FROM CUTTING TO CASTING: IMPACT AND INITIAL BARRIERS TO THE PONSETI METHOD OF CLUBFOOT TREATMENT IN CHINA

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ABSTRACT
In 2005, a nationwide clubfoot treatment program focused on the Ponseti method—an effective, affordable and minimally-invasive method—was initiated in China. The purpose of this study was to evaluate and identify barriers to the program. A qualitative study (rapid ethnographic study) was conducted using semi-structured interviews of 44 physicians who attended four of the 10 Ponseti training workshops, focus groups with parents of children with clubfoot, and observation. Several barriers to the Ponseti method are quite unique due to China’s size, socio-economics, culture, politics, and healthcare systems. The barriers were classified into seven themes: (i) physician education, (ii) caregiver compliance, (iii) culture, (iv) public awareness, (v) poverty, (vi) financial constraints for physicians/hospitals, and (vii) challenges of the treatment process. A number of suggestions that could be helpful in reducing or eliminating the effects of these barriers were also identified: (i) pamphlets explaining clubfoot and treatment for caregivers, (ii) directories of Ponseti providers, (iii) funding/financial support, and (iv) improving public awareness. The information from this study provides healthcare planners with knowledge to assist in meeting the needs of the population and continued implementation of effective and culturally appropriate awareness and treatment programs for clubfoot throughout China.

INTRODUCTION
Clubfoot is a complex deformity present at birth that results in complete inward turning of the foot. Clubfoot can be idiopathic or occur as part of other disorders, such as spina bifida, arthrogryposis, and others. It is the most common musculoskeletal congenital birth defect. Congenital clubfoot has a worldwide incidence of 1.6-8/1000 live births. In the People’s Republic of China, where the birthrate is more than 18.2 million births per year, it is estimated that over 18,000 children are born each year with clubfoot. If left untreated, neglected clubfeet result in physical, social, psychological, and financial burdens for individuals and their families.

Traditionally, clubfoot has been treated by several months of casting followed by surgical correction. However, this approach is very time consuming and expensive. In countries with limited health care resources, it has resulted in many patients not receiving treatment. In recent years there has been an increased interest in the Ponseti method of treatment of clubfoot. This method is a conservative procedure using a very specific manipulation and casting technique based on the functional anatomy of the foot. It is supported by a limited intervention (percutaneous Achilles Tenotomy performed under local anesthesia in the office) and a foot-abduction brace to prevent relapses (to be worn at night time up to the age of four years old). Complete correction can be achieved in >95% of patients in as little as 16 days. When the Ponseti method is properly performed, surgical release is indicated in less than 1% of patients. Over the last 10 years, the Ponseti method has become the gold standard of care for clubfoot.

In 2005, a nationwide clubfoot treatment program focused on the Ponseti method was initiated in China. Similar programs were established in other countries, but China, with a population of more than 1.3 billion people and an average annual income of only $2,025, presents some unique challenges. The purpose of this study was to evaluate and identify the initial barriers to the program in China. Understanding these barriers is essential for successful and culturally appropriate approaches for the continuation of the program.
MATERIALS AND METHODS

Qualitative methodology was used to collect data using semi-structured interviews, focus groups, and observation. The purpose of using multiple methods was to verify the data gathered and increase the validity of the study through triangulation. Ponseti-trained practitioners, who currently treat clubfoot patients in China, were recruited for phone interviews from lists of attendees of Ponseti training workshops. Since the workshops were sometimes part of a larger conference, not all attendees who were registered were trained. Since 2005, 10 Ponseti training workshops were organized as part of the national Ponseti training program. From a list of 341 potentially trained practitioners, contact information for 164 participants from four of these workshops were obtained. 44 physicians who treat clubfoot in 12 provinces were interviewed, but five of these physicians were not included in the study. Therefore, the total interviewed was 39. Focus groups were conducted with eight sets of parents of children with clubfoot who sought treatment in the Departments of Pediatric Orthopaedics and Rehabilitation, Shanghai Jiaotong University, XinHua Hospital, Shanghai. Observation of healthcare in China, clubfoot patients and families, and clubfoot treatment took place at Jiaotong University, XinHua Hospital in Shanghai and Fourth Military Medical University, Xijing Hospital in Xian.

The interviews and focus groups were conducted by a medical student fluent in Chinese (Mandarin) and English. The data was collected in Chinese (Mandarin) and recorded in English over a period of 10 weeks. It was then coded manually and sorted into themes. The validity of the data was confirmed by summarizing the notes for the respondents at the end of each focus group/interview. A team approach was used to draw conclusions about the organized data. The proposal was passed through the University of Iowa Institutional Review Board. Informed consent was obtained by having interviewees read the consent form. No names were attached to the data and all data was stored in a secure location.

RESULTS

39 providers from 12 provinces were interviewed. These included: Henan (2) Hubei (13) Shanghai (2) Zhejiang (3) Jiangxi (1) Shaanxi (1) Guangdong (2) Hunan (4) Guangxi (1) Gansu (1) Beijing (1) and Shandong (4). They practice in the following specialties: Orthopaedics (24), Pediatric Orthopaedics (6), Rehabilitation/Physical Therapy (1), Surgery (1), Pediatric Surgery (2), and Pediatrics (1). These providers have treated patients from Henan, Hubei, Zhejiang, Jiangxi, Shaanxi, Guangdong, Guangxi, Shandong, Gansu, Hunan, Beijing, and “all over.” The interviewed physicians have treated a combined number of at least 823 clubfoot patients per year. At least 375 patients per year are treated using the Ponseti method, at least 270 patients per year are treated using a surgical technique, and at least 135 patients per year are treated using other methods.

Some of the barriers to the Ponseti method in China are quite unique due to China’s size, socio-economics, culture, politics, and healthcare systems. The barriers were classified into the following seven themes:

Physician Education

Eight of the 39 physicians interviewed identified physician education as a barrier to the Ponseti method in China. The training available at the Ponseti workshops usually includes theory and minimal hands-on practice. Many physicians felt that a couple hours of training was not enough. Physicians in some areas only see one to two cases of clubfoot annually. This results in Ponseti providers who are trained, but have very little experience. Some physicians felt that a high level of experience is required for effective treatment with the Ponseti method, especially for complex cases. Additionally, many physicians believe that a lot of physicians, especially in rural areas, still do not understand clubfoot, treatment options, and the Ponseti method. With the Ponseti method, results are better with earlier treatment. However, many physicians recommend for parents to wait until their afflicted children grow older and then have surgery. Some physicians even make modifications to the Ponseti method, rendering it less effective or ineffective.

Caregiver Compliance

Six of the 39 physicians interviewed identified an educational gap between families of patients and physicians as a major barrier to the Ponseti method. Many caregivers of clubfoot patients have not even completed middle school, especially in rural areas. This educational gap is believed by those interviewed to make it difficult for caregivers to understand each step of the treatment, leading to noncompliance. For example, some caregivers discontinue treatment after casting because they do not understand the purpose of the brace. They see the results of casting and believe that the patient is cured. Secondary illness (e.g., a cold) causes other caregivers to temporarily discontinue use of the brace, which may then be forgotten. Three out of eight sets of parents from the focus group were worried about their children’s comfort during treatment and difficulty holding their child with a brace.
The educational gap is compounded by the healthcare experience in China. Patients often go to larger hospitals to seek treatment and second opinions because they believe they will receive better quality of care there. Patients are seen on a first-come, first-served basis, so many arrive before the hospital even opens. Patients are seen according to the number given during payment of the office fee. Pediatric patients are accompanied by parents; often with one or two sets of grandparents, other relatives, or family friends. However, there is rarely privacy for most patients. Most people line up outside the single crowded exam room where a given doctor is seeing patients, but the line often spills into the room. Each patient only gets a few minutes with the doctor, while others in the room are also trying to get the doctors' attention. This makes thoroughly explaining clubfoot and the Ponseti method of treatment, and compliance, difficult. There are also families who do not understand or believe in the Ponseti method and choose a different method or no treatment at all.

**Culture**

China has a one-child policy that fines married couples for having more than one child. Since many families cannot afford these fines, they try “to make that one birth count.” As there is still a preference for male offspring, there is a high incidence of sex-specific abortions. In addition, many children with birth defects are given up for adoption. So within the population of orphaned children, many have some type of birth defect, and clubfoot is one of the most prevalent deformities in these children.

Two of the 39 physicians interviewed identified the stigma of clubfoot as a barrier to the Ponseti method. The family of the patient may feel shame and embarrassment about having “bad genes.” They do not want to publicize their “bad genes” by seeking treatment for the patient. The stigma of clubfoot also prevents word-of-mouth advertising of Ponseti method success stories.

Three of the 39 physicians revealed that many patients and caregivers do not believe in any type of surgical intervention. Although Western medicine considers an Achilles tenotomy to be a relatively minor surgery, caregivers who do not believe in surgical treatments do not allow it to be performed on their children as part of treatment. There are also those who believe only in Traditional Chinese medicine (TCM), which includes herbal remedies, acupuncture, and massage.

**Public Awareness**

Six of the 39 physicians identified lack of publicity and public knowledge of clubfoot and the Ponseti method as a barrier. Some caregivers do not know what methods of treatment are available, if any, or which ones have the highest success rates. They visit hospital after hospital seeking second and third opinions. Caregivers cannot seek out providers of the Ponseti method, or treatment at all, if they are not aware of their existence. Additionally, some parents and/or physicians may not recognize a foot defect until patients begin to walk.

Five of the eight sets of parents of children with clubfoot in the focus group discovered the Ponseti method and Ponseti providers on the Internet. The other three sets of parents were referred to a Ponseti provider by local doctors or a friend. One set of parents had their child diagnosed at birth, but the local doctor wanted them to wait until the child was 6 months old for surgery. Another was told by their local doctor to wait until their child was 100 days old before receiving treatment. The parents who were not immediately referred to a Ponseti provider felt they wasted valuable time.

**Poverty**

The average income for a family in China is $2,025. The cost of Ponseti treatment in China includes about 100 RMB ($15) per cast per foot with 4-10 castings required depending on deformity severity and physician experience; 4-20 RMB ($0.60 – 3.00) per office visit, and about 1,000 RMB ($150) for the brace. Total treatment costs are around 2,200 RMB ($320). According to the physicians interviewed, this is an affordable amount.

One of the eight sets of parents and nine of the 39 physicians interviewed identified convenience and overall costs of the treatment as a barrier. Families often have to travel long distances in order to reach a metropolitan area where the Ponseti method is offered. They must miss work and pay for transportation to the weekly casting or a place to live for the duration of the casting. Thus, the total cost of the entire treatment process can be much more than what the hospital charges. Moreover, although there are currently no documented studies on the incidence of clubfoot throughout different regions of China, a majority of the physicians said that their patients were primarily from rural, lower income areas.

**Financial Constraints for Physicians and Hospitals**

The majority of the cost of clubfoot treatment, regardless of method, is for materials and not the physician’s labor. Hospitals are pressured to improve their rankings, which improve with the number of surgeries performed each year. Thus, both hospital and physician incomes are greater for each clubfoot patient treated surgically, rather than with a non-surgical method like Ponseti. Five
of the 39 physicians interviewed identified the financial limits placed on physicians and hospitals as a barrier to the Ponseti method.

**Challenges of the Treatment Process**

Three of the 39 physicians interviewed felt that results with the Ponseti method are not quite as good with older patients. They felt that rural patients (many of the clubfoot patients in China) do not get diagnosed and begin treatment until they are older. Two of the 39 physicians felt that the Ponseti method results in decreased range of motion of the ankle joint, thus providing limited results. Two of the 39 physicians felt that it was difficult to prevent casts from falling off in younger patients. One of the 39 physicians was concerned about the comfort of the Ponseti patient. Two of the 39 physicians consider casting to be more tiring and difficult for a physician than surgery. They feel that treating a fussy patient while parents are watching for multiple weeks is much harder than treating a patient with anesthetics and surgery. In addition, fussy patients kick and move around, counteracting the specific manipulations of the physician during casting. Some physicians try to minimize this problem by anesthetizing patients, while others have the caregivers bottle-feed the patient during casting.

**No Barriers?**

Three of the eight sets of parents felt that there were no disadvantages to the Ponseti method. One set said that they had not experienced any negatives to the process, but were not very far into the treatment process. Another set felt that there were no negatives because it was a better alternative to surgery. Six of the 39 physicians also felt that there were no barriers to the Ponseti method in China.

**Moving Forward**

In an ideal situation, clubfoot patients would be identified at birth and begin receiving treatment within a week or two. However, due to the barriers identified in this study, this does not always take place. A number of suggestions that could be helpful in reducing or eliminating the effects of these barriers were also identified:

1. Four of the 39 physicians suggested that pamphlets explaining clubfoot and treatment could be given to the caregivers when the patient is diagnosed to provide detailed information about clubfoot, the treatment process, and success rates. This could educate and improve the understanding of caregivers by giving them information the physician may not be able to provide during each short office visit. In addition, these pamphlets could provide tips for successful casting, including suggesting to not feed the patient for a few hours prior to casting and feeding them instead during the casting.
2. Thirteen of the 39 physicians suggested providing pamphlets explaining clubfoot and the Ponseti method with directories of Ponseti providers. These directories should be given to public health organizations in each province, obstetricians and gynecologists, internists, and pediatricians so that clubfoot patients can be identified and directed to the appropriate treatment facility at birth (or at least at their first hospital visit).
3. Four of the 39 physicians believe it would be helpful to find more foundations to provide financial support for clubfoot patients and their families.
4. 20 of the 39 physicians believe that increasing awareness of clubfoot, signs of clubfoot, treatment options, and success rates is necessary to ensure that more children with clubfoot receive diagnosis and treatment earlier. Many of the websites detailing the Ponseti method are available only in English. In addition, many residents of rural areas may not have access to the internet, so increased advertisement in magazines, newspapers, and televised news programs would be helpful. 12 of the 39 physicians think it is important to make more physicians, especially rural physicians, aware of clubfoot, signs of clubfoot, treatment options, and success rates. By advertising broadly to the general public, some of the target audience will include physicians, as well.

**DISCUSSION**

In China, a country with an expansive geography and 1/5 of the world’s population, the public health implications of the Ponseti method are immense. For the 18,000+ children born each year with clubfoot, full correction is possible. Correction of the physical deformity can also alleviate social, psychological, and financial burdens for clubfoot patients and their families, treating the social determinants of health.

In addition to the physician education-related barriers we identified, we must also consider the process of becoming an orthopaedic surgeon in China. Medical licenses for either surgery or internal medicine are awarded to those who have completed medical school education programs ranging from 5 to 8 years. Those licensed to practice surgery can legally perform any type of surgery. There are no subspecialty licenses or certificates. Most orthopaedic training is on the job. Thus, the knowledge, skills, and experience of orthopaedists in China can vary greatly. Perhaps, once orthopaedic
education is standardized, it will be easier to ensure awareness and use of the Ponseti method for clubfoot treatment.5

Programs similar to the national Ponseti program in China have been established in many other countries, including Uganda and Malawi.6,8Unlike China, however, Uganda and Malawi have much smaller populations, 32 million and 12 million, respectively. Thus, they also have much smaller populations of clubfoot patients (1,100 – 1,400 cases of congenital clubfoot annually). Malawi only has three orthopaedists. Uganda only has four medical schools, compared to the 100+ medical schools and the 32+ schools of Traditional Chinese Medicine in China.

Despite the differences in population, the Ponseti programs in all three countries encountered similar difficulties. Poverty was a concern in all three countries. The costs of travel to treatment sites and costs of treatment itself are barriers to successful treatment in these countries. Caregiver compliance has also been an issue in all three countries. Caregivers often have other responsibilities, like farming or other jobs. It is difficult to take time off from these responsibilities to take the clubfoot patients to receive treatment each week. In addition, the treatment process is quite long and uncomfortable for the patient, resulting in difficult caregiver compliance with use of the brace, as well.

In both Malawi and Uganda, it was the mothers who were responsible for the healthcare of children with clubfoot. In Uganda, lack of paternal support was identified as a barrier to successful treatment with the Ponseti method. However, in China, it was common for both parents to be present for diagnosis and treatment. In Malawi, there were also problems with a shortage of supplies for treatment at the clinics, which are unique in that they attempt to fund most of the costs of treatment. In both China and Malawi, poor record keeping makes it difficult to keep track of individual patients. Follow-ups in China were dependent on whether or not patients returned.

The program in China could benefit from some of the findings from the other programs. For example, in Uganda, the push for all healthcare schools to modify their curricula to include education on clubfoot identification and the Ponseti method of treatment has resulted in such a change in five schools. In addition, it has been found that ‘massive’ training of health workers to provide treatments at remote locations resulted in difficulties maintaining expertise and access to materials. Currently, in Uganda, there are 15-20 well-acquitted clinics that perform the procedures with a high success rate and follow up. Therefore, more ‘targeted’ training followed up by the development of clinics specialized on

the treatment of this deformity seems to be a next step in the development of the program in China.

**CONCLUSIONS**

Our study highlights the impact of and barriers to the Ponseti method of clubfoot treatment, in some aspects comparable to those in Uganda and Malawi, but in others specific to China. In addition, we have identified suggestions that could be helpful for overcoming these barriers, whether they are financial, educational, or cultural. This information provides healthcare planners with knowledge to assist in meeting the needs of the population and implementing effective and appropriate awareness and treatment programs for clubfoot in China.

**REFERENCES**


