

HS-SM-5 Principles of Healing

Understanding the Basics of Healing

Objective:

Students will be able to analyze and describe the basic principles and concepts of healing by:

- Defining the terminology associated with wound healing.
- Comparing and contrasting the benefits of primary healing over secondary healing.

Assessment:

Students will demonstrate their understanding by completing a worksheet that requires them to define key wound healing terminologies and explain the advantages of primary healing compared to secondary healing.

Key Points:

- Definition of essential terminologies in wound healing.
- Advantages of primary healing.
- Advantages of secondary healing.
- Differences between primary and secondary healing.

Opening:

- Introduction to the concept of wound healing and its importance in the body.
- Engage students with a real-life scenario where they need to decide between primary and secondary healing for a particular type of wound.

Introduction to New Material:

- Define key terminologies related to wound healing.
- Discuss the benefits of primary healing.
- Address the misconception that primary healing is always the best option irrespective of the situation.

Guided Practice:

- Provide examples of wound types and guide students in determining the most suitable healing method.
- Scaffold questioning from simple scenarios to more complex wound cases.
- Monitor student performance through discussions and checking their responses.

Independent Practice:

- Students will work on a scenario-based assignment where they have to recommend the most appropriate healing method for different types of wounds.
- Detailed instructions and criteria for evaluation will be provided.

Closing:

- Conduct a quick group discussion where students summarize the advantages of primary and secondary healing.

Extension Activity:

- For early finishers, provide them with a case study of a complex wound and ask them to justify their choice of healing method with detailed reasoning.

Homework:

- Research and write a short essay comparing and contrasting primary and secondary healing methods and the factors that influence the choice of healing method.

Standards Addressed:

- HS-SM-5: Analyze and describe the basic principles and concepts of healing.
- HS-SM-5.1: Define the terminology associated with wound healing.
- HS-SM-5.2: Compare and contrast the benefits of primary healing over secondary healing.

Sports Medicine Goals

- When an injury occurs the sports med team
 - Minimize the adverse effects of traumatic inflammatory response
 - Promoting tissue repair
 - Expediting a safe return to performance
 - Challenged to understand and anticipate the cellular response in predicting the recovery from injury

Injury Mechanisms

- Human movement during sport and exercise is typically faster and/or produces greater force
- As a result, the potential for injury is also heightened
- Understanding the different forces that act upon the body- you can understand how to prevent injuries

Force

- Defined as a push or a pull acting on the body
- When a force is sustained by body tissue, two factors help determine if injury occurs
 - The size and magnitude of the force
 - The material properties of the involved tissues

Magnitude of Force

- Small forces**
 - The response of the loaded structure is elastic
 - When the load is removed the material will return to its original size and shape
- Large forces**
 - Exceeds the materials elastic limits- the structure is unable to elastically rebound to its original shape
 - Some amount of deformation results

Magnitude of Force

- Larger forces**
 - Exceeds the material's ultimate failure limit
 - Produces mechanical failure of the structure
 - Translates to a bone fracture or rupturing of a soft tissue

Direction

- The direction of force is applied has important implications for injury potential
- Many tissues are stronger in resisting force from some directions than from others
 - Lateral ankle sprains are much more common than medial ankle sprains, because ligament support of the ankle is much stronger on the medial side and because the lateral malleolus drops below the talus

Categories of Force

- Force acting along the long axis of a structure is an Axial force
- 4 categories of force
 - Compression
 - Tension
 - Shear
 - Torque

Compressive Force

- Axial load that produces a squeezing or crushing effect is a compressive force
 - Weight of the human body constantly produces compression of the bones
 - When a football player is sandwiched between two tacklers, the force upon the player is compressive
 - Often result in bruises or contusions

Tensile Force

- Axial loading in the direction opposite of that of

Shear Force

- Force that acts parallel or tangent to a plane

Torque

- A rotary or twisting force is termed torque or torsion

Stress

- When a given force is distributed over a larger

Wound Healing 5.1, 5.2, 5.3, 5.4, 5.5, 5.6

Inflammatory-Response Phase

- After injury, healing process begins immediately
 - Destruction of tissue produces direct injury to cells of various soft tissue
 - Characterized by redness, swelling, tenderness and increased temperature
 - Critical to entire healing process

Inflammatory-Response Phase

- Leukocytes and other phagocytic cells delivered to injured tissue
 - Dispose of injury by-products through phagocytosis

Inflammatory-Response Phase

- Vascular reaction**
 - Blood coagulation and growth of fibrous tissue occurs
 - First 5-10 minutes vasoconstriction occurs
 - Best time to evaluate
 - Followed by vasodilation
 - Edition of blood and plasma last 24 to 36 hours
- Chemical mediators**
 - Released from damaged tissue, white blood cells and plasma
 - Histamine, leukotrienes and cytokines assist in limiting vasoconstriction
 - Aid of swelling directly related to extent of vessel damage

Inflammatory Response Cont'

- Formation of Clot**
 - Fibrinogen adheres to collagen fibers and creates sticky matrix
 - Platelets and leukocytes adhere to matrix to form plug
 - Clot formation occurs 12 hours after injury and is complete in 48 hrs
 - 50 days for fibroblasts phase
- Chronic inflammation**
 - Acute phase does not respond sufficiently to eliminate injury agent and return tissue to normal physiologic state
 - Damage occurs to connective tissue and prolong healing and repair process
 - Response to overuse and overload

Inflammatory Response Cont'

- Entire phase last 2-4 days
 - Greater tissue damage longer inflammatory phase
 - NSAIDs may inhibit inflammatory response thus delaying healing process
 - Will assist with pain and swelling

Fibroblastic-Repair Phase

- Proliferative and regenerative activity leads to scar formation
 - Begins within few hours after injury and can last as long as 4-6 weeks
 - Signs and Symptoms of inflammatory phase subside
 - Increased O2 and blood flow deliver nutrients essential for tissue regeneration

Fibroblastic-Repair Phase

- Break down of fibrin clot forms connective tissue called granulation tissue
 - Consist of fibroblast, collagen and capillaries
 - Fills gap during healing process
 - Disorganized tissue/fibers form scar
 - Fibroblast synthesize extracellular matrix consisting of protein fibers (Collagen and Elastin)
 - Day 6-7 collagen fibers are formed throughout scar
 - Increase in tensile strength increases with rate of collagen synthesis

Fibroblastic-Repair Phase

- Importance of Collagen**
 - Major structural protein that forms strong, flexible inelastic structure
 - Type I, II & III
 - Type I found more in fibroblastic repair phase
 - Holds connective tissue together and enables tissue to resist mechanical forces and deformation
 - Direction of orientation of collagen fibers is along lines of tensile strength

Fibroblastic-Repair Phase

Maturation-Remodeling Phase

Maturation-Remodeling Phase

Name: _____

Injury and the Healing Process

Precision Standard 3: Students will describe

Types of Injuries

Acute	
• "Oh crap moment"	
Macrotrauma	Mic
•	

Stages of an Acute Injury

- Acute/Inflammation Phase
 - Time Frame
 - _____
 - _____
 - Signs and Symptoms
 - _____
 - _____
 - _____
 - _____
 - What is the purpose of swelling and pain?
 - _____
 - Vasodilation
 - The dilation/enlargement of blood vessel
 - _____
 - _____
 - Inflammation
 - _____
 - Is inflammation a good or bad thing?
 - Good

- _____
- Bad
- _____
- _____

- Hypoxia
 - _____
 - During inflammation phase the swelling that occurs can affect blood flow distal to the injured location. This causes a hypoxic situation that if not taken care of can lead to a secondary injury.
- Histamine Response
 - The histamine response during this time attracts fib
- What are ways to stop hypoxia from occurring?
 - _____

- Subacute/Repair and Regeneration Phase
 - Time Frame
 - _____
 - _____
 - Fibroblasts appear within 2-3 days of the injury and secrete
 - _____
 - _____
 - This is why a scar feels harder than the skin around

- Remodeling/Maturation Phase
 - Time Frame
 - _____
 - _____
 - Wolff's Law
 - _____
 - Davis's Law
 - _____

- Adhesions
 - _____
 - _____
 - Example: When you put a bandaid on a sore and th
 - Example 2: When you strain a hamstring an adhesive and your dermis, skin. The muscle should glide bel
- The timeframes of the three stages are general guidelines, it may be you.

- What do you think can speed up the time frame?
 - _____
- What do you think can slow down the time frame?
 - _____

Types of Injuries

- Sprains
 - _____
 - Ligaments connect bones together
- Strains
 - _____
 - Tendons connect muscles to bones
- Fractures
 - _____
- Dislocation
 - _____
- Subluxation
 - _____
- Contusion
 - _____

Degrees of Soft Tissue Injuries

- First Degree Injuries
 - Tearing of 0-25 percent of fibers
 - Symptoms
 - _____
- Second Degree Injuries
 - Tearing of 25-50 percent of fibers
 - Symptoms
 - _____
- Third Degree Injuries
 - Tearing of more than 50 percent of fibers
 - Symptoms
 - _____

Types of Fractures

- Compression Fractures
 - _____
 - _____
- Depressed Fractures

Assignments cover all standards with the standard to understand the principles of healing