The presentation of a clubfoot in a newborn infant in a developing country can signal a bleak future of serious disability and potential poverty for the child and family. Hindered mobility reduces education and employment prospects. Socially, the child may grow into a marginalized and impoverished adult who will depend on family support or external aid sources to survive.\(^1\)\(^-\)\(^3\) The presence of many neglected adult clubfoot deformities in developing countries reinforces this reality, a situation not uncommon in many developing countries of the world, including Vietnam.

The clubfoot or talipes equino varus deformity has long been recognized as a serious pediatric orthopedic problem responsible for much suffering, multiple medical interventions, and often disabling outcomes for the child.\(^2\)\(^-\)\(^4\) The prevalence of infant clubfoot varies according to ethnicity, ranging from 0.3 per 1,000 births in China to 7 per 1,000 births in Polynesia.\(^5\) The prevalence in Vietnam is estimated to be approximately 1 per 1,000 births. Surgical correction has now been replaced by nonsurgical correction as the almost-universally accepted standard of initial treatment for congenital idiopathic clubfoot.\(^6\)\(^,\)\(^7\) Although there are many methods of nonsurgical correction (manipulation and serial casting, physical therapy and continuous passive motion), which can be successful when correctly instituted, clinical reports have found success rates of only 15% to 50%.\(^6\) The frequently reported exception is the Ponseti method, which is reported to be approximately 90% successful in both the short- and long-term.\(^2\)\(^,\)\(^7\)\(^,\)\(^9\)

Globally, the Ponseti method has gained increasing favor in the past three decades, although it has been used by the original author, Dr. Ignacio Ponseti, since the 1940s. The follow-up results over 30 years are very good in terms of pain and function.\(^10\) The technique has been refined over many years and current research continues to inform our practice and method.\(^6\)\(^,\)\(^9\)\(^,\)\(^11\)\(^-\)\(^15\) The correct use of the Ponseti technique has repeatedly been shown to radically reduce the rate of extensive corrective surgical procedures for clubfoot cases and has been found to be adaptable to successful use in the developing world.\(^1\)\(^,\)\(^3\)\(^,\)\(^7\)

Concurrently, the long-term results of clubfoot surgery have found moderate to severe degenerative changes in 50% of patients.\(^16\)

The Ponseti method provides the best long-term results for clubfoot deformity, has few complica-
tions, and is cost effective. In Vietnam, the initial cost estimates revealed a very favorable cost comparison between clubfoot surgery and the nonsurgical Ponseti method. The cost of surgery (including surgery, medication, dressings, radiographs, splint, hospital accommodation, and food) was VND 4,300,000 per case. By comparison, the cost of the Ponseti method (including five casts, three braces/shoes) was VND 1,400,000 per case. Therefore in Vietnam, the Ponseti method is at least two, and possibly three times more cost effective than clubfoot surgery.\textsuperscript{17} Economics aside, the clinical results for a pain-free functional foot are much better when the Ponseti method is correctly used.\textsuperscript{9}

Clubfoot

Basic Pathology

The congenital idiopathic clubfoot deformity is identified by the presence of a retracted and inverted heel (equinus), usually a medial crease on the plantar aspect of the adducted forefoot, and longitudinal arch cavus. Pathognomonic to this deformity is the inability to bring the foot to a plantigrade position. In unilateral cases, the clubfoot is comparatively stiff and smaller because of leg muscle atrophy; and shortening is also common.

In terms of etiology, a normally developing foot deforms at approximately the 16th fetal week to become a clubfoot. Although genetics and environmental influences are both probable contributors, it is curious to note that a more precise mechanism of etiology is still unknown.

The primary deformity centers on the shape and position of the talus and the related misplacement of the navicular. The Ponseti method focuses on stabilizing the talus and reducing the clubfoot deformity by abducting the inverted forefoot. This allows for the calcaneus to abduct, which in turn allows for the ankle to be dorsiflexed (often necessitating lengthening of the Achilles tendon).\textsuperscript{2, 5, 18, 19}

Types of Clubfoot

There are three main types of clubfoot to be aware of when diagnosing the infant clubfoot. The first and most common is the congenital idiopathic clubfoot, a difficult deformity that affects otherwise healthy children. The second type is the resistant clubfoot often associated with syndromes such as arthrogryposis and is stiffer in nature. Third is the atypical or complex clubfoot, which is short, fat, stiff, and requires a very adapted casting approach.\textsuperscript{19} Although the Ponseti method is suitable for all types of clubfeet, it is mostly used for congenital idiopathic clubfoot. The extent of deformity of the stiffer syndrome-associated clubfoot, as occurs with arthrogryposis or myelomeningocele, may be reduced with careful technique use. The technique must be adapted for the atypical or complex clubfoot as Ponseti\textsuperscript{19} has clearly described.

The Ponseti Method Described

The basic steps involved in the Ponseti method are outlined below. After initially assessing the clubfoot type, the foot is given a score using the Pirani method to assess severity. The foot is then manually manipulated to the correct position for the first cast to be applied. This process is repeated every 5 to 7 days until foot position is corrected, which usually takes approximately five to six casts. It may be necessary to perform an Achilles tenotomy to gain full correction of the ankle equinus, in which case a final abductory cast is applied for an additional 3 weeks. Following initial castings and Achilles tenotomy if required, the foot correction must be maintained with an abduction brace for 3 to 5 years to prevent relapse of the deformity. It is vital that children are monitored regularly. The reader is strongly encouraged to access the Ponseti Management publication, which was recently translated into Vietnamese and is available for free download from Global Help.\textsuperscript{2}

Diagnose Type of Clubfoot

With reference to the above description of clubfoot types or categories, it is important to identify the type of presenting clubfoot so as to select the correct casting technique (standard Ponseti for the congenital idiopathic clubfoot or adapted Ponseti for the complex or atypical clubfoot) and to realistically predict the results (often not as good for the resistant clubfoot seen with arthrogryposis).

Score the Clubfoot Severity with the Pirani Scale

The Pirani scoring system is used to assess initial clubfoot condition and to monitor treatment progress of the Ponseti technique. It has also been found to be reliable\textsuperscript{10} (Table 1), predictive for the need of Achilles tenotomy,\textsuperscript{14} and prognostic.\textsuperscript{11} Pirani scoring of clubfoot consists of examining six areas of the foot that reflect the hindfoot, midfoot, or total foot status in terms of clubfoot severity (Fig. 1).

The initial Pirani score has been shown to predict the likely need for Achilles tenotomy. Initial scores ≥ 5
Table 1. Pirani Score Reliability Pilot Study as Used in Vietnam for the Clubfoot Project

<table>
<thead>
<tr>
<th>Pirani Measure</th>
<th>Examiner 1 ICC SM 1-way (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral border</td>
<td>0.91</td>
</tr>
<tr>
<td>Medial crease</td>
<td>1.00</td>
</tr>
<tr>
<td>Talar head coverage</td>
<td>0.77</td>
</tr>
<tr>
<td>Midfoot score</td>
<td>0.94</td>
</tr>
<tr>
<td>Posterior crease</td>
<td>0.73</td>
</tr>
<tr>
<td>Rigid equinus</td>
<td>0.86</td>
</tr>
<tr>
<td>Empty heel</td>
<td>0.22</td>
</tr>
<tr>
<td>Hindfoot score</td>
<td>0.82</td>
</tr>
<tr>
<td>Total foot score</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Abbreviations: ICC, intrarater correlation coefficient; CI, confidence interval; SM, single measure.

Six infants (10 clubfeet) aged 8 to 18 months (mean age 13.3 mo) were examined for the reliability protocol. There was good correlation between examiner 1 (aid team volunteer) and a Vietnamese nurse who has been trained to use the Pirani scoring system (rho = 0.927). However, the interrater measures were limited to two subjects, and therefore, provide only preliminary indication.

require tenotomy; scores \( \leq 3.5 \) do not require tenotomy; and scores between 3.5 and 5.0 may need tenotomy. Another recent study has found that the initial Pirani score not only predicts the need for tenotomy but also the number of casts required to gain correction. This study found that hindfoot scores are most predictive for tenotomy need with initial hindfoot scores of 2.5 or 3.0 (of a possible 3.0) requiring a tenotomy in approximately 75% of cases. The total score of above or below 4 indicates how many cast applications may be required for correction. A total score of 4 needs at least four casts; a total score of less than 4 needs fewer casts.

Pirani scores are a very useful guide. The foot should be scored initially, at each cast change, and at splint reviews. Evaluating the foot at each cast change will enable residual components of the deformity to be addressed. It is important to remember that because each case is individual, the Pirani score system may guide, but not dictate, clinical decision making.

Manipulation

All components of the clubfoot deformity are corrected simultaneously except for the ankle equinus, which is corrected last. The arch cavus is corrected at the same time the forefoot adduction is reduced. This is achieved by inverting (supinating) and abducting the forefoot to align with the hindfoot.

Manual manipulation of the infant clubfoot must be both anatomically accurate and gentle. Ensure that the parents and baby are comfortable for this process. Feeding can greatly assist in relaxing the infant during the casting process. The applied forces should not distress the infant and must be carefully directed around the stabilized talus (Fig. 2). The newborn infant clubfoot is very small, and it is easy to incorrectly manipulate the foot. The basis of the Ponseti technique is to abduct the inverted forefoot around the stabilized talus (Figs. 3 and 4). The heel is not touched during this process. If the talus is not accurately located, the force of abduction will break the foot at the developing talonavicular joint and the calcaneus will not abduct. This was the main problem with the Kite technique, which applied pressure over the calcaneocuboid joint, preventing correction of the heel. We recommend that doctors contemplating using the Ponseti technique use a skeletal model to review the details of foot anatomy (Fig. 5).

Padding

Once the foot has been held in the correctly manipulated position for 60 sec, a layer of under-cast padding is applied. It is important that the manipulated position of the foot continues to be held while the padding is applied. Clearly, two doctors are now necessary for this process. The padding must be applied with firm tension and minimal bulk. Too much padding will simply compress and allow for cast slippage, less effective foot molding, and skin abrasions. Care must be taken to ensure that all skin surfaces are covered, from toes to groin (Fig. 6).

Application of Plaster Cast

The manipulated foot position continues to be maintained while the plaster cast is applied over the layer of minimal padding. The plaster is always applied in two sections: the foot and leg below the knee (Fig. 7A), and above knee, with knee flexed at 90° (Fig. 7B). The first section of plaster is applied by one doctor (or other trained staff member) while the other doctor maintains the corrected foot position. The plaster is molded very well around the arch and hindfoot. Once the first section of plaster is set firm and holding the foot position, the knee is flexed to 90° and the above-knee section is applied up to the groin. Firm tension must be used when applying the plaster to prevent cast slippage. Ensure that all skin is covered by padding so that no abrasions will be caused from the plaster edges. The knee must be reinforced to prevent cast breakage and it is helpful to apply an anterior plaster slab rather than heavy layers. Once the cast is firmly set, it must be well trimmed to allow...
Figure 1. The Pirani scoring method. A, Lateral border; B, medial crease; C, talar head coverage; D, posterior crease; E, rigid equinus; F, empty heel. Each of the six criteria is scored 0, normal findings; 0.5, moderate or partial deformity; or 1.0, severe deformity. The total Pirani score is 6, with two subscores for the midfoot and hindfoot scores of 3 each. (Reprinted with permission from Global Help.)

Figure 2. Gentle manipulation of the foot first requires location of the head of talus on the lateral side by palpating the tibial and fibular malleoli with one hand and holding the toes and metatarsals with the other hand. Slide thumb and forefinger from malleoli to the front of the ankle mortice. The navicular is small (forming) and being medially displaced, will be found under the medial malleolus. The anterior calcaneus will be felt just below the talar head. Stabilize the head of the talus laterally so the foot can be abducted around the talus. Do not touch the calcaneus for this movement.

Figure 3. Gentle manipulation of the foot requires reduction of the cavus deformity (A). The cavus deformity is attributable to pronation (eversion) of forefoot in relation to rearfoot. Cavus is always a supple deformity in newborn infants, so inversion (supination) of the forefoot will flatten out the arch (B, C). (Reprinted with permission from Global Help.)
first 24 hours. The position of the toes in the cast should not change. If the toes become less visible, this is an indication that the cast has slipped, foot correction will be reduced, and the likelihood of skin abrasions (possible infections) increased. In this case, the cast must be removed and reapplied. Cast slippage will occur if the standard Ponseti technique, rather than the adapted technique, is applied to an atypical or complex clubfoot. Again, the importance of diagnosing the type of clubfoot is very important in selecting the casting technique.

**Repeat Casting until Foot Position is Corrected or Achilles Tenotomy is Required**

The casting process is repeated every 5 to 7 days and is guided by the initial Pirani score, especially the initial hindfoot score. It is now known that casting for 5 days gives the same results as casting for 7 days and can shorten the overall casting process (average of six cast repeats) from 42 days to 30 days. This may be very useful for families from remote regions.

To avoid upsetting or cutting the infant, cast saws are not used. Instead, it is recommended that all casts be soaked off 1 hour before the next cast is to be applied. This can be easily achieved by having the parents wrap the cast in wet newspaper or wet towels.

**Figure 4.** Stabilize the talus laterally and abduct the foot while in supination as far as possible, without hurting the infant. Hold this position with gentle pressure for 60 seconds. Note the correct positions of the hands. Repeat this gentle manipulation at each cast change to gain elongation of the connective tissues prior to cast immobilization.

**Figure 5.** Foot skeleton references. Notice that with the talus stabilized laterally, the simultaneous supination (reduces the cavus) (A) and abduction of the forefoot also abducts the heel (B). This is essential for successful reduction of clubfoot deformity. (Reprinted with permission from Global Help.)
Achilles Tenotomy Decision

The foot is scored with the Pirani scale at each cast change so that progress can be monitored. If adequate dorsiflexion is not achieved with sequential cast abductions, an Achilles tenotomy may be required. This will have been indicated from the initial Pirani score.\textsuperscript{11, 14} It is very important that the foot is sufficiently ab-
ducted before performing an Achilles tenotomy to increase ankle dorsiflexion. The best sign of sufficient abduction is being able to palpate the anterior process of the calcaneus as it abducts from under the talus.\textsuperscript{2} At this stage the heel should be in a neutral position and the foot abducted 60° to the tibia (coronal plane). It is better to apply another one or two casts to be sure of the hindfoot abduction, rather than performing a premature and ineffective tenotomy. It is also important that the foot not be forcibly pronated in an attempt to reduce the equinus. Remember that unless the calcaneus can abduct beneath the talus, the foot cannot dorsiflex. The impatient use of excessive force will cause a midtarsal break of the infant foot and will not reduce the ankle equinus. The calcaneus must be able to abduct beneath the talus to reduce the equinus (with or without a tenotomy).

A tenotomy, if required, can be performed percutaneously with either topical or locally infiltrated anesthesia. Some authors\textsuperscript{14} have commented that both of these methods of anesthesia appear to provide the infant with similar pain relief but that the topical skin approach enables easier palpation of the tendon. If local anesthetic solution is injected, a small amount is advised. Full skin disinfection and good sterile technique must be used for this procedure. As seen in Figure 9, the tenotomy is performed with a small blade to sever the Achilles tendon approximately 1.5 cm above the calcaneus. The foot is held in maximal dorsiflexion while this is performed, and increased dorsiflexion is immediate once the tendon is released. The incision is lightly dressed and the post-tenotomy cast applied with the foot abducted 60° to 70° and knee

and then put the cast leg in a plastic bag. After an hour, the cast is soft and can be easily removed with plaster scissors.
flexed at 90° (Fig. 10). This cast remains for 3 weeks, during which the tendon heals. Upon removal of this cast, the foot abduction brace must be immediately applied.

Abduction Brace

Although the casting and tenotomy (usually required) achieve the correction of the clubfoot, it will all be wasted if the foot abduction brace is not used properly for the months and years following correction. We now know that clubfoot relapse following good cast/tenotomy correction is enormously increased when the foot abduction brace is not used consistently.6, 15, 23, 24 Given the genetically driven tendency of the clubfoot to be deformed, bracing and monitoring must be very diligent until the child is at least 5 to 6 years of age and beyond.2

The foot abduction brace is applied immediately after the last cast is removed, 3 weeks after the tenotomy. The brace bar measures shoulder width of the baby and will need to be increased with growth. For bilateral clubfoot the boots are ideally abducted 70°; for unilateral cases, the clubfoot is abducted 70° and the unaffected side abducted 30°. However, it should be emphasized that the initial brace abduction angle should be the same as that obtained with the post-tenotomy cast. Bracing the feet in greater abduction than that achieved with the final casts may well increase the baby’s discomfort and a higher chance of early noncompliance. The knees are free so the baby can kick to exercise and stretch the gastrocnemius muscles. A slight 10° bend in the bar maintains dorsiflexion.

The brace used in Vietnam is now manufactured in Da Nang by the Orthotics Department of Da Nang Orthopedic and Rehabilitation Centre and comes in three sizes. The attached boots are also locally produced in nine sizes to accommodate for growth. The child usually needs three to four different sizes for the duration of bracing (Fig. 11).

The brace is worn 23 hours per day for the first 3

---

Figure 8. The plaster is removed to allow dorsal exposure of all toes. This allows toe extensors to work and strengthen against stronger flexors. Vascular status and cast position must also be monitored.

Figure 9. Apply skin preparation to disinfect the foot on all surfaces (A). Use a small amount of local anesthetic solution or topical anesthetic cream if available (B). Using a No. 11 or No. 15 blade, a small incision is made 1.0 to 1.5 cm above the calcaneus, while the foot is held in dorsiflexion (C). As the tendon releases, a “pop” is felt or heard, and 10° to 20° dorsiflexion should be gained (D). (Reprinted with permission from Global Help.)
months. After 3 months, the brace is worn for 16 hours per day, at night and during daytime naps. The use of the brace is continued 10 to 12 hours per day up to age 4 years, and is still worn at night up to 5 to 6 years of age. The longer the brace can maintain correction against genetic clubfoot activity, the better the long-term results.

The parents need to be informed of the importance of brace use right from the start of managing the clubfoot. It is a mistake to allow parents to think that the cast correction alone has fixed their baby’s clubfoot, and they must be clearly informed that the clubfoot will relapse if the brace is not worn as instructed (Fig. 12). A printed information sheet and regular review appointments are advised. Ensure the parents know how to apply the splint and warn them that a few difficult nights are normal.

**Monitor**

Because the brace use is so critical to good long-term results, it is important to monitor compliance regularly. Follow-up after the initial fitting of the brace should occur at 2 weeks, 1 month, and 3 months. After 3 months, brace use is reduced to 16 hours per day.

---

**Figure 10.** A final cast is applied after the Achilles tenotomy and remains for 3 weeks. The cast should be applied with the foot abducted 60° to 70° (A). After removal of this final cast, 20° to 30° of ankle dorsiflexion should be possible (B). The foot is now ready for splinting, which must begin immediately to avoid loss of any initial correction. To reduce early noncompliance with the boots and abduction brace, the initial abduction angles should not be greater than that achieved with the final casts. (Reprinted with permission from Global Help.)

**Figure 11.** The brace boots are made in nine sizes to allow for growth. In unilateral cases of clubfoot, different sized boots may be required because the clubfoot is usually smaller than the foot without deformity.

**Figure 12.** The use of the foot abduction brace is essential to prevent relapses, and its use must be regularly monitored.
Continue to check every 3 months until the child is 12 months old (depending upon the age the process began), three to six monthly checks until the child is 5 to 6 years old, and then six to twelve monthly checks until age 15 years or at skeletal maturity.

The risk of relapse is greatly increased with bracing noncompliance. It has been shown that insufficient use of the brace accounts for more than 80% of relapses and that noncompliance with the brace is the most predictive factor for clubfoot recurrence. Noncompliant patients are 27 times more likely to relapse than those who comply with brace use.

The management of the relapsed clubfoot is largely avoidable if the Ponseti method is used correctly and in particular if the foot abduction brace is used to maintain correction during the early years. Signs of a relapsing clubfoot include reduced abduction, reduced ankle dorsiflexion, increased metatarsal adduction, heel varus, and forefoot supination. If the clubfoot does relapse, the patient should undergo recasting and rebracing. For equinus, the patient should be recast; another tenotomy may be needed, and then cast and splint again. For gait supination, the patient may need tibialis anterior transfer to the third cuneiform. For further detail regarding relapse management, the reader is referred to the Ponseti monograph.

The Ponseti method is not quick, but it is cost effective in Vietnam and gives the best long-term results for the life of the growing child.

**Ponseti Method Research**

The results of research investigating the efficacy of the Ponseti method are summarized and presented in Table 2. These results illustrate very clearly why the Ponseti method has now become the technique of choice in the developed world. It becomes implicit that this approach is also suitable and beneficial for use in developing countries where scant health-care resources make the cost-effective Ponseti method very suitable. There is still much to learn regarding both the universally similar and country specific barriers for families adhering to the Ponseti method.

**The Vietnam Experience to Date**

The Feet for Walking clubfoot project (FFW) in Vietnam began in 2004 as a collaborative venture between the Da Nang Orthopedic and Rehabilitation Centre (DORC) and the Australian College of Podiatric Surgeons (ACPS). The project aims to increase community awareness of clubfoot as a deformity that is best identified and treated early from birth; build a capacity for medical staff to treat this condition with the Ponseti method wherever possible; and incorporate necessary surgical correction for old and neglected cases.

Many seminars have been conducted in provinces in central Vietnam to provide education to hospital and clinic staff. Seminar content is consistently reviewed and updated. Educational posters and booklets have been produced and distributed to increase awareness, and doctors have been trained to use the Ponseti technique in workshops. The boots and bar comprising the foot abduction brace are now developed and manufactured at DORC, which is developing as the center of the Ponseti method expertise in Vietnam, with one of the authors of this paper (D.V.T.) coordinating the program.

The International Committee of the Red Cross (ICRC) convened three seminars for doctors in Ho Chinh Minh City in 2007 and 2008 for the Ponseti technique to be further conveyed to doctors and physical therapists by the FFW team. To date, 271 doctors and therapists have attended for briefing, and 67 have been trained to use the technique locally. Prior to 2006, approximately 10 to 12 children aged 4 to 10 years were presenting annually to the Centre of Paediatric Orthopedic Rehabilitation, Ho Chinh Minh City, for revision of previous clubfoot surgery. Since 2006, this same center has seen approximately 30 younger infants annually with untreated clubfoot who are treated with the Ponseti method by doctors and therapists who have attended the ICRC trainings (TV Tan, oral communication, 2008). Dr. Lea Tho Hiean Nhi from the TuDu Maternity Hospital, Ho Chinh Minh City, completed the ICRC Ponseti method training in 2007 (Table 3). At the subsequent seminar in May 2008, she presented a summary of the use of the Ponseti method on 30 infants (49 clubfeet) in this hospital over a 6-month period (Table 4). Of the 30 infants, 19 were male and 11 female. There were 11 unilateral clubfeet (nine right feet, two left feet) and 19 bilateral cases. Twenty cases were idiopathic clubfeet and ten had other associated pathologies. Initial Pirani scores were ≥ 3.5 in nine feet, between 3.5 and 5.0 in 11 feet and ≥ 5.0 in 24 feet.

The liaison between the ICRC and the FFW team is ongoing, which will further promote the best management of infant clubfoot deformity for infants in Vietnam. The FFW Web site provides current information about the progress of this very worthwhile, collaborative project (www.feetforwalking.org).

**Acknowledgment:** The following bodies have supported and continue to facilitate the clubfoot project: The Medical Director, Mr. Cuc, Medical, Nursing and
## Table 2. Ponseti Technique Success Rates in the Literature, 1980–2007

<table>
<thead>
<tr>
<th>Author</th>
<th>Date</th>
<th>No. of Patients</th>
<th>No. of Clubfeet</th>
<th>Average Age of Patients</th>
<th>Initial Correction (%)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laaveg and Ponseti</td>
<td>1980</td>
<td>70</td>
<td>104</td>
<td>&lt; 6 mo</td>
<td>88.5</td>
<td>Randomized controlled trial: 3% required posterior medial release versus 94% in control group</td>
</tr>
<tr>
<td>Ponseti et al</td>
<td>1981</td>
<td>32</td>
<td>32</td>
<td>infant</td>
<td>87.5</td>
<td>Correction reduced to 50% if brace not used properly</td>
</tr>
<tr>
<td>Cooper and Dietz</td>
<td>1995</td>
<td>45</td>
<td>71</td>
<td>&lt; 4 mo</td>
<td>78</td>
<td>Relapses due to poor brace use</td>
</tr>
<tr>
<td>Herzenberg et al</td>
<td>2002</td>
<td>27</td>
<td>34</td>
<td>&lt; 3 mo</td>
<td>97</td>
<td>Relapses (31%) correlates with brace use: 183 times increased recurrence risk</td>
</tr>
<tr>
<td>Lehman et al</td>
<td>2003</td>
<td>63</td>
<td>87</td>
<td>10.8 wks</td>
<td>92</td>
<td>Correction reduced to 50% if brace not used properly</td>
</tr>
<tr>
<td>Morecuende et al</td>
<td>2004</td>
<td>157</td>
<td>256</td>
<td>most &lt; 6 mo</td>
<td>98</td>
<td>Relapses due to poor brace use</td>
</tr>
<tr>
<td>Dobbs et al</td>
<td>2004</td>
<td>51</td>
<td>86</td>
<td>12 wks</td>
<td>100</td>
<td>Relapses (31%) correlates with brace use: 183 times increased recurrence risk</td>
</tr>
<tr>
<td>Thacker et al</td>
<td>2005</td>
<td>30</td>
<td>44</td>
<td>&lt; 6 mo</td>
<td>70</td>
<td>Brace use avoids relapse</td>
</tr>
<tr>
<td>Tindall et al</td>
<td>2005</td>
<td>75</td>
<td>100</td>
<td>11.5 wks</td>
<td>98</td>
<td>Malawi study</td>
</tr>
<tr>
<td>Morecuende et al</td>
<td>2005</td>
<td>230</td>
<td>319</td>
<td>3–5 mo</td>
<td>92–93</td>
<td>Brace use improves results</td>
</tr>
<tr>
<td>Gupta et al</td>
<td>2006</td>
<td>96</td>
<td>154</td>
<td>infant &lt; 3 mo</td>
<td>100</td>
<td>India study</td>
</tr>
<tr>
<td>Changulani et al</td>
<td>2006</td>
<td>66</td>
<td>100</td>
<td>3 wks</td>
<td>97.5</td>
<td>Treatment delivered by physical therapist</td>
</tr>
<tr>
<td>Shack and Eastwood</td>
<td>2006</td>
<td>24</td>
<td>40</td>
<td>3 wks</td>
<td>97</td>
<td>Treatment delivered by physical therapist</td>
</tr>
<tr>
<td>Ponseti et al</td>
<td>2006</td>
<td>50</td>
<td>75</td>
<td>3 mo</td>
<td>100</td>
<td>Complex clubfeet, 14% relapse with poor brace use</td>
</tr>
<tr>
<td>Goksan et al</td>
<td>2006</td>
<td>92</td>
<td>134</td>
<td>97</td>
<td>100</td>
<td>Relapses due to poor brace use, previous treatment, doctor’s experience</td>
</tr>
<tr>
<td>Haft et al</td>
<td>2007</td>
<td>51</td>
<td>73</td>
<td>15 days</td>
<td>100</td>
<td>Relapses (41%) correlates with brace use</td>
</tr>
</tbody>
</table>

*aAge of patient was not defined in this study.

## Table 3. The Scale of Treatment Provided for Infants with Clubfoot at TuDu Maternity Hospital, Ho Chinh Minh City, 2005–2007

<table>
<thead>
<tr>
<th>Year Treated</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of all patients seen</td>
<td>6,427</td>
<td>7,621</td>
<td>10,646</td>
</tr>
<tr>
<td>No. with clubfoot</td>
<td>64</td>
<td>23</td>
<td>36</td>
</tr>
<tr>
<td>Results of clubfoot treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent/good</td>
<td>52</td>
<td>18</td>
<td>31</td>
</tr>
<tr>
<td>Normal/poor</td>
<td>7</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Quit program</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

## Table 4. Clinical Results of Ponseti Management for 30 Infants (49 Clubfeet) During A 6-month Period (2007–2008)

<table>
<thead>
<tr>
<th>Sex</th>
<th>Male 19 (63%)</th>
<th>Female 11 (37%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male 19 (63%)</td>
<td>Female 11 (37%)</td>
</tr>
<tr>
<td>Foot affected (30 infants)</td>
<td>Right 9</td>
<td>Left 2</td>
</tr>
<tr>
<td>Type (30 infants)</td>
<td>Normal clubfoot: 20</td>
<td>Clubfoot with other pathology: 10</td>
</tr>
<tr>
<td>Initial Pirani scores</td>
<td>≤ 3.5: 9 (20%)</td>
<td>3.5–5.0: 11 (25%)</td>
</tr>
<tr>
<td>Treatment stage at time of report</td>
<td>Casts 27%</td>
<td>Boots/splint 73%</td>
</tr>
</tbody>
</table>

**Acknowledgments**

Allied Health staff at the Da Nang Orthopedic and Rehabilitation Centre, Da Nang City, Vietnam; Variety Club of Australia and Clark's Shoes/Pacific Brands for project sponsorship; Australian College of Surgical Podiatrists (especially Paul Wade, DPM, and Andrew van Essen); East Meets West Foundation, Da Nang City, Vietnam (especially Mark Conroy); International Committee of the Red Cross, Ho Chinh Minh City, Vietnam (especially Leo Gasser); Centre of Paediatric Orthopedic Rehabilitation, Ho Chinh Minh City (especially Dr. Tan); Vietcot, Hanoi, Vietnam (especially Mr. Thanh); Dr. I. Ponseti, Iowa; Dr. N. Davis, Booth Hall, Manchester; Ms. D. Watson, Chelsea and Westminster Hospitals, London; Dr. E. Goergens, Ham-
burg, for generous collegial support and sharing their invaluable experience. Many individual donors of funding, assistance, and supplies. All are very gratefully acknowledged.

Financial Disclosure: None reported. Conflict of Interest: None reported.

References