

A decorative graphic consisting of a semi-circle of dots of varying sizes, arranged in a pattern that suggests motion or a signal. The dots are grey and white.

# MUSCLE THROUGH IT



## GUIDELINES FOR TREATMENT

Rehabilitation Incorporating  
Neuromuscular Electrical Stimulation (NMES)

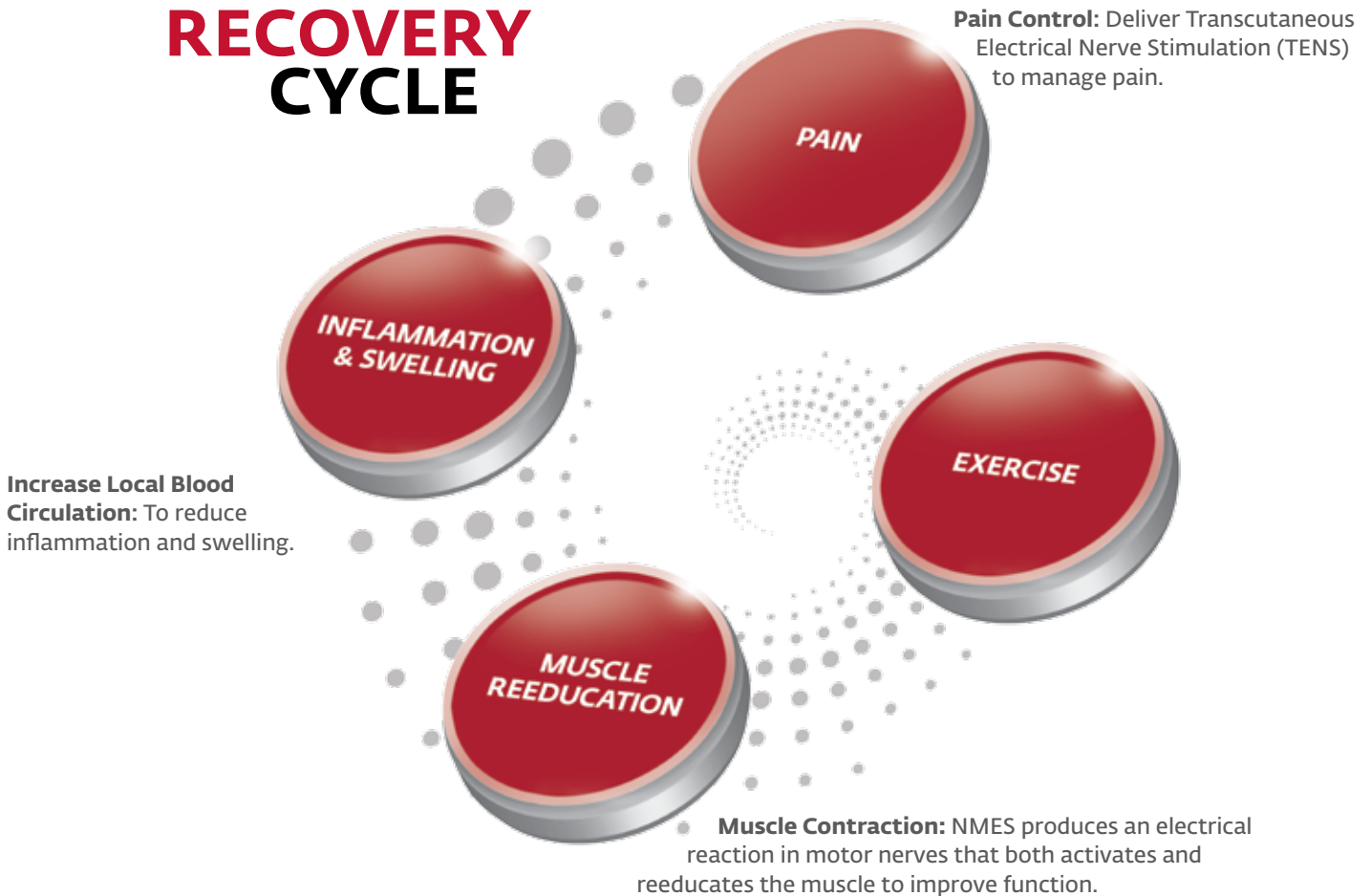


## GUIDELINES FOR TREATMENT

### Rehabilitation Incorporating Neuromuscular Electrical Stimulation (NMES)

- Total Knee Arthroplasty (TKA)
- Anterior Cruciate Ligament (ACL)
- Total Shoulder
- Orthopedic Shoulder/Rotator Cuff

## MUSCLE RECOVERY CYCLE



## ENHANCE RECOVERY

## Neuromuscular Electrical Stimulation (NMES) - Empi Continuum

The Empi Continuum is a multi-functional medical device offering treatment of muscle reeducation, pain management, and increased blood circulation. Therapies include Neuromuscular Electrical Stimulation (NMES), Transcutaneous Electrical Nerve Stimulation (TENS), and Pulsed Direct Current (Edema). The device is equipped with thirteen (13) pre-set treatment regimens for ease-of-use and transition to at-home use. Three (3) custom programs allow for clinical preference protocols, with the ability to customize multiple parameters. The Locking feature also allows the clinician to lock in custom protocols for patients.

### Benefits of the Continuum NMES

- Retarding or preventing disuse atrophy
- Maintaining or increasing range of motion
- Reeducating muscles
- Relaxation of muscle spasm
- Increasing local blood circulation
- Prevention of venous thrombosis of the calf muscles immediately after surgery
- Symptomatic relief and management of chronic, intractable pain (TENS)
- Adjunctive treatment for post-surgical and post-trauma acute pain (TENS)



### Pre-Programmed Regimens

Preset Programs	Type	Application
Large Muscle Atrophy	NMES	Muscle reeducation
Large Muscle Spasm	NMES	Reduction of Spasm
Large Muscle Trigger Point	NMES	Reduction of trigger points
Large Muscle Custom	NMES	Muscle reeducation / gait training
Small Muscle Atrophy	NMES	Muscle reeducation
Small Muscle Spasm	NMES	Reduction of Spasm
Small Muscle Trigger Point	NMES	Reduction of trigger points
Small Muscle Custom	NMES	Muscle reeducation / gait training
TENS Knee	TENS	Pain control
TENS Shoulder	TENS	Pain control
TENS Back	TENS	Pain control
TENS Hand	TENS	Pain control
TENS Foot	TENS	Pain control
TENS Custom	TENS	Pain control
Edema Acute	Pulsed DC	Edema / Increase circulation
Edema Chronic	Pulsed DC	Edema / Increase circulation

**CLINICAL  
TREATMENT PLAN  
GUIDELINES**

## TREATMENT PLAN GUIDELINES

### • Total Knee Arthroplasty (TKA)

The overall goals of the pre- and post-surgical rehabilitation of the Total Knee Arthroplasty are:

- Increase localized circulation
- Acute pain management
- Neuromuscular reeducation and strengthening

	Problem	Modality	Goals
<b>30 Days Pre-Op</b>	Muscle atrophy	Continuum	<ul style="list-style-type: none"> <li>• Maintain functional use</li> <li>• Increase muscle strength</li> <li>• Reduce Pain/Inflammation</li> </ul>
	Pain	Continuum (TENS)	
	Edema	Continuum/Cryotherapy	
<b>Day 1-10 Immediate Post-Op</b>	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Reduce swelling and inflammation</li> <li>• Active quad contraction</li> <li>• Knee extension to 0 degrees</li> <li>• Knee flexion to 90°</li> </ul>
	Edema	Cryotherapy/CPM/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
	Ambulation	Walker/crutches	
		<i>Exercise [Active]</i> <ul style="list-style-type: none"> <li>• Quad sets</li> <li>• Single Leg Raises (SLR)</li> <li>• Hip abduction/adduction</li> <li>• Hamstring curls</li> <li>• Stationary bike</li> </ul>	
<b>Week 2-6 Early Movement</b>	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Improve ROM</li> <li>• Improve muscular strength and endurance</li> <li>• Develop dynamic stability</li> <li>• Decrease swelling and inflammation</li> <li>• Begin return to functional activities</li> <li>• Knee flexion to 115 degrees</li> </ul>
	Edema	Cryotherapy/CPM/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
		<i>Exercise [Active]</i> <ul style="list-style-type: none"> <li>• Quad sets</li> <li>• Single Leg Raises (SLR)</li> <li>• Hip abduction/adduction</li> <li>• Hamstring curls</li> <li>• Stationary bike</li> </ul>	
<b>Week 7-12 Intermediate</b>	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Knee flexion &gt; 115°</li> <li>• Improve muscular strength and endurance</li> <li>• Eccentric/concentric control of limb</li> <li>• Functional activity performance</li> </ul>
	Muscle Reeducation/Strengthening	Continuum	
	Ambulation	No device	
		<i>Exercise [Active]</i> <ul style="list-style-type: none"> <li>• Continue previous exercises</li> <li>• Functional activities</li> </ul>	
<b>Month 3-4 Return to Normal Activity</b>	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Return to advanced level of function</li> <li>• Maintain/improve strength and endurance</li> <li>• Full non painful ROM</li> <li>• Strength 90% of contra-lateral limb</li> <li>• Resume normal activities for daily living</li> </ul>
	Muscle Reeducation/Strengthening	Continuum	
	Normal activities for daily living	No device	
		<i>Exercise [Active]</i> <ul style="list-style-type: none"> <li>• Continue previous activities</li> <li>• Knee extension</li> <li>• Step ups</li> </ul>	

Note: A progression of exercises can be incorporated into a patient's rehabilitation protocol, but should be first approved by the surgeon. These exercises provided serve only as a guide and will vary according to specific procedures, indications, and patient progress.

## TREATMENT PLAN GUIDELINES

### • Anterior Cruciate Ligament (ACL)

The overall goals of the pre- and post-injury/surgical rehabilitation of the Anterior Cruciate Ligament are:

- Increase localized circulation
- Acute pain management
- Neuromuscular reeducation and strengthening

	Problem	Modality	Goals
14-21 Days Pre-Op	Muscle atrophy	Continuum	<ul style="list-style-type: none"> <li>• Laxity testing (KT-1000)</li> <li>• Range of motion measurements</li> <li>• Thigh girth measurements</li> <li>• All limits-of-motion clinical testing</li> </ul>
	Pain	Continuum (TENS)	
	Inflammation/Swelling	Continuum/ Cryotherapy	
		<ul style="list-style-type: none"> <li>• Immobilizer with knee straight (0 degrees) extension (struts for immobilizer bent to position of relative knee recurvation to keep knee with a post-op dressing in full extension)</li> <li>• Proper knee elevation</li> <li>• Immediate quad sets; ankle pumps encouraged</li> </ul>	
Day 1-10 Immediate Post-Op	Pain	Continuum (TENS)	<p>Immediate:</p> <ul style="list-style-type: none"> <li>• Protected weight bearing with crutches to tolerance</li> <li>• Full passive extension (0 degrees) out of immobilizer</li> <li>• 90 degrees of flexion</li> </ul> <p>Discharge:</p> <ul style="list-style-type: none"> <li>• Gait-weight bear as tolerated with crutches</li> </ul>
	Inflammation/Swelling	Cryotherapy/CPM/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
	Ambulation	Walker/crutches	
		<p><i>Exercise [Active (Post-Op)]</i></p> <ul style="list-style-type: none"> <li>• No pillow under knee at any time first 6 weeks. Pillows always support foot/ankle while in bed</li> <li>• Out of bed: Quad sets - 30 reps, 3-5x/day. Five quads hard for 6 sec. Relax for 3 sec. Repeat</li> <li>• Ankle pumps every hour</li> <li>• Full passive extension (0 degrees) out of immobilizer</li> <li>• Protected weight bearing as tolerated (WBAT) with crutches</li> <li>• Exercises (out of immobilizer): Quad sets; Active assisted knee flexion (sitting); Hamstring stretches; Passive extension to 0 degrees; Standing hamstring curls</li> </ul> <p><i>Exercise [Discharge (out of brace)]</i></p> <ul style="list-style-type: none"> <li>• Quad stretch to full passive extension (frequently)</li> <li>• Quad sets (10 sets of 30 daily)</li> <li>• Straight leg raises (full extension) (10 sets, 30 day). No knee sag</li> <li>• Hamstring stretches (hourly)</li> <li>• Crutch Ambulation Protocol (verify with surgeon): Weight bear as tolerated (protected) with crutches for 2 weeks. Progress to one crutch (on opposite side) as quad function/gait normalizes. Discontinue once gait normalizes (no limping)</li> </ul>	
Week 2-6 Early Movement	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Obtain full (0 degree) knee extension</li> <li>• Increase knee range of motion</li> <li>• Increase quad strength in progression to ambulation w/o crutches</li> </ul>
	Inflammation/Swelling	Cryotherapy/CPM/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
		<p><i>Exercise [Active]</i></p> <ul style="list-style-type: none"> <li>• Knee immobilizer full extension. Decrease as comfortable (verify with surgeon). May ambulate w/o knee brace (with crutches) once quad can fire well</li> <li>• Flexion Exercises: Active assisted knee flexion (with overpressure - goal 130°)</li> <li>• Biking as tolerated to 30 min. (low resistance). First 2 weeks bike backwards (no resistance)</li> <li>• Progressive Resistance: (30-50 reps, 0-5 lb, 3x/day)</li> <li>• Straight leg raises (full extension)</li> <li>• Hamstring curls</li> <li>• Hip flexion, extension, abduction</li> <li>• If exercises aggravate knee (swelling, pain, tenderness), postpone until discussed with surgeon</li> </ul>	

Note: A progression of exercises can be incorporated into a patient's rehabilitation protocol, but should be first approved by the surgeon. These exercises provided serve only as a guide and will vary according to specific procedures, indications, and patient progress.

Anterior Cruciate Ligament (ACL) Table (cont'd)

	Problem	Modality	Goals
Week 7-12 Intermediate	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>Achieve full extension to near full flexion</li> <li>Improve quadriceps tone (return of vast medialis obliquus (VMO) definition)</li> </ul>
	Muscle Reeducation/Strengthening	Continuum	
	Ambulation	No Device	
		<p><i>Exercise [Active]</i></p> <ul style="list-style-type: none"> <li>Quadriceps - straight leg raises (10 sets 30 reps each)</li> <li>Hip muscle groups. Progress adding weights above knee</li> <li>Hip abductors, flexors, abductors, extensors 10 reps, 4 sets day. Isometric variation pushing down on hip and sustain contraction for 10 sec.</li> <li>Hamstrings curls - may add ankle weights, 10 reps, 4x/day</li> <li>Calf raises. 3 sets, 10 reps - fast/slow sets (ea)</li> <li>Swim: Flutter kick only - gentle. No whip kick</li> <li>Outdoor biking: avoid hills</li> <li>Accelerated - start w/sand bags on tibial tubercle. Straight leg raises (10 sets, 10 reps ea), progress fulcrum distally one inch per week</li> <li>Walk (level ground): Build pace gradually. Feel big toe push off to ensure normal gait pattern</li> <li>Start 1 brisk mile, increase to 3 miles. No limping</li> <li>Sissy squats. Stand facing edge of door. Place hands on door knobs on each side of door. Feet shoulder width apart. Half-squat (never past 90°) slowly raise to starting position. Build to 100 reps/day</li> </ul>	
Month 3-4 Return to Normal Activity	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>Full knee range of motion. Refer to surgeon for extension restriction of 5° or if less than 110° flexion</li> <li>Normal gait pattern</li> <li>Progressively increasing functional strengthening program</li> </ul>
	Muscle Reeducation/Strengthening	Continuum	
	Activities for daily living	No device	
		<p><i>Exercise [Active]</i> Continue with previous exercise program</p> <p><b>Weight room:</b> - Leg press: press body weight as many times as possible on nonsurgical side (fatigue). Follow same sequence on surgical side</p> <p>- Squat rack: half squats (not past 70°) at one-half body weight, 10 reps; progress to full body weight as tolerated</p> <p><b>Swim:</b> Continue biking and/or swimming daily. No whip kicks</p> <p><b>Agility:</b> Balance on a teeter-totter board or disc on a half-croquet ball; Figure of 8's (20 to 30 yard diameter circles)</p> <p>- Jog: Backward jog, half speed (level surfaces only). Alternate 100 yds walk/jog &gt; 1 mile. Build to 1 mile by 16 weeks postoperative</p>	
Month 4-6 Months Return to Full Activity	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>Improve quadriceps strength/function</li> <li>Improve endurance</li> <li>Improve coordination/proprioception</li> </ul>
	Muscle Reeducation/Strengthening	Continuum	
	Full activities	No device	
		<p><i>Exercise [Active]</i></p> <p>-Jog (level surface): 15 min./day at 8-10 min./mile pace. Add 5 min./week</p> <p>-Bike: Increased set resistance. 20 min./day. Legs should feel drained</p> <p>-Step-ups (face step): Foot on step and step up. Repeat with rep build up to 100/day. Lower from step twice as long as it takes to raise up</p> <p><b>Agility:</b> -Figure 8's: daily - 5 min. half-speed, tighten circle size down</p> <p>-Shuttle runs daily: 5 min., half-speed, 10-12 reps</p> <p>-Zigzag running: angle across 10-15 yard distance, then back across field to another boundary 10-15 yards apart. Continue 100 yards. Tighten as strength/endurance permits</p> <p><b>Sports on Own:</b> -Basketball - shooting baskets only</p> <p>-Rollerblade - level surface, no hills, no quick stops, cutting, or leg cross-overs (parking lots)</p> <p>-Recreational tennis (no pivoting)</p> <p>-Golf (9 holes, avoid fatigue)</p> <p><b>Postoperative Full Rehabilitation:</b></p> <p>No competitive or pivot sports until cleared by surgeon.</p> <ul style="list-style-type: none"> <li>Quadriceps/thigh circumference should be within 1 cm of non-operative (if normal) side. Weekly strengthening program - independently (2-3x/week):</li> <li>Full speed jog/run: 20-30 min., 6-7 min./mile or best pace</li> <li>Bike: increase resistance, set bike so low leg flexed no more than 10-15 degrees, 20 min.</li> <li>Agility drills: (figure 8's, shuttle runs, turns), teeter-totter</li> <li>Continue quad sets: SLR (300 repetitions/day)</li> <li>Hills/stairs: to build muscle mass and strength. Careful running downhill/steps as it can irritate the knee</li> </ul>	

Note: A progression of exercises can be incorporated into a patient's rehabilitation protocol, but should be first approved by the surgeon. These exercises provided serve only as a guide and will vary according to specific procedures, indications, and patient progress.



# PARAMETER GUIDELINES FOR NMES REHABILITATION

## PAIN

- Total Knee Arthroplasty (TKA)
- Anterior Cruciate Ligament (ACL)

### PAIN CONTROL

#### Indication

Acute/Chronic Pain.

#### Rationale for use

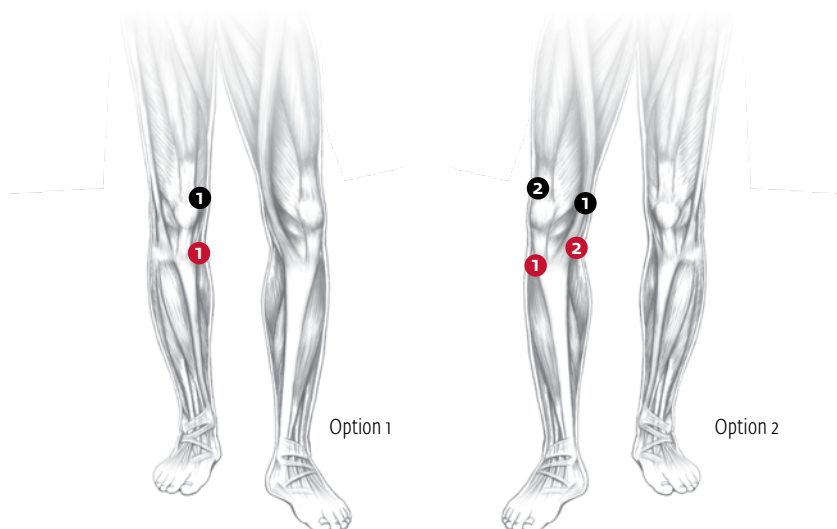
*Acute pain:* The **Gate Control Theory** is indicated to produce immediate analgesic effect for acute pain. The analgesia may decrease postoperative pain and allow for functional exercise that would otherwise have been difficult to perform because of the pain. Analgesia only occurs as long as stimulation is delivered.

*Chronic pain:* The **Opiate Release** is indicated to produce a long-lasting analgesic effect for chronic pain. The analgesia may allow for decreased narcotic pain medication taken and functional exercise that would otherwise have been difficult to perform because of pain. Analgesia may last for several hours after stimulation is delivered.

Continuum Preset	Program TENS - Knee
Pulse Rate	100 hz
Waveform	Symmetrical Biphasic
Pulse Duration (width)	300 usec
Frequency Modulation	Modulated amplitude
Cycling	Continuous
Timer	30-60 min., as needed
Electrode Placement	Place electrode(s) to allow stimulation through the affected area or injury site
Amplitude	Strong but comfortable

#### [Electrode Placement – single channel, dual channel]

Note: These electrode placements serve only as a guide and will vary by indication and individual patient need. Specific electrode placement should be determined by the physician.



## PARAMETER GUIDELINES FOR NMES REHABILITATION

### INFLAMMATION/SWELLING

- Total Knee Arthroplasty (TKA)
- Anterior Cruciate Ligament (ACL)

#### EDEMA

##### Indication

Increased localized circulation.

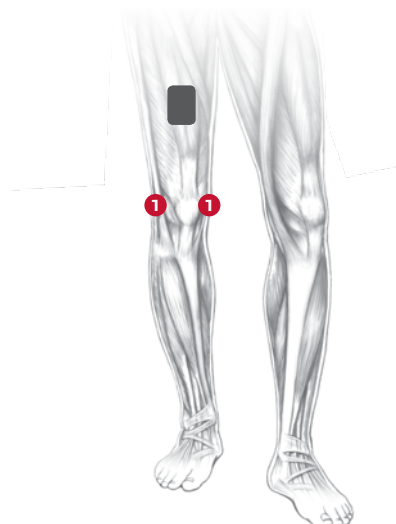
##### Rationale for use

Increase localized circulation to facilitate reabsorption of edema to reduce pain.

Continuum Preset	Edema Program (Chronic) (negative polarity): chronic (more than 72 hours post-surgery) Edema Program (Acute) (positive polarity): inflammation/acute (first 72 hours post-surgery)
Waveform	Pulsed DC
Cycling	Continuous
Timer	30-60 min., 3-4x/day after 24-72 of injury
Electrode Placement	Edema (Chronic) – chronic phase after 24 -72 of injury Place electrode(s) to allow stimulation through the affected area or injury site. Red lead bifurcated (use bifurcated lead) with 2 electrodes on either side of the knee joint (do not place directly on incision) and dispersive/ground on the low back or quadriceps. Can use larger electrode on quadriceps. The red electrode wire is negative. Edema (Acute) – acute phase of injury same as above 48-72 hours post injury. Electrode placement is the same as above. The Red electrode wire is positive.
Amplitude	Sensory input, strong but comfortable

#### [Electrode Placement – single channel, dual channel]

Note: These electrode placements serve only as a guide and will vary by indication and individual patient need. Specific electrode placement should be determined by the physician.



# PARAMETER GUIDELINES FOR NMES REHABILITATION

## MUSCLE REEDUCATION/MUSCLE STRENGTHENING

- Total Knee Arthroplasty (TKA)
- Anterior Cruciate Ligament (ACL)

### MUSCLE REEDUCATION / MUSCLE STRENGTHENING

**Indication:**

Muscle reeducation.

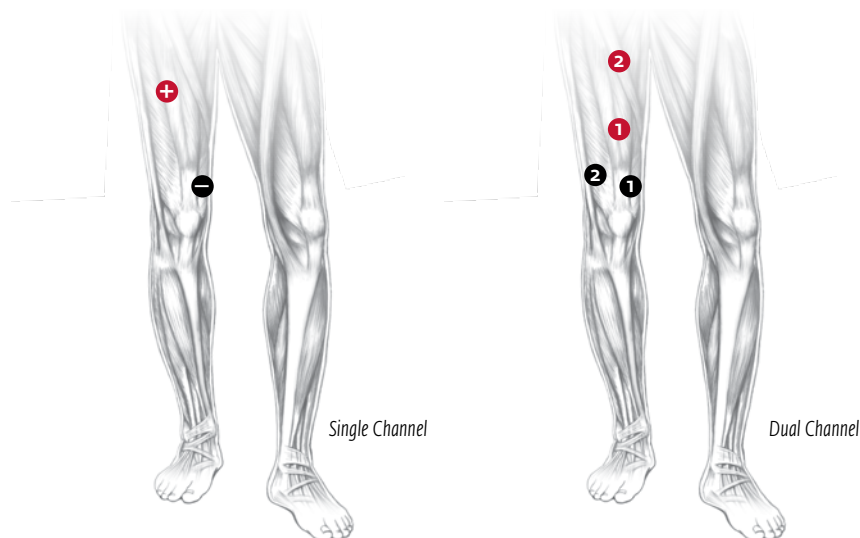
**Rationale for use**

The electrical stimulation is indicated to produce muscle contraction in atrophied or deconditioned muscle resulting from injury or surgery. The muscle reeducation initiates muscle contraction to develop muscle power and regain speed lost as a result of inactivity or surgery.

<b>Continuum Preset</b>	<b>NMES Program (Large Muscle, Atrophy)</b>
<b>Pulse Rate</b>	50 hz
<b>Pulse Duration (width)</b>	300 usec
<b>Waveform</b>	Symmetrical
<b>Cycling Type</b>	Lag. Ch 2 lags Ch 1 by 3 seconds. Ch 1 On time 12 seconds, Off time 30 seconds Ch 2 On time 9 seconds, Off time 30 seconds
<b>Timer</b>	Reeducation: 20 min./day; 2-3x/day Strengthening: 10-15 min./day to goal of 30-60 min./day (broken into a few sessions as needed)
<b>Electrode Placement</b>	<i>Single Channel</i> Negative electrode placed over motor point of VMO. Positive electrode placed over the midpoint of quadriceps muscle belly <i>Dual Channel</i> Channel 1: Negative electrode placed over motor point of the VMO. Positive electrode placed over midpoint of quadriceps muscle belly Channel 2: Negative electrode placed over motor point of vastus lateralis. Positive electrode placed over most proximal point of quadriceps
<b>Amplitude</b>	Muscle contraction

**[Electrode Placement – single channel, dual channel]**

Note: These electrode placements serve only as a guide and will vary by indication and individual patient need. Specific electrode placement should be determined by the physician.



# TREATMENT PLAN GUIDELINES

## • Orthopedic Shoulder/Rotator Cuff

The **overall goals** of the pre and post injury/surgical orthopedic shoulder/rotator cuff rehabilitation are to:

- Control pain and inflammation
- Regain normal upper extremity strength and endurance
- Regain normal shoulder range of motion
- Achieve the level of function based on the orthopedic and patient goals

SHOULDER

	Problem	Modality	Goals
Pre Surgery	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Promote healing of tissue</li> <li>• Control pain and inflammation</li> <li>• Minimize disuse atrophy</li> </ul>
	Inflammation/Swelling	Cryotherapy	
	Muscle Reeducation/Strengthening	Continuum	
Week 1-2 Immediate Post-Op	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Promote healing of tissue</li> <li>• Control pain and inflammation</li> <li>• Gradual increase in ROM</li> <li>• Enhance upper extremity strength</li> </ul>
	Inflammation/Swelling	Cryotherapy/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
	Ambulation	Walker/crutches  <i>Exercise [Active]</i> <ul style="list-style-type: none"> <li>• Wand exercises</li> <li>• Rope/Pulley</li> <li>• Posterior capsule stretch</li> <li>• Pendulum exercises</li> <li>• Manual stretching and mobilization of post capsule</li> </ul>	
Week 2-6 Early Movement	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Achieve full ROM</li> <li>• Progress upper extremity strength and endurance</li> <li>• Enhance neuromuscular control</li> </ul>
	Inflammation/Swelling	Cryotherapy/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
		<i>Exercise [Active]</i> <ul style="list-style-type: none"> <li>• Posterior capsule stretch</li> <li>• Joint mobilization and manual stretching</li> <li>• Wand exercises</li> <li>• Rope/Pulley</li> <li>• Strength exercise in all ROM</li> </ul>	
Week 6-12 Intermediate	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Full painless ROM</li> <li>• Maximize upper extremity strength and endurance</li> <li>• Full painless ROM</li> </ul>
	Inflammation/Swelling	Cryotherapy/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
		<i>Exercise [Active]</i> <ul style="list-style-type: none"> <li>• Continue ROM exercises</li> <li>• Posterior capsule stretch</li> <li>• Joint mobilization and manual stretching</li> <li>• Continue strengthening exercises in all ROM</li> <li>• Progress functional exercises</li> </ul>	
Week 12-24	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Maximize upper extremity strength and endurance</li> <li>• Maximize neuromuscular control</li> <li>• Return to functional activities</li> </ul>
	Inflammation/Swelling	Cryotherapy/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
		<i>Exercise [Active]</i> <ul style="list-style-type: none"> <li>• Continue all ROM activities from previous phases</li> <li>• Continue strengthening exercises in all ROM</li> <li>• Continue total body work out for overall strength</li> </ul>	

Note: A progression of exercises can be incorporated into a patient's rehabilitation protocol, but should be first approved by the surgeon. These exercises provided serve only as a guide and will vary according to specific procedures, indications, and patient progress.

# TREATMENT PLAN GUIDELINES

## • Total Shoulder Arthroplasty

The **overall goals** of the pre and post injury/surgical total shoulder rehabilitation are to:

- Control pain and inflammation
- Regain normal upper extremity strength and endurance
- Regain normal shoulder range of motion
- Achieve the level of function based on the orthopedic and patient goals

	Problem	Modality	Goals
Pre Surgery	Pain	Continuum (TENS)	Increase local circulation to reduce pain and inflammation
	Inflammation/Swelling	Cryotherapy	
Week 1-6 Immediate Post-Op	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Promote healing of subscapularis +/- rotator cuff if repaired</li> <li>• Control pain and inflammation</li> <li>• Restore nearly full ROM</li> <li>• Delay muscle atrophy</li> </ul>
	Inflammation/Swelling	Cryotherapy/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
	Ambulation	Brace/Sling	
		<p><i>Exercise [Active]</i></p> <ul style="list-style-type: none"> <li>• 1-6 ROM</li> <li>• No active shoulder motion first 3 weeks</li> <li>• Begin active flexion, extension, abduction, external rotation week 3-4</li> <li>• Pendulum exercises</li> <li>• Elbow, wrist, hand ROM</li> <li>• Gentle posterior capsular stretching</li> <li>• Passive ROM and AAROM</li> </ul> <p><i>Strength</i></p> <ul style="list-style-type: none"> <li>• Grip strengthening with putty or ball</li> </ul> <p><i>Brace</i></p> <ul style="list-style-type: none"> <li>• Shoulder brace 7-10 days as instructed. Remove to perform exercises</li> </ul>	
Week 6-12 Early Movement	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Reach goal ROM without pain</li> <li>• Initiate strengthening of rotator cuff while allowing healing</li> <li>• Initiate scapular stabilization</li> </ul>
	Inflammation/Swelling	Cryotherapy/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
		<p><i>Exercise [Active]</i></p> <ul style="list-style-type: none"> <li>• 6-12 ROM</li> <li>• Increase active ROM in all planes</li> <li>• Grade I-II joint mobilizations</li> <li>• Pendulum exercises</li> <li>• Elbow, wrist, hand range of motion</li> <li>• Rope/Pulley (flex/abd/scaption)</li> <li>• Posterior capsular stretching</li> <li>• Initiate gentle stretching</li> </ul> <p><i>Strength</i></p> <ul style="list-style-type: none"> <li>• Limit cuff strengthening to 3x/week</li> <li>• Continue grip strengthening as needed</li> </ul>	

SHOULDER

Total Shoulder Arthroplasty Table (cont'd)

	Problem	Modality	Goals
<b>SHOULDER</b>  Week 12-24 Intermediate	Pain	Continuum (TENS)	<ul style="list-style-type: none"> <li>• Gradual return to functional activities</li> <li>• Reach full ROM</li> <li>• Improve upper extremity strength, power, and endurance</li> <li>• Enhance neuromuscular control and shoulder proprioception</li> <li>• Home program with daily ROM exercises and strengthening 3x/week</li> </ul>
	Inflammation/Swelling	Cryotherapy/Continuum	
	Muscle Reeducation/Strengthening	Continuum	
		Exercise [Active] <ul style="list-style-type: none"> <li>• 12-24 ROM</li> <li>• Continue ROM from previous phases</li> <li>• Posterior capsule stretching</li> <li>• Initiate Grade II-IV joint mobs as needed</li> </ul> Strength <ul style="list-style-type: none"> <li>• Limit to 3x/week</li> <li>• Continue with strengthening from previous phases increasing resistance and repetition</li> <li>• Add internal rotation and extension strengthening</li> <li>• Continue scapular stabilizer strengthening</li> <li>• Deltoid strengthening</li> <li>• Plyometric exercises</li> </ul>	

Note: A progression of exercises can be incorporated into a patient's rehabilitation protocol, but should be first approved by the surgeon. These exercises provided serve only as a guide and will vary according to specific procedures, indications, and patient progress.

# PARAMETER GUIDELINES FOR NMES REHABILITATION

## PAIN

- Orthopedic Shoulder/Rotator Cuff
- Total Shoulder Arthroplasty

### Indication

Acute/Chronic Pain.

### Rationale for use

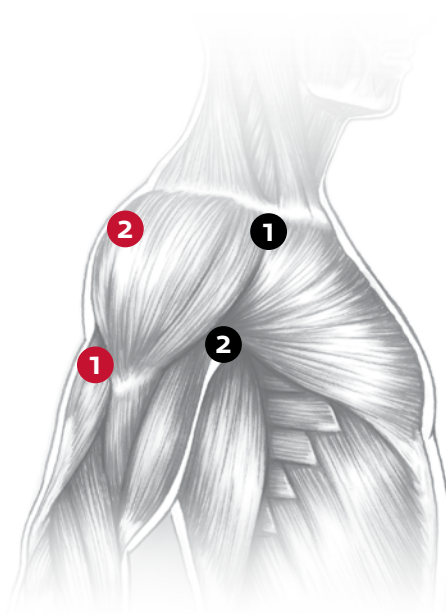
*Acute pain:* The **Gate Control Theory** is indicated to produce immediate analgesic effect for acute pain. The analgesia may decrease postoperative pain and allow for functional exercise that would otherwise have been difficult to perform because of the pain. Analgesia only occurs as long as stimulation is delivered.

*Chronic pain:* The **Opiate Release** is indicated to produce a long-lasting analgesic effect for chronic pain. The analgesia may allow for decreased narcotic pain medication taken and functional exercise that would otherwise have been difficult to perform because of pain. Analgesia may last for several hours after stimulation is delivered.

Continuum Preset	Program TENS - Shoulder (TENS)
Pulse Rate	100 hz
Pulse Duration (width)	300 usec
Waveform	Symmetrical Biphasic
Frequency Modulation	SMP
Cycling	Continuous
Timer	30-60 min., as needed, 3-4x/day
Electrode Placement	Surrounding the painful site
Amplitude	Strong but comfortable

### [Electrode Placement – single channel, dual channel]

Note: These electrode placements serve only as a guide and will vary by indication and individual patient need. Specific electrode placement should be determined by the physician.



# PARAMETER GUIDELINES FOR NMES REHABILITATION

## INFLAMATION/SWELLING

- Orthopedic Shoulder/Rotator Cuff
- Total Shoulder Arthroplasty

### EDEMA

#### Indication

Increase localized circulation.

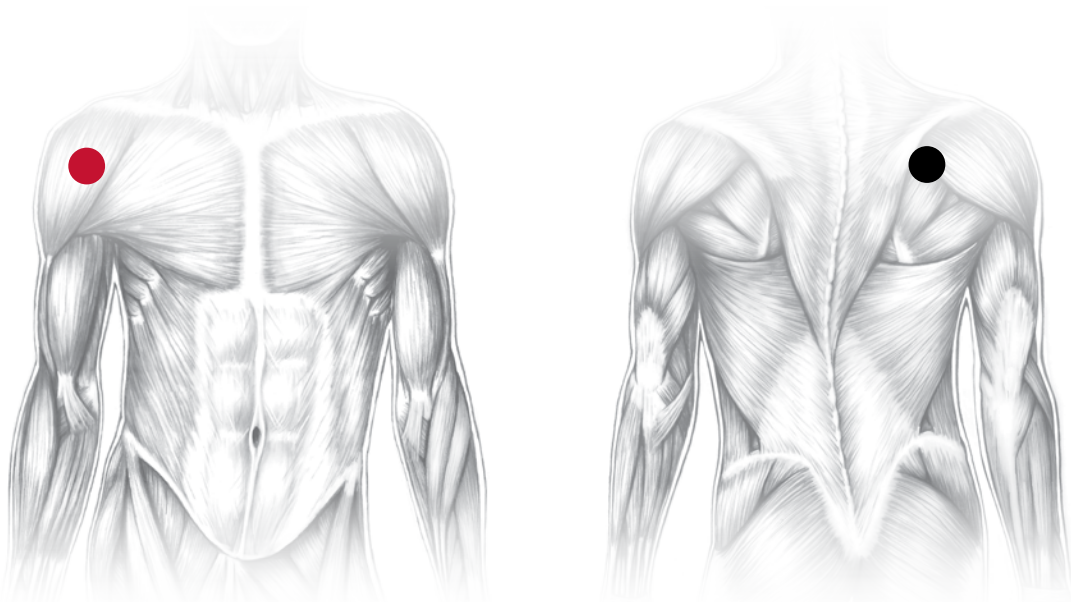
#### Rationale for use

Increase localized circulation to facilitate re-absorption of acute or chronic edema to reduce pain and inflammation.

Continuum Preset	Edema Program (Chronic) (negative polarity): chronic (more than 72 hours post-surgery) Edema Program (Acute) (positive polarity): acute (first 72 hours post-surgery)
Waveform	Pulsed DC
Cycling	Continuous
Timer	30-60 min., 3-4x/day
Electrode Placement	Option 1: Orthopedic Shoulder/Rotator Cuff: Anterior and posterior of shoulder joint Option 2: Total Shoulder Arthroplasty: Up to four electrodes (two bifurcations) Not Shown
Amplitude	Sensory input, strong but comfortable

#### [Electrode Placement – single channel, dual channel]

Note: These electrode placements serve only as a guide and will vary by indication and individual patient need. Specific electrode placement should be determined by the physician.





# PARAMETER GUIDELINES FOR NMES REHABILITATION

## MUSCLE REEDUCATION/MUSCLE STRENGTHENING

### • Orthopedic Shoulder/Rotator Cuff

#### MUSCLE REEDUCATION / MUSCLE STRENGTHENING

##### Indication

Muscle reeducation.

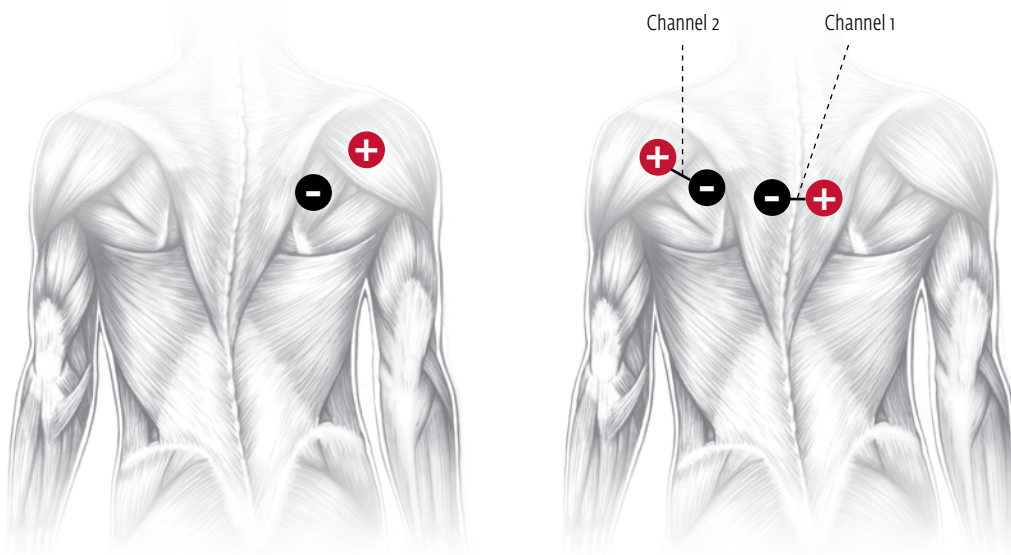
##### Rationale for use

The electrical stimulation is indicated to produce muscle contraction in atrophied or deconditioned muscle resulting from injury or surgery. The muscle reeducation initiates muscle contraction to develop muscle power and regain speed lost as a result of inactivity or surgery.

Continuum Preset	NMES Program (Small Muscle, Atrophy) Rhomboids/mid trap add Channel 1
Pulse Rate	35 hz
Pulse Duration (width)	300 usec
Waveform	Asymmetrical
Cycling	Simultaneous. On time 10 seconds / Off 30 seconds
Timer	Reeducation: 20 min./day; 2-3x/day Strengthening: 10-15 min./day to goal of 30-60 min./day (broken into a few sessions as needed)
Electrode Placement	Channel 1: Electrodes placed bilaterally on rhomboid and mid trapezius. Negative electrode should be placed on involved side. Channel 2: Place negative electrode over infraspinatus motor point. Place positive electrode on myotendinous aspect of infraspinatus and teres muscle group. Note: Avoid placement on upper trapezius to minimize stimulation and reinforcement of shoulder girdle elevation substitution pattern.
Amplitude	Muscle contraction

##### [Electrode Placement – single channel, dual channel]

Note: These electrode placements serve only as a guide and will vary by indication and individual patient need. Specific electrode placement should be determined by the physician.



# PARAMETER GUIDELINES FOR NMES REHABILITATION

## MUSCLE REEDUCATION/MUSCLE STRENGTHENING

### • Total Shoulder Arthroplasty

#### MUSCLE REEDUCATION / MUSCLE STRENGTHENING

##### Indication

Range of Motion (ROM) and disuse atrophy.

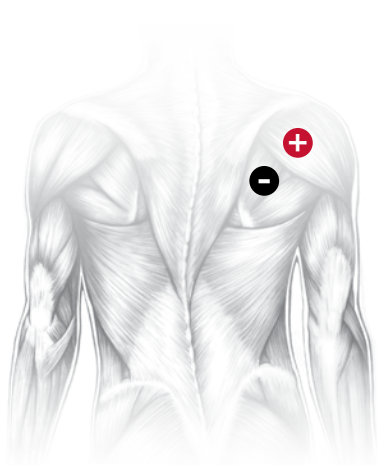
##### Rationale for use

The electrical stimulation is indicated for ROM and disuse atrophy arising from traumatic injury or surgery. The muscle reeducation initiates muscle contraction to develop muscle power and speed lost as a result of inactivity or surgery.

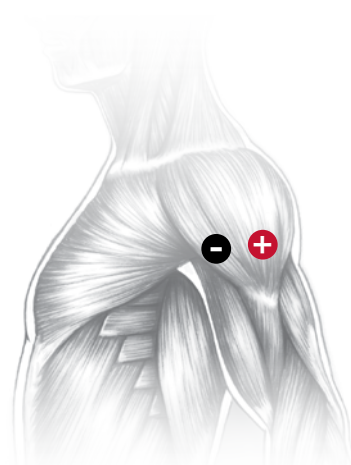
Continuum Preset	Program NMES (Small Muscle Atrophy)
Pulse Rate	35 hz
Pulse Duration (width)	300 usec
Waveform	Asymmetrical
Cycling	On time 10 seconds / Off 30 seconds
Timer	Reeducation: 20 min./day; 2-3x/day Strengthening: 30-60 min./day (broken into a few sessions if needed)
Electrode Placement	Option 1: Place negative electrode over infraspinatus motor point. Place positive electrode on myotendinous aspect of infraspinatus and teres muscle group. Note: Avoid placement on upper trapezius to minimize stimulation and reinforcement of shoulder girdle elevation substitution pattern. Option 2: Both electrodes are placed on the proximal third of the anterior arm, below the acromium. At least one inch of space should be left between the electrodes. If an asymmetric biphasic waveform is used, electrode polarity should be determined according to program goal of either increased flexion or abduction.
Amplitude	Muscle contraction

##### [Electrode Placement]

Note: These electrode placements serve only as a guide and will vary by indication and individual patient need. Specific electrode placement should be determined by the physician.



Option 1



Option 2

# QUICK START GUIDE

## Basic Setup – New Program

1. Depress ON/OFF button.
2. Select desired program (NMES, TENS, Edema) from Home menu using soft key buttons
3. Use the soft key buttons to select programming options
4. When setting parameters, use the left soft key buttons to toggle parameters and the right soft key buttons to adjust the parameter settings.
5. Press "OK" when parameter settings are complete to move to the treatment screen.
6. Use the left and right soft key buttons to adjust the channel intensity up and down.

## Lock Program(s)

*Note: Lock up to 3 programs. 1 each for TENS, NMES, Edema.*

1. Pick a program
2. Set parameters
3. Select "CONFIG" from the home screen menu.
4. Select "Set"
5. Use the left soft key buttons to scroll to the program you want to lock (NMES, TENS or Edema)
6. Use the right soft key buttons to toggle lock setting. An image of a closed padlock will appear when the program is locked, and an unlocked padlock will appear when the program is unlocked.

To remove the program from the Home menu, set locking to "NA".

7. Press "OK" and return to the Home screen.

## Provide patient with home-use instructions:

1. Turn ON. (defaults to last open program screen)
2. Select program (if more than one available).
3. Adjust amplitude.

*(Note: device will turn each program off according to timer selections made by clinician and the device still needs to be powered off after completion of the treatment).*

## Unlock Program

1. Select "CONFIG" from the Home menu
2. Select "SET"
3. Use the left soft key buttons to select the program you wish to unlock
4. Use the right soft key buttons to set the program to unlock (image of an open padlock will appear)

**For full instructions for use, indications, contraindications, warnings, precautions and adverse reactions, refer to the Continuum Instruction Manual.**



## QUICK START GUIDE

### Basic Setup Programs (NMES Pre-Programmed Regimens (PPR's))

Preset Programs	Program Description	Rate	Suggested Uses
<b>Large Muscle Atrophy</b>	"Overlapping: Ch1 on first, Ch2 follows after 2 sec delay. Timing: Ch1 3/21/2; Ch 2: 2/9/1"	50	2 Ch sequenced contraction. • Joint protection • ACL repair (hamstring/quad) • TKA rehabilitation • Quad timing (VL/VMO)"
<b>Large Muscle Spasm</b>	Spasm treatment Timing: 2/10/2. Simultaneous.	80	Relieve muscle spasm
<b>Large Muscle Trigger Point</b>	Timing: 2/10/2. Simultaneous.	50	Reduction of trigger points
<b>Small Muscle Atrophy</b>	Timing: 2/10/2 on both channels. Simultaneous.	35	General stimulation program.
<b>Small Muscle Spasm</b>	Spasm treatment Timing: 2/10/2. Simultaneous.	80	Relieve muscle spasm
<b>Small Muscle Trigger Point</b>	Timing: 3/10/2. Simultaneous.	50	Reduction of trigger points
<b>TENS Knee</b>	TENS - Modulated amplitude	100	Pain control in knee
<b>TENS Shoulder</b>	TENS - SMP	100	Pain control in shoulder
<b>TENS Back</b>	TENS - Modulated amplitude	100	Pain control for back
<b>TENS Hand</b>	TENS - SMP	100	Pain control for wrist/hand
<b>TENS Foot</b>	TENS - SMP	100	Pain control for ankle/foot
<b>Edema Acute</b>	Pulsed direct current (net positive)	60	Increase local blood circulation within 48 hours of surgery/injury
<b>Edema Chronic</b>	Pulsed direct current (net negative)	60	Increase local blood circulation past 48 hours of surgery/injury

For full instructions for use, indications, contraindications, warnings, precautions and adverse reactions, refer to the Continuum Instruction Manual.

## CONTRAINDICATIONS

Continuum should not be used for the following situations or patients with:

- Demand type implanted pacemaker or defibrillator
- Any transcerebral electrode placement
- Any electrode that applies current to the carotid sinus region

Specific to use of Continuum as a TENS device:

- Whenever pain syndromes are undiagnosed, until etiology is established.

Specific to use of Continuum as a FES device:

- Assisting paraplegic patients into the standing position.

**For full instructions for use, indications, contraindications, warnings, precautions and adverse reactions, refer to the Continuum Instruction Manual.**

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TENS administered with a strong, subnoxious intensity at an adequate frequency in the wound area, can significantly reduce analgesic consumption for postoperative pain. *Eur J Pain*. 2003;7(2):181–8.

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A graphic consisting of a semi-circle of grey dots of varying sizes, arranged in a pattern that suggests motion or a signal. The text "MUSCLE THROUGH IT" is overlaid on the right side of this graphic.

**MUSCLE  
THROUGH IT**

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