

Benefits of Exercise and Rehabilitation

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Disclaimer

This presentation is for informational purposes only and should not be taken as customized medical advice.

Specific exercise recommendations and precautions should be discussed with your healthcare provider as indicated.

Disclosures

None

Objectives

- Recognize benefits of therapeutic exercise
- Discuss precautions
- Review exercise intensity targets
- Discuss benefits of rehabilitation

Cancer Prevention

Percentages indicate relative risk reduction

Bladder (15%)

Breast (12-21%)

Colon (19%)

Endometrial (20%)

Esophageal (21%)

Kidney (12%)

Stomach (19%)

Increased Survival

Breast (48% reduction in risk for all cause mortality)

Colon (42% reduction in risk for all cause mortality)

Prostate (37-49% reduction in risk for all cause mortality)

McTiernan A, Friedenreich CM, Katzmarzyk PT, et al.
Physical Activity in Cancer Prevention and Survival: A
Systematic Review. *Med Sci Sports Exerc.*
2019;51(6):1252-1261.

Effects of Exercise on Health-Related Outcomes in Those with Cancer

What can exercise do?

• Prevention of 7 common cancers*

Dose: 2018 Physical Activity Guidelines for Americans: 150-300 min/week moderate or 75-150 min/week vigorous aerobic exercise









• Survival of 3 common cancers**

Dose: Exact dose of physical activity needed to reduce cancer-specific or all-cause mortality is not yet known; Overall more activity appears to lead to better risk reduction

*bladder, breast, colon, endometrial, esophageal, kidney and stomach cancers

**breast, colon and prostate cancers

Overall, avoid inactivity, and to improve general health, aim to achieve the current physical activity guidelines for health (150 min/week aerobic exercise and 2x/week strength training).

Outcome	Aerobic Only	Resistance Only	Combination (Aerobic + Resistance)
Strong Evidence	Dose	Dose	Dose
 Cancer-related fatigue	3x/week for 30 min per session of moderate intensity	2x/week of 2 sets of 12-15 reps for major muscle groups at moderate intensity	3x/week for 30 min per session of moderate aerobic exercise, plus 2x/week of resistance training 2 sets of 12-15 reps for major muscle groups at moderate intensity
 Health-related quality of life	2-3x/week for 30-60 min per session of moderate to vigorous	2x/week of 2 sets of 8-15 reps for major muscle groups at a moderate to vigorous intensity	2-3x/week for 20-30 min per session of moderate aerobic exercise plus 2x/week of resistance training 2 sets of 8-15 reps for major muscle groups at moderate to vigorous intensity
 Physical Function	3x/week for 30-60 min per session of moderate to vigorous	2-3x/week of 2 sets of 8-12 reps for major muscle groups at moderate to vigorous intensity	3x/week for 20-40 min per session of moderate to vigorous aerobic exercise, plus 2-3x/week of resistance training 2 sets of 8-12 reps for major muscle group at moderate to vigorous intensity
 Anxiety	3x/week for 30-60 min per session of moderate to vigorous	Insufficient evidence	2-3x/week for 20-40 min of moderate to vigorous aerobic exercise plus 2x/week of resistance training of 2 sets, 8-12 reps for major muscle groups at moderate to vigorous intensity
 Depression	3x/week for 30-60 min per session of moderate to vigorous	Insufficient evidence	2-3x/week for 20-40 min of moderate to vigorous aerobic exercise plus 2x/week of resistance training of 2 sets, 8-12 reps for major muscle groups at moderate to vigorous intensity
 Lymphedema	Insufficient evidence	2-3x/week of progressive, supervised, program for major muscle groups does not exacerbate lymphedema	Insufficient evidence
Moderate Evidence			
 Bone health	Insufficient evidence	2-3x/week of moderate to vigorous resistance training plus high impact training (sufficient to generate ground reaction force of 3-4 time body weight) for at least 12 months	Insufficient evidence
 Sleep	3-4x/week for 30-40 min per session of moderate intensity	Insufficient evidence	Insufficient evidence






Citation: bit.ly/cancer_exercise_guidelines

Moderate intensity (40%-59% heart rate reserve or VO₂R) to vigorous intensity (60%-89% heart rate reserve or VO₂R) is recommended.

Exercise
is Medicine

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of SPORTS MEDICINE

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Exercise Guidelines for Cancer Survivors: Consensus Statement from International Multidisciplinary Roundtable

Moderate Evidence



Bone health

Insufficient evidence

2-3x/week of moderate to vigorous resistance training plus high impact training (sufficient to generate ground reaction force of **3-4** time body weight) for at least **12** months

Insufficient evidence



Sleep

3-4x/week for **30-40** min per session of moderate intensity

Insufficient evidence

Insufficient evidence

Exercise Guidelines for Cancer Survivors: Consensus Statement from International Multidisciplinary Roundtable

ACSM 2019 Exercise Recommendations

150 minutes per week of moderate intensity aerobic exercise

2-3 days per week of strength training targeting major muscle groups

NCCN 2021 Guidelines for Physical Activity

- Activity/exercise recommendations should be tailored to individual abilities and preferences
- Aim for **150** of moderate intensity or **75 minutes** of vigorous intensity activity throughout the week
- Resistance training of major muscle groups **2-3x** per week
- Stretching of major muscle groups **2x** per week
- Avoid prolonged sedentary behavior

NCCN Guidelines: Initial Prescription

Frequency: 1-3 days per week

Intensity: Light to moderate

Type: Aerobic activity and/or resistance training

Initial time goal based on baseline level of fitness and exercise tolerance

ACSM 2019 Guidelines: Exercise Testing

“...a comprehensive physical fitness assessment before starting exercise may create an unnecessary barrier...”

“...no assessments are required to start low-intensity aerobic training (i.e, walking or cycling), resistance training with gradual progression, or a flexibility program in most survivors.”

“Medical clearance may still be indicated as previously described depending on exercise and health history...”

“...we have referred to the National Comprehensive Cancer Network (NCCN) Survivorship Guidelines to frame recommendations...”

NCCN Guidelines: Risk Assessment

Peripheral Neuropathy
Arthritis
Musculoskeletal Issues
Poor Bone Health
Lymphedema



Recommend pre-exercise medical evaluation
Modify recommendations based on assessments
Consider referral to trained personnel

History of lung surgery
History of major abdominal surgery
Ostomy
Heart Failure/Coronary Artery Disease/COPD
Ataxia
Severe Fatigue
Severe Nutritional Deficiencies
Worsening/Changing Physical Condition

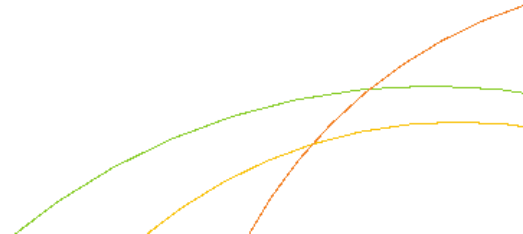


Pre-exercise medical evaluation
Clearance by physician before exercise
Referral to trained personnel

A Note About COVID-19

The CDC recognizes that having cancer increases the risk of severe illness from COVID-19.

Recommend use of masks, social distancing, and vaccination if able.



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Exercise is Medicine

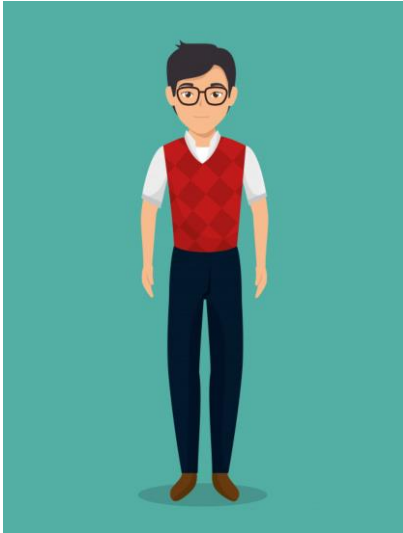
AMERICAN COLLEGE of SPORTS MEDICINE

Moderate intensity (40%-59% heart rate reserve or VO_2R) to vigorous intensity (60%-89% heart rate reserve or VO_2R) is recommended.

Age	Target HR Zone 50-85%	Average Maximum Heart Rate, 100%
20 years	100-170 beats per minute (bpm)	200 bpm
30 years	95-162 bpm	190 bpm
35 years	93-157 bpm	185 bpm
40 years	90-153 bpm	180 bpm
45 years	88-149 bpm	175 bpm
50 years	85-145 bpm	170 bpm
55 years	83-140 bpm	165 bpm
60 years	80-136 bpm	160 bpm
65 years	78-132 bpm	155 bpm
70 years	75-128 bpm	150 bpm

Calculating Heart Rate by Age

$$HR_{Max} = 220 - Age$$



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60 years	80-136 bpm	160 bpm
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70 years	75-128 bpm	150 bpm

Calculating Target Heart Rates



Heart Rate Reserve (HRR)

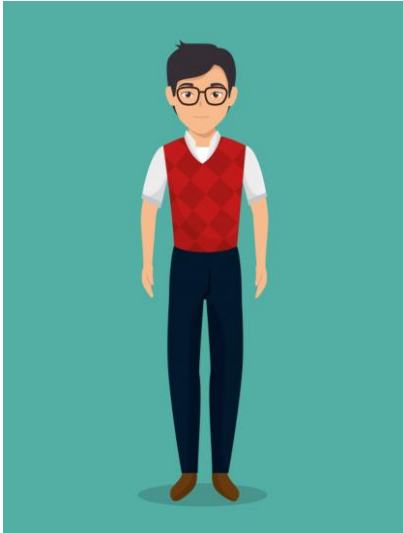
$$\text{HRR} = \text{HR}_{\text{Max}} - \text{HR}_{\text{Rest}}$$

$$\text{HR}_{\text{Max}} = 220 - \text{Age}$$

Calculating Target Heart Rate

Age: 40

Resting Heart Rate: 70



$$HR_{\text{Max}} = 220 - \text{Age}$$

$$220 - 40 = 180$$

$$HR_{\text{Max}} = 180$$

$$HRR = HR_{\text{Max}} - HR_{\text{Rest}}$$

$$180 - 70 = 110$$

$$HRR = 110$$

Calculating Target Heart Rate: Karvonen Formula

$$HR_{\text{Rest}} = 70$$

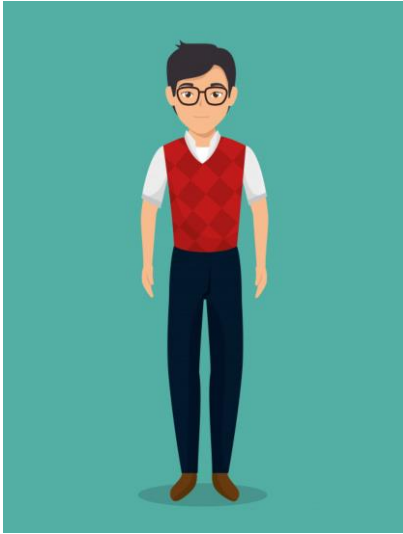
$$\text{Heart Rate Reserve} = 110$$

Moderate Intensity

$$\begin{aligned} \text{-Target Lower Limit: } & (0.40 \times \text{HRR}) + HR_{\text{Rest}} \\ & - (0.40 \times 110) + 70 = 114 \end{aligned}$$

$$\begin{aligned} \text{-Target Higher Limit: } & (0.59 \times \text{HRR}) + HR_{\text{Rest}} \\ & - (0.59 \times 110) + 70 = 134.9 \end{aligned}$$

Target Heart Rate for moderate intensity exercise should be between 114 and 135



VO2 Reserve

$$\text{VO2 Reserve} = \text{VO2}_{\text{Max}} - \text{VO2}_{\text{Rest}}$$

$$\text{VO2}_{\text{Rest}} \sim 3.5 \text{ mL/min/kg}$$



Calculating VO2 Targets

Moderate Intensity

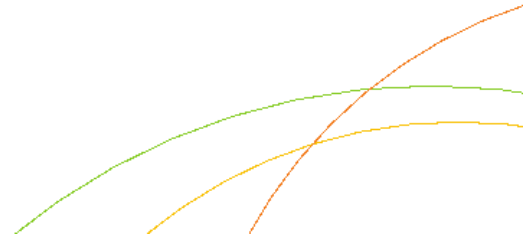
-Target Lower Limit: $(0.40 \times \text{VO2R}) + \text{VO2}_{\text{Rest}}$

-Target Higher Limit: $(0.59 \times \text{VO2R}) + \text{VO2}_{\text{Rest}}$

Vigorous Intensity

-Target Lower Limit: $(0.60 \times \text{VO2R}) + \text{VO2}_{\text{Rest}}$

-Target Higher Limit: $(0.89 \times \text{VO2R}) + \text{VO2}_{\text{Rest}}$



How you might describe your exertion	Borg rating of your exertion	Examples (for most adults <65 years old)
None	6	Reading a book, watching television
Very, very light	7 to 8	Tying shoes
Very light	9 to 10	Chores like folding clothes that seem to take little effort
Fairly light	11 to 12	Walking through the grocery store or other activities that require some effort but not enough to speed up your breathing
Somewhat hard	13 to 14	Brisk walking or other activities that require moderate effort and speed your heart rate and breathing but don't make you out of breath
Hard	15 to 16	Bicycling, swimming, or other activities that take vigorous effort and get the heart pounding and make breathing very fast
Very hard	17 to 18	The highest level of activity you can sustain
Very, very hard	19 to 20	A finishing kick in a race or other burst of activity that you can't maintain for long

Light Exercise	Moderate Exercise	Vigorous Exercise
Leisurely biking (≤ 5 MPH) Light housework (sweeping) Bowling Playing catch Slow walking Child care Tai Chi Yoga	Ballroom dancing Biking on level ground Gardening Baseball/softball Brisk walking Using a manual wheelchair Water aerobics Pilates Yoga	Fast dancing Biking faster than 10 MPH Heavy gardening Hiking uphill Martial arts Race walking Jogging/running Swimming Stair climbing High-intensity yoga
No noticeable change in breathing	Can talk but can't sing	Can say a few words without stopping to catch a breath

Be Active



"image: Freepik.com". These images were taken from Freepik.com

Benefits of Rehabilitation

Amputation

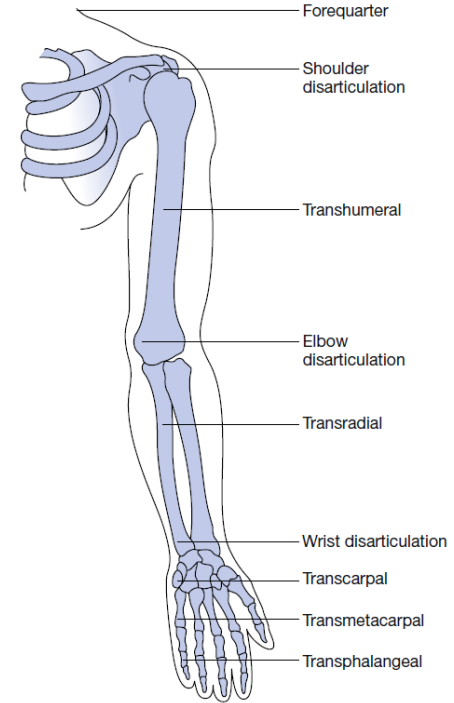
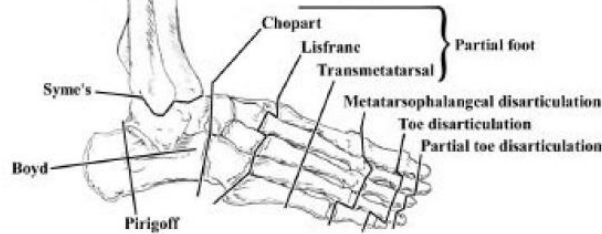
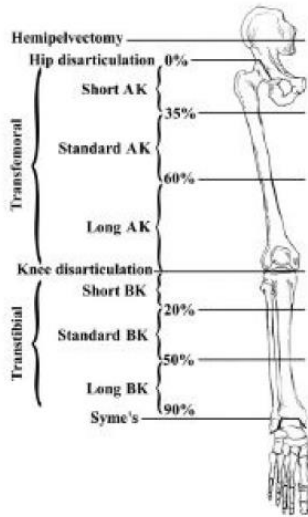


FIGURE 12-1 Types of upper extremity amputations.

Physical Medicine and Rehabilitation Board Review (3rd ed.),
Cuccurullo 2015

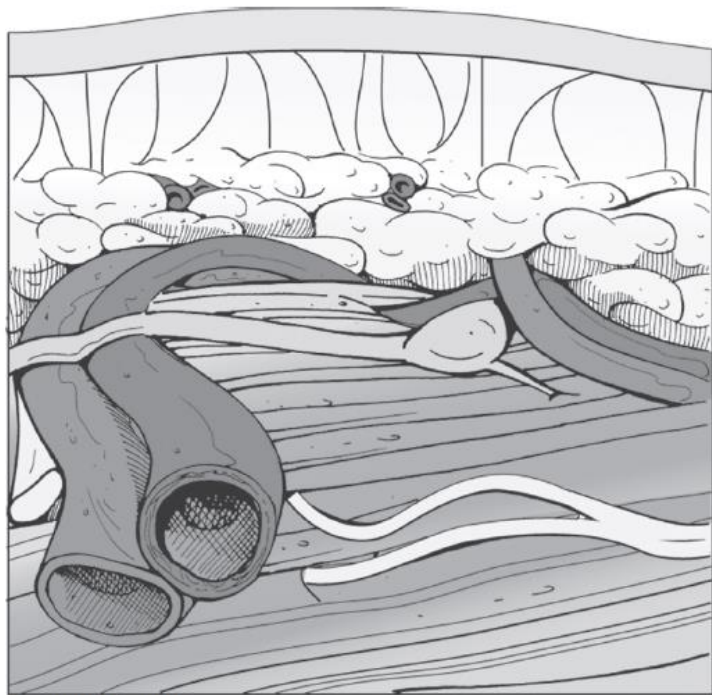
Physical Medicine and Rehabilitation (4th ed.)
Braddom 2011

Radiation Fibrosis

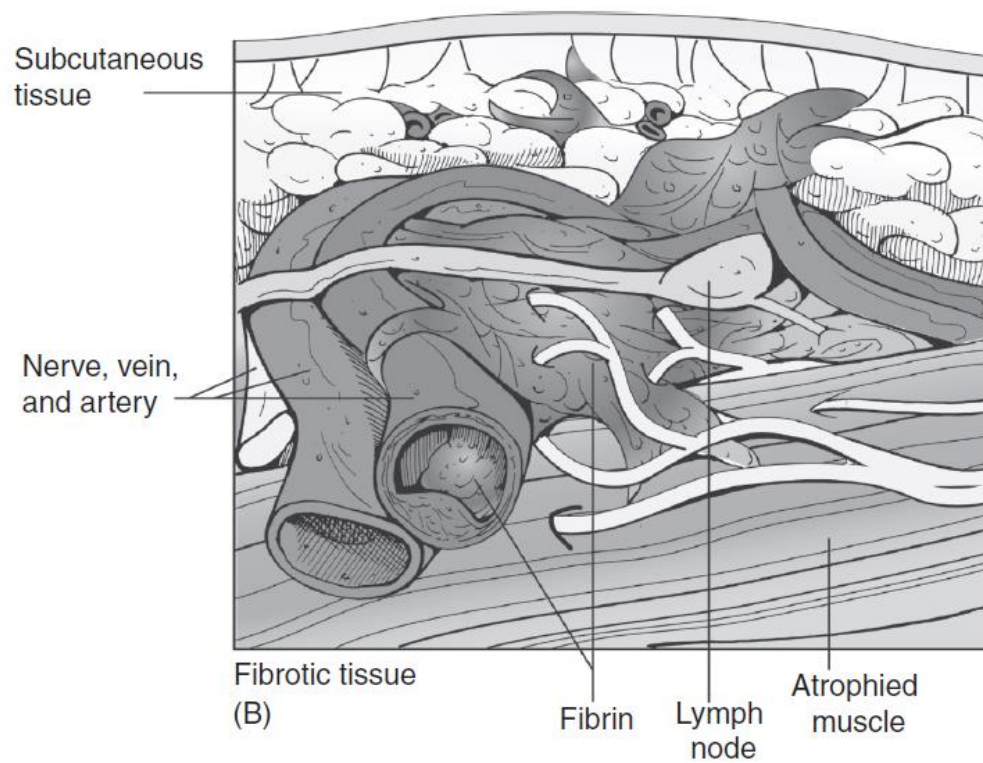
Radiation Fibrosis: The progressive tissue hardening and dysfunction that occurs in response to radiation

Radiation Fibrosis Syndrome: The symptoms that occurs due to this hardening

- Tightness
- Loss of range of motion
- Swelling
- Muscle loss, numbness



Normal tissue
(A)



Fibrotic tissue
(B)

Fibrin

Lymph
node

Atrophied
muscle

Radiation Fibrosis

Acute: Effects occur during or immediately after treatment

Early Delayed: Effects occur up to 3 months after completion of treatment

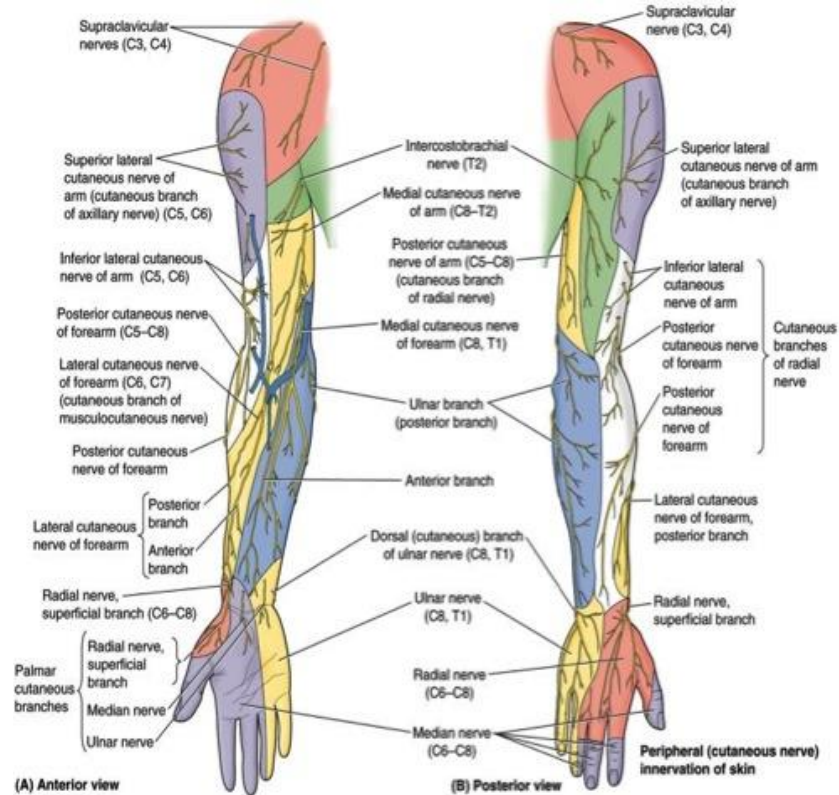
Late Delayed: Effects occur more than 3 months after completion of treatment

Radiation Fibrosis Treatment

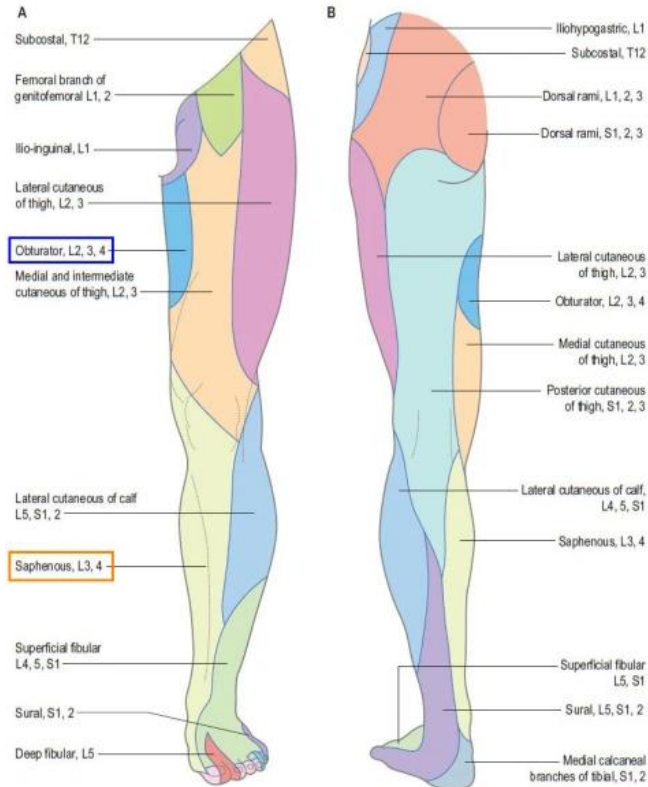
Hyperbaric oxygen therapy

Pentoxifylline with or without Vitamin E

Nerve Injury



Nerve Injury



Sequelae From Amputation, Radiation Fibrosis and Nerve Injury

Pain

Weakness

Loss of range of motion

Difficulty with walking

Difficulty with transfers

Difficulty performing everyday activities (showering, getting dressed, etc)

Pain

Medications

- Topicals

- Muscle relaxants

- Cannabinoids

- Gabapentinoids

- SNRI's (serotonin and norepinephrine reuptake inhibitor)

- TCAs (tricyclic antidepressants)

- NSAIDs

- Acetaminophen

- Steroids

Interventions

- Nerve blocks

- Botox

- Plexus blocks

- Nerve stimulators

- Trigger point injections

- Epidural steroid injections

- Nerve ablations

Modalities

- Heat

- Cold

- Electrical stimulation

- Massage

- Osteopathic manipulative treatment

- Phonophoresis

- Desensitization therapy

- Stretching/ROM

Integrative Medicine

- Supplements

- Acupuncture

Prosthetics



Orthotics



Physical Therapy

- Relearning to walk
- Transfer training
- Regaining range of motion
- Modalities (electrical stimulation, heat, ultrasound, cold)
- Strengthening
- Stretching
- Soft tissue techniques



Occupational Therapy

- Relearning everyday activities (showering, dressing, eating, driving, preparing a meal)
- Strengthening
- Stretching
- Regaining range of motion
- Modalities (electrical stimulation, heat, ultrasound, cold)
- Soft tissue techniques



Hand Therapy

- Focused on hand function
- Strengthening
- Stretching
- Regaining range of motion
- Modalities (fluidotherapy, paraffin wax)
- Bracing



Lymphedema Therapy

Complete Decongestive Therapy

- Lymphatic massage
- Skin care
- Therapeutic exercise
- Compression wrapping
- Compression garments



<https://www.clt-lana.org/>

Questions

- Exercise is recommended for most people
- Seek medical clearance if indicated
- Aim for **150 minutes** of moderate intensity or **75 minutes** of vigorous intensity activity throughout the week
- Improves fatigue, physical function, anxiety, depression, and health-related quality of life

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