**Name of Policy:**
Bone Growth Stimulators: Ultrasound

**Policy #:** 331  
**Category:** DME  
**Latest Review Date:** February 2015  
**Policy Grade:** B

**Background/Definitions:**
As a general rule, benefits are payable under Blue Cross and Blue Shield of Alabama health plans only in cases of medical necessity and only if services or supplies are not investigational, provided the customer group contracts have such coverage.

The following Association Technology Evaluation Criteria must be met for a service/supply to be considered for coverage:

1. The technology must have final approval from the appropriate government regulatory bodies;
2. The scientific evidence must permit conclusions concerning the effect of the technology on health outcomes;
3. The technology must improve the net health outcome;
4. The technology must be as beneficial as any established alternatives;
5. The improvement must be attainable outside the investigational setting.

Medical Necessity means that health care services (e.g., procedures, treatments, supplies, devices, equipment, facilities or drugs) that a physician, exercising prudent clinical judgment, would provide to a patient for the purpose of preventing, evaluating, diagnosing or treating an illness, injury or disease or its symptoms, and that are:

1. In accordance with generally accepted standards of medical practice; and
2. Clinically appropriate in terms of type, frequency, extent, site and duration and considered effective for the patient’s illness, injury or disease; and
3. Not primarily for the convenience of the patient, physician or other health care provider; and
4. Not more costly than an alternative service or sequence of services at least as likely to produce equivalent therapeutic or diagnostic results as to the diagnosis or treatment of that patient’s illness, injury or disease.
**Description of Procedure or Service:**

Bone growth stimulation is the technique of promoting bone growth in difficult to heal fractures by applying a low electrical current or ultrasound to the fracture. Bone growth stimulation is done when satisfactory healing is not occurring naturally. The result is a condition known as fracture nonunion. It is estimated that 5% of all long bone fractures will result in nonunion. The most recent FDA labeling states that a nonunion is considered established when the fracture site shows no visibly progressive signs of healing, with a reasonable time for lack of visible signs of healing at three months.

Low-intensity pulsed ultrasound has been investigated as a technique to accelerate healing of fresh fractures, delayed unions, and nonunions. Ultrasound is delivered with the use of a transducer applied to the skin surface overlying the fracture site.

The majority of bone fractures heal spontaneously over the course of several months following injury. However, approximately 5%-10% of all fractures have delayed healing, resulting in continued morbidity and increased utilization of health care services. Ultrasound may accelerate healing of fractures by stimulating new bone growth, and therefore, has been proposed as a treatment for fractures with delayed healing or at high risk for non-healing.

Ultrasound treatment can be self-administered with one daily 20 to 30 minute treatment, continuing until the fracture has healed. The mechanism of action at the cellular level is not precisely known, but is thought to be related to a mechanical effect on cell deformation or indirectly by an electrical effect caused by cell deformation. The ultimate effect on fracture healing may be mediated by enhanced vascularity at the fracture site or enhanced chondrocyte maturation.

The definition of a fracture nonunion has remained controversial. The original U.S. Food and Drug Administration (FDA) labeling defined nonunion as follows: “A nonunion is considered to be established when a minimum of nine months has elapsed since injury and the fracture site shows no visibly progressive signs of healing for minimum of three months.” Others have contended that nine months represents an arbitrary cut-off point that does not reflect the complicated variables that are present in fractures, i.e., degree of soft tissue damage, alignment of the bone fragments, vascularity, and quality of the underlying bone stock. Other proposed definitions of nonunion involve three to six months’ time from original healing or simply when serial x-rays fail to show any further healing. According to the FDA labeling for a low-intensity pulsed ultrasound device, “a nonunion is considered to be established when the fracture site shows no visibly progressive signs of healing.”

Delayed union is generally considered a failure to heal between three and nine months after fracture, after which the fracture site would be considered to be a nonunion. Delayed union may also be defined as a decelerating bone healing process, as identified in serial radiographs. (In contrast, nonunion serial radiographs show no evidence of healing.) Together, delayed union and nonunion are sometimes referred to as "ununited fractures." To determine the status of fracture healing, it is important to include both radiographic and clinical criteria. Clinical criteria include the lack of ability to bear weight, fracture pain, and tenderness on palpation.”
**Policy:**

**Effective for dates of service on or after January 1, 2014:**

**Fresh Fracture**

*Low-intensity ultrasound treatment (E0760) meets* Blue Cross and Blue Shield of Alabama’s medical criteria for coverage when used as an adjunct to conventional management (i.e., closed reduction and cast immobilization) for the treatment of fresh, closed fractures in skeletally mature individuals. Candidates for ultrasound treatment are those at high risk for delayed fracture healing or nonunions. These risk factors may include either locations of fractures or patient morbidities and include any one of the following:

- **Patient Comorbidities**
  - Diabetes
  - Steroid therapy
  - Osteoporosis
  - Alcoholism history
  - Smoking
  - Obesity greater than 50% over ideal weight
  - Severe anemia
  - End Stage Renal disease

- **Fracture locations**
  - Radial fractures that are closed & posteriorly displaced (Colles fx)
  - Tibial diaphysis fractures that are closed or grade 1 open (wound <1cm with minimal soft tissue injury, wound bed is clean and bone injury is simple with minimal comminution)
  - Jones Fracture, 5th metatarsal
  - Navicular (scaphoid) fracture
  - Fractures associated with extensive soft tissue or vascular damage
  - Metatarsal fracture

**Delayed Union**

*Low intensity ultrasound treatment (E0760) meets* Blue Cross and Blue Shield of Alabama’s medical criteria for coverage as a treatment of delayed union of bones, including nonunion of previously surgically-treated fractures, and excluding the skull and vertebra, when the following criteria are met:

- A decelerating healing process is documented by a lack of clinical and radiologic (serial x-rays) evidence of union, bony continuity or bone reaction at the fracture site for no less than 16 weeks from the index injury or the most recent intervention

**Nonunion**

*Low-intensity ultrasound treatment (E0760) meets* Blue Cross and Blue Shield of Alabama’s medical criteria for coverage as a treatment of fracture nonunions of bones, including nonunion of previously surgically-treated fractures, and excluding the skull and vertebra, when all of the following criteria are met:

- The treatment is for nonunion of bones other than the skull or vertebrae (e.g., radius, ulna, humerus, clavicle, tibia, femur, fibula, carpal, metacarpal, tarsal and metatarsal).
• The nonunion is not related to, or due to, a malignancy.
• It is ≥ 90 days from the date of initial treatment of the fracture.
• The fracture nonunion is documented by at least two sets of appropriate imaging studies, multiple views, separated by a minimum of 90 days confirming that clinically significant healing has not occurred, with written interpretation by a physician stating such.
• A fracture gap of ≤1 cm.
• The patient can be adequately immobilized and is of an age where he/she is likely to comply with non-weight bearing (if fracture is of a weight-bearing bone).

Non-covered/Investigational

Low-intensity ultrasound treatment (E0760) does not meet Blue Cross and Blue Shield of Alabama’s medical criteria for coverage and is considered investigational when utilized for other applications including but not limited to:
• Congenital pseudarthrosis
• Fractures that are Open Grade II or III
• Fresh surgically-treated closed fractures (with or without internal fixation)
• Fractures too unstable for closed reduction/casting
• Fractures involving immature skeletal system
• Pathological fractures due to bone pathology or malignancy
• Treatment of Charcot foot disorder
• Avascular necrosis of the femoral head
• Fractures, failed fusions, or nonunions of the axial skeleton (skull and vertebrae)
• Chronic epicondylitis
• Prosthesis loosening following hip arthroplasty
• Stress fractures

Effective for dates of service September 29, 2011 through December 31, 2013:

Fresh Fracture

Low-intensity ultrasound treatment (E0760) meets Blue Cross and Blue Shield of Alabama’s medical criteria for coverage when used as an adjunct to conventional management (i.e., closed reduction and cast immobilization) for the treatment of fresh, closed fractures in skeletally mature individuals. Candidates for ultrasound treatment are those at high risk for delayed fracture healing or nonunions. These risk factors may include either locations of fractures or patient morbidities and include any one of the following:

• Patient Comorbidities
  o Diabetes
  o Steroid therapy
  o Osteoporosis
  o Alcoholism history
  o Smoking
  o Obesiy greater than 50% over ideal weight
  o Severe anemia
  o End Stage Renal disease
Fracture locations
- Radial fractures that are closed & posteriorly displaced (Colles fx)
- Tibial diaphysis fractures that are closed or grade I open (wound <1cm with minimal soft tissue injury, wound bed is clean and bone injury is simple with minimal comminution)
- Jones Fracture, 5th metatarsal
- Navicular (scaphoid) fracture
- Fractures associated with extensive soft tissue or vascular damage
- Metatarsal fracture

Delayed Union
Low intensity ultrasound treatment (E0760) meets Blue Cross and Blue Shield of Alabama’s medical criteria for coverage as a treatment of delayed union of bones, excluding the skull and vertebra, when the following criteria are met:
- A decelerating healing process is documented by a lack of clinical and radiologic (serial x-rays) evidence of union, bony continuity or bone reaction at the fracture site for no less than 16 weeks from the index injury or the most recent intervention

Nonunion
Low-intensity ultrasound treatment (E0760) meets Blue Cross and Blue Shield of Alabama’s medical criteria for coverage as a treatment of fracture nonunions of bones, excluding the skull and vertebra, when all of the following criteria are met:
- The treatment is for nonunion of bones other than the skull or vertebrae (e.g., radius, ulna, humerus, clavicle, tibia, femur, fibula, carpal, metacarpal, tarsal and metatarsal).
- The nonunion is not related to, or due to, a malignancy.
- It is ≥ 90 days from the date of initial treatment of the fracture.
- The fracture nonunion is documented by at least two sets of appropriate imaging studies, multiple views, separated by a minimum of 90 days confirming that clinically significant healing has not occurred, with written interpretation by a physician stating such.
- A fracture gap of ≤1 cm.
- The patient can be adequately immobilized and is of an age where he/she is likely to comply with non-weight bearing (if fracture is of a weight-bearing bone).

Non-covered/Investigational
Low-intensity ultrasound treatment (E0760) does not meet Blue Cross and Blue Shield of Alabama’s medical criteria for coverage and is considered investigational when utilized for other applications including but not limited to:
- Congenital pseudarthrosis
- Fractures that are Open Grade II or III, or require surgical intervention (with or without internal fixation), or are too unstable for closed reduction/casting
- Fractures involving immature skeletal system
- Pathological fractures due to bone pathology or malignancy
- Treatment of Charcot foot disorder
- Avascular necrosis of the femoral head
- Fractures, failed fusions, or nonunions of the axial skeleton (skull and vertebrae)
• Chronic epicondylitis
• Prosthesis loosening following hip arthroplasty
• Stress fractures

*Blue Cross and Blue Shield of Alabama does not approve or deny procedures, services, testing, or equipment for our members. Our decisions concern coverage only. The decision of whether or not to have a certain test, treatment or procedure is one made between the physician and his/her patient. Blue Cross and Blue Shield of Alabama administers benefits based on the member’s contract and corporate medical policies. Physicians should always exercise their best medical judgment in providing the care they feel is most appropriate for their patients. Needed care should not be delayed or refused because of a coverage determination.*

**Key Points:**
This policy includes a literature review through November, 2014.

Approximately six million fractures occur annually in the United States. It is estimated that the healing process of almost 10% of these fractures is delayed. Delayed in this situation is defined as healing not completed by three months. A significant number of this sub-population will not heal by nine months would be characterized as non-unions. The biological, anatomical and chemical factors are recognized as contributing to the occurrence of delayed union and non-union.

When a bone breaks, blood vessels also break resulting in bleeding around the injury site. Cells in neighboring tissue send out chemical messages that encourage the growth of small blood vessels. Within days, a large number of these small vessels grow into the fracture area. Eventually, the cells divide and form different connective tissues such as cartilage, bone and fibrous tissue; however, if this process is delayed or if it fails to occur at all, a nonunion results.

**Low intensity Ultrasound**
The primary factors contributing to the occurrence of delayed union or nonunion are the location or severity of the fracture, the nature of the blood supply to the bone, adequate stabilization, the extent of soft tissue damage or bone loss, air contact and contamination. Systemic factors such as smoking, alcoholism, age, and diabetes can also severely compromise the healing process. The risk factors are two to six times higher in patients who smoke because of reduced bone density. Pseudoarthrosis has been reported to be more likely in cigarette smokers after ankle arthrodesis. Nicotine in the smoke inhibits the revascularization of the bone grafts and may be responsible for the high pseudarthrosis rates.

The clinical studies substantiate basic scientific data that ultrasound has a strong positive influence on the human process of bone since this device enhances angiogenic, contra genic, and osteogenic activity resulting in accelerated healing.

Low-intensity ultrasound bone stimulators and electrical stimulation appear to transmit micromechanical force to the fracture site and promote bone formations. Studies have shown acceleration in healing and an increase in strength at the site of bone callus, but these have not
been widely studied in the Charcot foot. Although these studies show promise, further investigations is needed in this area before any clinical role for electrical stimulation of low intensity ultrasound for the management of Charcot foot can be defined.

There were no controlled studies in the published literature that specifically addressed the use of low-intensity ultrasound as a treatment of delayed unions, congenital pseudarthroses, or spinal fusions; therefore, this portion of the policy statement is unchanged. For healing of fresh fractures, the current policy limits its use to the treatment of closed fractures. Data are conflicting regarding the efficacy of UAFHS for the treatment of open fractures, specifically those treated surgically with placement of an intramedullary nail. For example, Emami et al conducted a study that randomized 32 patients with a fresh tibial fracture that was fixed with an intramedullary rod to undergo additional treatment with an active or inactive ultrasound device. The time to healing was not significantly different in the two groups. These observations are consistent with a meta-analysis conducted by Busse and colleagues, whose analysis supported the use of low-intensity ultrasound as a technique for fractures treated nonoperatively. However, the authors concluded that there was no benefit in operatively treated fractures. In contrast, Leung et al reported on the results of a study that randomized 30 fractures in 28 patients with complex tibial fractures treated with internal or external fixation to receive or not receive additional treatment with low-intensity ultrasound. Based on radiologic assessment, the time to callus formation was significantly less in those in the ultrasound group. Due to the inconsistent results in the two small randomized studies, and the negative results of the meta-analysis, low-intensity ultrasound is still considered investigational for open fractures.

Fresh Fractures
The policy regarding fresh fractures is based in part on a 1995 TEC Assessment that concluded that ultrasound fracture healing met the TEC criteria for the indications labeled by the U.S. Food and Drug Administration (FDA) as a treatment of closed, fresh fractures of the tibial or distal radius (i.e., Colles’ fractures). Since the TEC Assessment, there have been numerous randomized controlled trials (RCTs) and systematic reviews of clinical trials on the use of ultrasound to improve healing in fresh fractures.

Systematic Reviews:
A 2002 meta-analysis conducted by Busse and colleagues supported the use of low-intensity ultrasound as a technique for fractures treated nonoperatively. This systematic review was updated in 2009 and included RCTs of low-intensity pulsed ultrasonography for any type of fracture. Thirteen trials were included; in five of them, patients were managed conservatively, and in eight studies, patients had ultrasound therapy after operative management (distraction osteogenesis in three studies, bone graft for nonunion in one, and operative treatment of fresh fractures in four). Ultrasound therapy significantly accelerated radiographic healing of fractures in all three RCTs of conservatively managed fresh fractures that assessed this outcome. (These trials are described in more detail below.)

The trials of operatively managed (open) fresh fractures outcomes were inconsistent; 4 trials provided low-quality evidence for acceleration of healing by ultrasound therapy. Pooled results of two trials showed a non-significant mean reduction in radiographic healing time of 16.6%.
A 2014 update of a 2012 Cochrane review on ultrasound and shockwave therapy included 11 studies on ultrasound; eight of the studies were randomized controlled trials with placebo controls, two were RCTs without placebo controls, and two were quasi-randomized. The included studies were limited in methodologic quality, with all having some evidence of bias. There was very limited evidence on functional outcomes, and the available data showed no significant difference between ultrasound and placebo control on functional outcomes. Pooling results from eight studies (446 fractures) showed no significant reduction in time to union of complete fractures. This systematic review included studies of conservatively managed fractures along with surgically treated fractures and stress fractures. Subgroup analysis comparing conservatively and operatively treated fractures raised the possibility that pulsed US may be effective in reducing healing time in conservatively managed fractures, but a test for subgroup differences did not confirm a significant difference between the subgroups. The review concluded that while a potential benefit of US for acute fractures could not be ruled out, the currently available evidence was insufficient to support its routine use.

RCTs of Closed Fractures:
In a 1997 multicenter RCT by Kristiansen et al, 60 patients with dorsally angulated fractures of the distal radius treated with manipulation and cast were randomly assigned to 10 weeks of daily treatment with a pulsed ultrasound device or an inactive device. All patients started ultrasound within seven days after having sustained the fracture. Blinded radiographic and clinical examinations showed faster healing in the ultrasound group (61 days) than in the control group (98 days) (p<0.001). Each radiographic stage of healing also was significantly accelerated in the treatment group.

Heckman et al (1994) performed a double-blind RCT comparing ultrasound treatment (n=33) with a placebo-control device (n=34) in closed or Grade-I open fractures of the tibial shaft. Treatment was started within seven days after the fracture and consisted of one 20-minute period each day. Time-to-healing was 86 days in the treatment group versus 114 days in the control group (p=0.01), and time to overall (clinical and radiographic) healing was 96 days in the active-treatment group compared to 154 days in the control group (p=0.0001). Scaphoid fractures were treated with ultrasound in a 2008 study done in Germany. Fifteen patients with fresh scaphoid fractures (<10 days) were randomly assigned to treatment and 15 to placebo device groups. Healing was assessed by computed tomography (CT) scans every two weeks. Fractures treated with ultrasound healed in 43.2 days versus 62 days in the control group (p<0.01). Pooled data from these studies demonstrated a mean reduction in radiographic healing time of 36.9% (95% CI: 25.6% to 46.0%).

Authors of another study included in the 2009 systematic review observed that the clinical relevance of accelerated radiologic healing has not been described and examined the effect of low-intensity pulsed ultrasound on fracture healing issues such as pain, function, and resumption of professional and personal activities. They performed a multicenter double-blind RCT of ultrasound treatment of fresh clavicle fractures. Patients were taught to use the ultrasound devices for 20 minutes each day for 28 days and to record daily their subjective feeling as to whether the fracture healed or not (the primary outcome measure), pain on visual analogue scale (VAS), level of daily activities once a day expressed as hours of activity (work, household work, sport), and analgesic use. A total of 120 patients (61 active and 59 placebo)
started study treatment. Nine patients in the active group and 10 in the placebo group were excluded from analysis because of incomplete follow-up or early withdrawal from the study. The day that the fracture clinically healed according to patient perception was determined in 92 patients (47 active and 45 placebo), and mean duration of time to clinical healing was 26.77 days in the active group versus 27.09 days in the placebo group. Between-group differences in analgesic use and mean VAS were not significant.

RCTs of Open Fractures and Surgically-treated Closed Fractures:
For the treatment of open fractures, the data are conflicting regarding the efficacy of ultrasonic accelerated fracture healing system (UAFHS), specifically those treated surgically with placement of an intramedullary nail. For example, Emami et al (1999) randomly assigned 32 patients with a fresh tibial fracture that was fixed with an intramedullary rod to undergo additional treatment with an active or inactive ultrasound device. Ultrasound treatment began within three days of surgery, and with one exception, within seven days of injury. The time-to-healing was not significantly different in the two groups, and the authors concluded that there was no benefit in operatively treated fractures. In contrast, Leung and colleagues reported on the results of a study that randomly assigned 30 fractures in 28 patients with complex tibial fractures treated with internal or external fixation to receive or not receive additional treatment with low-intensity ultrasound. Ultrasound treatment was begun when the patient’s condition had stabilized, and the open wound was covered with simple closure or skin grafts. The duration of tenderness, time to weight bearing, and time to callus formation was significantly less in those in the ultrasound group. Due to the inconsistent results in the two small randomized studies, and the negative results of the meta-analysis, low-intensity ultrasound is considered investigational for open fractures.

In 2011 Dijkman et al reported data from a substudy of 51 patients of a larger randomized controlled trial that enrolled patients with open or closed tibial shaft fractures that were treated surgically with an intramedullary nail. According to the posting on the clinical trials website (www.Clinicaltrials.gov (NCT00667849)), “the study was terminated due to futility”, which suggested lack of benefit for this indication.

Section Summary:
There is some RCT evidence that ultrasound treatment improves radiographic healing for closed fresh fractures, but this finding is not consistent for studies of open fresh fractures. A 2009 systematic review and meta-analysis of RCTs found moderate- to very low-quality evidence for low-intensity pulsed ultrasonography in accelerating functional recovery among patients with fracture. The systematic review concluded that large trials of high methodologic quality focusing on patient important outcomes such as quality of life and return to function are needed to determine whether ultrasound fracture healing devices provide important benefits to patients. A 2014 Cochrane review that did not distinguish between closed and open fractures reported that there is a possibility that pulsed ultrasound may be effective in reducing healing time in conservatively managed fractures, but that currently available evidence was insufficient to support its routine use.
Nonunion Fractures
The policy regarding nonunion of fractures is based on data presented to the FDA as part of the approval process for Sonic Accelerated Fracture Healing System (SAFHS®) as a treatment of fracture nonunions. The following data were reported and are included in the package insert for the device:

- Data were collected on 74 cases of established nonunion with a mean fracture age of nearly three years. The principal outcome measure was the percentage of patients with healed nonunions, as determined clinically and by radiographic analysis. Each case served as its own control, based on the definition of nonunion that suggests that nonunions have a 0% probability of achieving a healed state without an intervention.
- A total of 64 of 74 cases (86%) were healed with use of low-intensity ultrasound. The time to healing was 173 days. The healed rate of scaphoid bones was lower at 33% (two of six cases), which was partially responsible for a significant difference between the healing rates of long bones (92%) vs. other bones (67%).
- Fracture age also affected healing rates, with fractures over five years old having a healing rate of 50% compared to a healing rate of 95% in those present for no more than one year.

A 2007 study used prospectively defined criteria for analysis of all Dutch patients (96 participating clinics) who had been treated with ultrasound for established nonunion of the tibia (characterized by a total stop of all fracture repair processes). Included in the analysis were 71 patients who were at least three months from the last surgical intervention and did not show any healing improvements in the three months before ultrasound treatment (average fracture age: 257 days; range: 180–781 days). All patients were followed up (average 2.7 years) by questionnaire, or by phone, if needed. There was an overall healing rate of 73%, at an average 184 days to healing (range: 52–739 days). No difference in healing rate for open or closed fractures was observed.

Delayed Union
In 2010, Schofer et al reported an industry-sponsored multicenter randomized double-blinded sham-controlled trial of low-intensity pulsed ultrasound in 101 patients with delayed union of the tibia. Delayed union was defined as lack of clinical and radiologic evidence of union, bony continuity, or bone reaction at the fracture site for no less than 16 weeks from the index injury or the most recent intervention. Roughly one third of the patients had an open fracture. Fifty-one patients were randomized to daily treatment with ultrasound, and 50 were assigned to an inactive sham device (20 minutes daily for 16 weeks). The primary outcome measure was the change in bone mineral density (BMD) over the 16 weeks, assessed by CT attenuation coefficients, or Hounsfield units (Hus). Gap area at the fracture site was a secondary endpoint. The primary analysis was intention-to-treat with imputation of missing values (24% of sham-treated subjects and 9.8% of active-treated subjects were missing post-treatment values). The mean improvement in BMD was 1.34 (90% CI: 1.14 to 1.57) times greater for ultrasound-treated subjects compared to sham. Analysis of ‘completers’ showed a medium effect size (0.53) of the treatment. A mean reduction in bone gap area also favored ultrasound treatment, with a mean change of log gap area of -0.131 mm2 for the active treatment and -0.097 mm2 for sham (effect size of -0.47, 95% CI: -0.91 to -0.03). Untransformed data showed a difference between groups of -0.457 mm2 (90% CI: -0.864 to -0.049), which was statistically significant by a one-sided test. The clinical significance of this difference is unclear. There was a trend
for more subjects receiving low-intensity pulsed ultrasound to be judged to be healed by the participating physicians by the end of the 16-week study period, 65% (33 of 51) of ultrasound versus 46% (23 of 50) sham subjects. While there was not a statistically significant improvement in the rate of healing, the improvements in intermediate outcomes and the corroborating evidence from trials of patients with similar indications, e.g., fracture nonunion, make it very likely that this treatment is efficacious for delayed union.

**Stress Fractures**
Rue et al examined the effect of 20-minute daily low-intensity pulsed US on tibial stress fracture healing issues such as pain, function, and resumption of professional and personal activities in 26 military recruits. The delay from onset of symptoms to diagnosis was 32 days in the US group and 28 days in the placebo group. Pulsed US did not significantly reduce the healing time for the tibial stress fractures; the time to return to duty was 56 days in each group.

**Osteotomy Sites**
In 2013, Urita et al published a small (n=27) quasi-randomized study (alternating assignment) of low-intensity pulsed ultrasound after ulnar shortening osteotomy for ulnar impaction syndrome or radial shortening osteotomy for Kienbock disease. Patients in the ultrasound group received once-daily 20- minute ultrasound treatments for at least 12 weeks postoperatively. Blinded evaluation of radiographic healing showed that ultrasound reduced the mean time to cortical union by 27% (57 vs. 76 days) and endosteal union by 18% (121 vs. 148 days). At the time of endosteal healing (mean of 121 or 148 days), the two groups had similar results on the Modified Mayo Wrist Score and no pain at the osteotomy site. Limitations of this study include the lack of a sham control and the long interval between the 16 and 24 week assessments, which may have increased group differences. In addition, clinical outcomes appear to have been assessed only at the time of radiographic healing and did not show any differences at this time point. Additional study is needed to determine with greater certainty the effect of low -intensity pulsed ultrasound on healing of osteotomy sites.

**Distraction Osteogenesis**
The 2009 systematic review by Busse et al found three trials of distraction osteogenesis that used a variety of surrogate outcome measures with inconsistent results and provided very low-quality evidence of accelerated functional improvement. In 2011, a small (n=36) nonblinded RCT of low-intensity pulsed ultrasound found no significant differences between the active and control groups in efficacy measures, although the treatment period (fixator gestation period) was decreased by more than a month. A 2014 study randomized 21 patients undergoing callus distraction for post-traumatic tibial defects to pulsed US or no treatment (controls). In this non-blinded study, US shortened healing by 12 days/cm and the total fixator time by 95 days. Double-blind trials with a larger number of subjects are needed to evaluate the health benefits of this procedure.

**Clinical Input Received Through Physician Specialty Societies and Academic Medical Centers**
While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process through the provision of appropriate
reviewers, input received does not represent an endorsement or position statement by the
physician specialty societies or academic medical centers, unless otherwise noted.

2008
In response to requests for input from physician specialty societies and academic medical centers
for the 2008 policy update, input was received from one physician specialty society while this
policy was under review. Physician input obtained through the American Academy of
Orthopaedic Surgeons agreed with the positions regarding the criteria for medical necessity and
the conditions that are considered investigational (e.g., delayed union and open/unstable grade II
or III fractures).

2011
In response to requests, input was received through two physician specialty societies and one
academic medical center for the policy review in January 2011. Input supported the use of
ultrasound for nonunion and for fresh closed fractures at high risk for delayed fracture healing or
nonunion as described in the policy. One reviewer supported including chemotherapy,
immunosuppressive agents, history of infection, Charcot neuroarthropathy, and fractures of the
tibial shaft or clavicle as additional risk factors, and a different reviewer supported including
fractures of the talus and sesamoids as additional risk factors.

2012
In response to requests, input was received through four academic medical centers for the policy
review in December 2012. Input supported the use of low-intensity ultrasound in delayed union
and nonunion of bones excluding the skull and vertebra, and in fresh closed fractures at high risk
for delayed fracture healing or nonunion. Input agreed that other applications of low-intensity
ultrasound treatment are investigational, including, but not limited to, treatment of congenital
pseudoarthroses, open fractures, stress fractures, arthrodesis or failed arthrodesis. Additional risk
factors were noted, including: use of anticoagulants, immunosuppressive drugs or chemotherapy;
infection at the fracture site; severe anemia; obesity; and fracture locations more prone to
nonunion such as tibial and distal radial fractures.

Summary
There is evidence from published studies that ultrasound improves healing rates in closed fresh
fractures, delayed union, and fracture nonunion. As a result, ultrasound may be considered
medically necessary for these indications. For treatment of open, fresh fractures, the evidence is
less consistent across RCTs, and systematic reviews do not report strong conclusions on efficacy
of ultrasound for improving healing when data on closed and open fresh fractures are combined.
Most fresh closed fractures heal without complications with the use of standard fracture care, i.e.,
closed reduction and cast immobilization. Therefore, the most appropriate candidates for
ultrasound treatment may be those with closed fractures at high risk for delayed fracture healing
or nonunion. Based on the available evidence and support from clinical input, low intensity
ultrasound treatment may be considered medically necessary for fresh fractures (closed), delayed
union of fractures, and nonunion of fractures.

Evidence is insufficient to evaluate health outcomes with use of low-intensity ultrasound as a
treatment of congenital pseudarthroses, arthrodesis of the appendicular skeleton, or spinal
fusions. Use of ultrasound for these conditions is considered investigational. Based on one small trial with results showing no benefit to use of ultrasound treatment in the treatment of stress fractures, this is considered investigational.

**Practice Guidelines and Position Statements**
The United Kingdom’s National Institute for Health and Clinical Excellence (NICE) updated their guidance on low-intensity pulsed ultrasound for the treatment of non-union and delayed fracture healing in 2013. NICE reached the following conclusions:

1.1 The case for adopting the EXOGEN ultrasound bone healing system to treat long-bone fractures with **non-union** (failure to heal after nine months) is supported by the clinical evidence, which shows high rates of fracture healing.

1.2 The EXOGEN ultrasound bone healing system to treat long-bone fractures with **non-union** is associated with an estimated cost saving of £1164 per patient compared with current management, through avoiding surgery.

1.3 There is some radiological evidence of improved healing when the EXOGEN ultrasound bone healing system is used for long-bone fractures with **delayed healing** (no radiological evidence of healing after approximately three months). There are substantial uncertainties about the rate at which bone healing progresses without adjunctive treatment between three and nine months after fracture, and about whether or not surgery would be necessary. These uncertainties result in a range of cost consequences, some cost-saving and others that are more costly than current management.

The American Academy of Orthopaedic Surgeons (AAOS) has published 2009 guidelines on the treatment of distal radius fractures. The AAOS provided a weak recommendation for use of ultrasound for adjuvant treatment of distal radius fractures. This recommendation was based results from two studies that used non-validated patient outcome measures.

**U.S. Preventive Services Task Force Recommendations**
The U.S. Preventive Services Task Force has not addressed ultrasound accelerated fracture healing devices.

**Key Words:**
Fracture, nonunion, delayed union, bone growth stimulator, ultrasound accelerated fracture healing device, low intensity ultrasound stimulator, osteogenesis stimulator, percutaneous, pseudarthrosis, pseudoarthrosis, Exogen 2000™, Exogen 3000, SAFHS® Model 2A, SAFHS® Model 2000

**Approved by Governing Bodies:**
The Sonic Accelerated Fracture Healing System, SAFHS® (also referred to an Exogen 2000®) was initially cleared for marketing by the FDA in October 1994 as a treatment of fresh, closed, posteriorly displaced distal radius (Colles’) fracture and fresh, closed, or Grade I open tibial diaphysis fractures in skeletally mature individuals when these fractures are orthopedically managed by closed reduction and cast immobilization. In February 2000, the labeled indication was expanded to include the treatment of established non-unions, excluding skull and vertebra.
Benefit Application:
Coverage is subject to member’s specific benefits. Group specific policy will supersede this policy when applicable.
ITS: Home Policy provisions apply.
FEP: Special benefit consideration may apply. Refer to member’s benefit plan. FEP does not consider investigational if FDA approved and will be reviewed for medical necessity.
Pre-certification requirements: Not applicable.

Current Coding:
CPT Codes:
20979 Low intensity ultrasound stimulation to aid bone healing, non-invasive (nonoperative)

HCPCS:
E0760 Osteogenesis stimulator, low intensity ultrasound; non-invasive

References:

**Policy History:**
Medical Policy Group, October 2008 (4)
Medical Policy Administration Committee, November 2008
Available for comment November 20, 2008-January 5, 2009
Medical Policy Group, February 2009 (4)
Medical Policy Administration Committee, March 2009
Available for comment February 27-April 13, 2009
Medical Policy Group, October 2009 (1)
Medical Policy Administration Committee, October 2009
Available for comment October 20-December 3, 2009
Medical Policy Group, November 2009 (1)
Medical Policy Administration Committee, December 2009
Available for comment December 4, 2009-January 19, 2010
Medical Policy Group, February 2010 (1)
Medical Policy Administration Committee, April 2010
Available for comment April 7-May 21, 2010
Medical Policy Group, February 2010; Regular update (1)
Medical Policy Group, November 2011 (1): Electrical bone stimulator portion removed and put into separate policy #082; Update to Description, Policy, Key Points, and References with criteria for coverage for delayed union
Medical Policy Administration Committee, January 2012
Available for comment January 11 – February 27, 2012
Medical Policy Panel, December 2012
Medical Policy Group, March 2013 (1): Update to policy statement with clarifications, no change to coverage criteria; update to Key Points and References, also.
Medical Policy Panel, January 2014
Medical Policy Group, January 2014 (1): Update to Policy, Key Points and References related to clarification of coverage concerning surgically-treated fractures, fresh versus nonunion; policy statements prior to March 2010 removed
Medical Policy Administration Committee, February 2014
Available for comment February 15 through March 31, 2014
Medical Policy Panel, February 2015
Medical Policy Group, (6): 2015 Update to Key Points and References; no change to policy statement.

This medical policy is not an authorization, certification, explanation of benefits, or a contract. Eligibility and benefits are determined on a case-by-case basis according to the terms of the member’s plan in effect as of the date services are rendered. All medical policies are based on (i) research of current medical literature and (ii) review of common medical practices in the treatment and diagnosis of disease as of the date hereof. Physicians and other providers are solely responsible for all aspects of medical care and treatment, including the type, quality, and levels of care and treatment.

This policy is intended to be used for adjudication of claims (including pre-admission certification, pre-determinations, and pre-procedure review) in Blue Cross and Blue Shield’s administration of plan contracts.