drawing on the “teach-back” method as a framework, the program incorporated one-on-one teaching,

TABLE 1. SURVEY TO ASSESS SELF-EFFICACY OF PARENTS FOR BRACING PROTOCOL ADHERENCE

How Confident Are You About Your Ability with the Following?	1 (Not at All Confident)	2	3	4	5	6	7	8	9	10 (Very Confident)
Remember the correct length of time my child should wear the brace										
Correctly put the brace on my child's feet										
Notice if my child's feet are not fitting correctly in the brace										
Notice when the brace is irritating my child's feet										
Know when I should contact my child's doctor because the brace is not fitting my child's feet correctly										
Ask my child's doctor any questions I may have about the brace										
Explain how to use the brace to someone who is caring for my child during the time they are supposed to be wearing the brace										
Find ways to comfort my child without removing the brace										
Use items such as car seats and strollers while my child is wearing the brace										
Remember to bring the brace with us when we travel										
Find clothing items for my child, such as onesies that snap and are footless, that make using the brace easier										

the use of a practice doll for brace application, and the use of a brochure and video as supplemental educational tools. Families are often overwhelmed and distracted during their initial visits, so the program began on the third casting appointment in order to better ensure parental attention and education (London, 1999). The two-session design stemmed from the expressed parental desire for repeated emphasis of educational material. In addition, in approaching the study from a quality improvement perspective, the pre-/post-test design facilitated evaluation of the immediate impact of the program.

Educational material regarding clubfoot bracing is scarce, meaning the parents who visited the clinic served as critical resources for the creation of program materi-

als. The educational brochure incorporated parental feedback, and was designed to convey the importance of bracing adherence, as well as address common parental concerns. In order to maximize accessibility, the brochure was written at a sixth-grade reading level, as verified by the Fry Readability Formula (1968). The brochure contains statistics on relapse risk (Table 3), step-by-step graphics depicting the correct application of the brace, and tips from parents on incorporating the brace into daily life and adhering to the bracing protocol.

Results

Thirty parents completed the educational program. Analysis of surveys revealed an increase in parental

TABLE 2. QUESTIONNAIRE TO ASSESS PARENTAL UNDERSTANDING AND CONFIDENCE FOR BRACING PROTOCOL ADHERENCE

Please Answer Yes, No, or Unsure, to the Following Statements About the Bracing Period	Yes	No	Unsure
Clubfoot relapses are more common in children who do not wear the brace for the correct amount of time			
It is OK to not tighten the straps on the shoes, because then the shoes will be more comfortable on my child			
If my child cries in the brace, I should always take the brace off to soothe them			
It is normal for the area of my child's leg that is in the brace to be slightly smaller if they are wearing the brace regularly			
If my child is not yet walking when we start the bracing period, they will only have to wear the brace until they are 3 months old			
When I put the brace on my child, it is best if I buckle the middle strap first.			



FIGURE 1. Demonstration of proper brace application.

knowledge and confidence for the majority of parents. In regard to our main study objectives, paired *t* tests revealed the program resulted in significant improvements for all aims. The results were as follows: Twenty-one (70%) reported increased understanding of the importance of bracing protocol adherence in reducing clubfoot relapse ($p < .01$). Twenty (67%) reported increased confidence in their ability to adhere to the bracing protocol ($p < .01$). Twenty-five (83%) reported increased confidence in their ability to correctly apply the brace ($p < .01$), and 23 (77%) reported increased confidence in their ability to recognize incorrect brace fit ($p < .01$). These and further findings are compiled in Table 4.

In addition, the supervision of brace application by health practitioners showed an improved ability in the skills of all parents to ensure proper alignment of the foot by checking placement within the shoe, and fastening the straps securely enough to prevent wiggling or rubbing.



FIGURE 2. Practice doll for brace application demonstration.

TABLE 3. RISK OF CLUBFOOT RELAPSE FROM BRACING NONADHERENCE BY YEAR (DOBBS et al., 2004)

Bracing Protocol Timeline	Relapse Risk From Noncompliance
Year 1	90%
Year 2	70%
Year 3	30%

Discussion

The efficacy of the educational program for parents of children with clubfoot was supported by the above descriptive results. The majority of parents reported increased knowledge of the importance of brace use and increased self-efficacy for adhering to the bracing protocol. In addition, participants demonstrated improved skills for applying the brace.

It is important to note that although three parents demonstrated a decrease in knowledge and confidence, they all shared abnormally high baseline levels. The three parents completed the baseline survey with confidence during the first visit, answering “10” for all questions. Their second assessment was likely lower due to an increased understanding of the high risk of relapse, and the commitment needed for adherence to the bracing protocol.

The success of the program depended largely on the incorporation of parents into their child’s healthcare team. Clinicians play a vital role in the first phase of treatment but parents become the primary caretakers upon removal of the casts, and thus must be involved in coordinated care of the child during treatment in order to promote successful bracing (Stille & Antonelli, 2004).

Previous research shows that active involvement of participants greatly increases both interest and recall, and such involvement was key in our program design (Doak, Doak, & Root, 1996). Parents responded positively to the educational mediums used, as evidenced in the following feedback:

“The brochure is helpful because I feel better knowing I have a resource to use when we go home with the brace.”

“The doll is a great idea! It allowed us to practice while our son was still in casts, and made sure we felt comfortable when it came time to use the brace.”

The design of the educational program encouraged parental interaction, and with their incorporation into the healthcare team, taught them that they play a vital role in the correction of their child’s clubfoot.

The immediate outcomes of the pilot study are promising for several reasons. The participation of parents as members of the healthcare team and the use of the “teach-back” method improved attention and recall, which is evidenced by an overall increase in measures of self-assessed knowledge, confidence, and ability. A study by Kornburger, Gibson, Sadowski, Maletta, & Klingbeil

TABLE 4. PILOT STUDY RESULTS: CHANGES IN PARENTAL KNOWLEDGE AND ABILITY

Knowledge/Skill	Positive Change	No Change	Negative Change
Understanding importance of brace use to prevent relapse	21 (70%)	6 (20%)	3 (10%)
Confidence in ability to adhere to bracing protocol	20 (67%)	7 (23%)	3 (10%)
Confidence in ability to apply brace correctly	25 (83%)	2 (7%)	3 (10%)
Confidence in ability to recognize incorrect brace fit	23 (77%)	4 (13%)	3 (10%)
Confidence in ability to explain brace use to other caretakers	22 (73%)	5 (17%)	3 (10%)
Confidence in ability to comfort child without removing the brace	24 (80%)	3 (10%)	3 (10%)

(2013) on the needs of children with complicated discharge orders showed that immediate positive changes in comprehension were linked to better rates of adherence to the protocol, and the researchers in this study remain optimistic regarding observing this trend in parents participating in the bracing program. The educational program therefore has positive implications for nursing practice, encouraging effective and engaged parent education, and providing an opportunity to discuss and assuage any fears or concerns parents have about using the brace. Ultimately, improved adherence to the bracing protocol will lead to fewer clubfoot relapses (Dobbs et al., 2004), thus demonstrating the potential for the program's short-term outcomes to lead to long-term benefits.

Conclusion

Because failure to adhere to the bracing protocol is the major reason for clubfoot relapse, it is promising that parental education results in increased understanding of bracing importance, and ability to adhere to the prescribed protocol.

Strengths of our study include the consistency of education allowed through the use of a small healthcare team, and the generally inexpensive cost of program implementation. The educational brochure is available on the Ponseti International website (<http://www.ponseti.info/bracing-tips.html>), and the video is on YouTube (<https://youtu.be/ruXE6xTYmSc>), allowing complimentary utilization by anyone interested in the parent education program. The remaining costs of program implementation include the purchase of a practice doll, and allotment of time and staff needed for the educational sessions. The bracing brochure currently exists in English and Spanish versions and if needed, translation will continue for different language texts in clinics around the country and the world. The website also contains an educational video in which the health educators use the brochure and practice doll in the same manner as in sessions that were conducted with parents in the clinic. The online availability of the bracing brochure and instructional video allows widespread distribution to parents and practitioners interested in resources during clubfoot treatment.

Implications of further research involve longitudinal tracking of relapse rates in study participants, as well as site expansion of program implementation, allowing replicable immediate outcomes. Although the short du-

ration of the study did not allow for quantifiable changes in relapse rates, the researchers in this study are optimistic that the immediate increases in parental knowledge, confidence, and skills observed upon completion of the educational program will lead to future decreases in bracing nonadherence and rates of clubfoot relapse.

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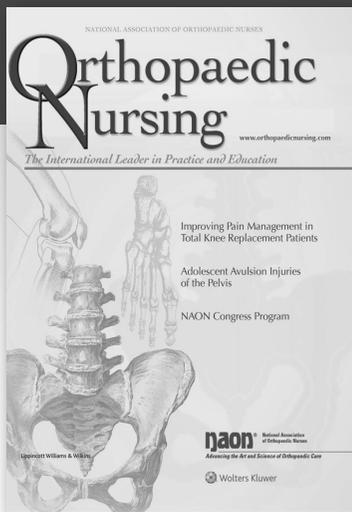
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