HEALING SKIN AND SUTURING

Essential Question: How Does Skin Heal?

Learning Targets:

Students will:

- Objectively summarize informational text.
- Use a variety of media to develop and deepen understanding of a topic or idea.
- Use new knowledge about how a wound heals to reflect on common first aid practices.
- Practice suturing on a model.
- Collaborate as a team member to practice a high-value study skill.

Lesson Overview

In this lesson, the skateboard accident victim is treated for his facial laceration. Young Physician Assistants participate in a laboratory exercise that is frequently used by physicians to practice their suturing skills, the Banana Suture Lab. A Gallery Walk of students’ attempts to suture is designed to give them a chance to find humor in their work. Students also engage with short informational texts to construct an understanding of skin as an organ of the body and how wounds heal. Students will answer the question: How does skin heal?
Lesson Agenda

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Materials

- Young Allied Health Professional student packet
- Projector, speakers (for videos)
- Videos (to project)
  - How Wounds Heal
  - Suturing a Wound
  - Continuous/Interrupted Stitches
- Suturing a Banana Lab (one per pair of students)
  - Banana (1/2 per student)
  - Dental floss (approx. 10 inches per wound)
  - Curved needle
  - Forceps or tweezers (if needed to pull skin away from wound)
  - One knife (a butter or kitchen knife is fine, for preparing the bananas. This is for teacher use only.)
- Materials for skin grafting extension (optional)

FACILITATION NOTES

The Narrative Arc. The more each <Emergency Scenario> can be presented as if telling a story, the more engaged the audience will be. Work to avoid a stale reading and lean towards bringing the information to life as in a conversation or a “reveal” of the next chapter. Think of creative ways to make the story your own.

Safety. Take time to establish procedures and norms for lab safety prior to conducting the labs in this unit. This lesson contains a lab that requires the use of sewing needles. Set the expectation that the young allied health workers take lab experiences seriously and behave in a
professional manner. With sharp materials, the first time a student acts inappropriately or unsafely, they will lose the privilege of participation. Take their needle and let them observe. Ensure they understand this “one strike, you’re watching” approach before receiving materials.

**Materials Preparation.** Consider preparing “suture stations” that are ready to distribute to the young allied health workers. This preparation will allow the class to remain fluid, encourage engagement, and lower classroom management issues.

**Materials Distribution.** With any materials that are sharp, take care to have accountability in distributing and collecting the needles. Consider using a checklist to ensure all needles are returned. If you choose to suture a pig’s foot rather than bananas, you can find a lab exercise at http://www.haspi.org/curriculum-library/A-P-Core-Labs/Integument%20System/Labs%20&%20Activities/Lab%20-%20Suturing.pdf.

**Bananas.** Prepare your bananas before class. There will be an excess of bananas after this lab. Consider composting them.

**Stitches.** Find this interesting or would like more background information? See: http://www.slideshare.net/obgynramamahidol/basic-suture-materials-and-needles.

**Take a Stand Protocol.** This protocol encourages reflection and finding nuance along a 0-100 gradient of “important to me” to “not important to me.” See a variation of this protocol at https://vimeo.com/101559969. In this application, students are not trying to convince others, though you might encourage them to share why they selected their stance.

**Extension.** As an extension, consider exploring another operation for healing skin: skin grafting, or a surgical operation in which a piece of healthy skin is transplanted to a new site on the body (https://www.youtube.com/watch?v=l83DndvlfV4). To help students understand what can be involved in this operation, have them build a model of the skin. You can reference the following lesson if you plan to run this activity: http://www.meetpenny.com/2013/03/science-saturday-a-model-of-the-skin-lesson-12/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed:+MeetPenny+%28MeetPenny%29&utm_content=Google+Reader.

**IN ADVANCE**

- Try the Banana Suture Lab yourself so that you know how to help students when they complete the lab.
- Pre-assign lab partners.
- Preview the Suturing a Wound video that can be found at https://www.youtube.com/watch?v=e1jThI5wbVw. This video shows a doctor suturing an actual wound. The first minute gives key information (to 1:09). Then the video shows a doctor suturing, which may be too graphic for some audiences, but could be shown to interested students as an extension.
- Preview the two types of stitches:
  - Continuous stitches: https://www.youtube.com/watch?v=LFzkH6U_M5c.
  - Interrupted stitches: https://www.youtube.com/watch?v=PH-Hzz6ixY.
- Ensure technology is in place for the lesson (projector, speakers, etc.)

**Vocabulary**

<table>
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<tr>
<th>Content</th>
<th>Tier II</th>
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<tr>
<td>suture, anesthetic, irrigate, saline, epidermis, dermis, subcutaneous, melanin, hypodermis</td>
<td>continuous, interrupted</td>
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**Opening (5 min)**

**Emergency Scenario**

*In the emergency room, the patient is placed in the hands of an emergency room team—including you! You are a physician assistant—or P.A. You work in the emergency room and perform many of the same tasks as a doctor, particularly for issues that are more routine. You chose to become a P.A. because you liked the excitement of the emergency room and can stay focused under pressure. You started as an EMT yourself, gaining experience in the field before applying to be a P.A. At first, you thought about becoming a doctor, but then learned about the role of a physician assistant. Your program was 2 years long—a fraction of the 11-16 years it would have taken you to become a doctor. These years were still hard work, requiring focus, persistence, grace under pressure, and excellent study skills. Now you are part of an allied health team that supports patients as they enter the E.R.*

*Today you get to practice suturing, or giving stitches.*
1. **Ask:** Who here has received stitches?
2. **Have** the young professionals turn to a colleague and share any personal stories they have about being in surgery, needing stitches, and/or having scars.
3. **Share** the next chapter of the story by reading or acting out: `<Emergency Scenario: Facial Laceration Treatment>`

## Work Time

### How Does Skin Heal? (25 min)

As a PA, it is important to know not only the structures and functions of the body, but also about the healing process. As we learn about how the skin heals, think about how bones heal. What are the similarities and differences? As you watch the video, think about what the healing process will mean for the treatment of your patient.

**Project:** [https://www.youtube.com/watch?v=TLVwELDMDWs](https://www.youtube.com/watch?v=TLVwELDMDWs).

Now we are going to read and review with a powerful study strategy.

**Spider Map: Read, Recall, Revisit Protocol**

1. **Distribute** the `<How Wounds Heal Text>`.
2. **Project** the image of the Spider Map.
3. **Ask:** What is the concept that is represented by the center circle?
4. **Use** equity sticks to choose randomly. **Listen for:** How a wound heals.
5. **Model** writing the heading into the center circle of the Spider Map.
6. **Explain** to the young professionals that they will follow a **Read, Recall, Revisit protocol**.

   - First they will **read** about stage one: bleeding.
   - Next, they will cover the reading and collaborate as a group to **recall** as many facts as they can. Each fact will be written on the “spider legs.”
   - Finally, they will **revisit** the reading and add any facts they missed.
   - **Repeat** for all four stages.

7. **Offer** to project the video a second time, if YP would like to add to their notes.
8. **Conclude:** *Turn to you neighbor and share a time you had a wound and if you recall it progressing through these stages.*

9. **Discuss** as a whole class: *Based on the healing process, what insights do you have that would help a wound to heal?*

**Suturing Skills (30 min)**

**Banana Suture Lab**

Your training as a physician assistant included a lot of time studying human anatomy and physiology. You know a lot about the skin as an organ of the body and how to **suture**, or stitch up, **lacerations**, or cuts in the skin. (Display the definitions of suture and lacerations up on board.) You are a perfectionist with your sutures and practice at home to make your sutures even better to reduce any scarring. As you practice, remember that a health professional spends hours practicing—expect to make mistakes on your first attempt.

Before suturing, the wound must be cleaned thoroughly. For large lacerations, stopping the bleeding would be the first priority. Which ABC would this fall under? After bleeding is under control, and for smaller wounds before bandaging or suturing, cleaning the wound is important. Why is this?

1. **Explain** to the young professionals that they will be watching a short video about how to suture a wound.
2. **Tell** the young professionals to record any important things to remember about doing quality suturing.
   - For example, the needle should enter the skin at a 90-degree angle.
3. **Project** the <Suturing a Wound> video:  
   https://www.youtube.com/watch?v=e1jThl5wbVw

   ➢ **SHOW ONLY TO 1:09.** After that there is a visual of actual suturing which may not be appropriate for the entire class.
   - **Invite** volunteers to share the important facts with the class.
   - **Write** them on the board as they are called out.
Invite the young professionals to join their lab partner.

- These are pre-assigned.
- Remind them that professionals work with all kinds of people. They are expected to be respectful and professional as they collaborate with colleagues.

Project the <Banana Suture Lab> videos.

- Interrupted stitches: https://www.youtube.com/watch?v=PH-Hzz6ixY.
- Continuous stitches: https://www.youtube.com/watch?v=LFzkH6U_M5c.

You are now going to receive your professional tools for the lab. These include a sharp instrument, and I will record who has received them. To leave class, you will need to return your equipment and be checked off. You have one chance to use your equipment correctly—especially the needle. If these needles are used for any other purpose—as toys or in an unsafe way—you will need to sit this lab out. There is NO second chance.

Distribute the materials for the <Suturing a Banana Lab>.

- Remind them of the expectations for safe and responsible use of materials.
- Record distribution of needles (and check them in at the end of class).

Invite the young professionals to follow the lab instructions they viewed in the video. Project the video again in the background as students begin to work.

- When the group completes the lab, invite the young professionals to display their work for a Gallery Walk. Consider having them label their banana with their names: P.A. ________.

Consider taking pictures of their work to add to the Gallery Walk.

This hands on lab is an opportunity to emphasize the growth mindset. Professionals practice for many hours to become competent—most allied health careers have extensive labs and practicums as part of their training. As you circulate, encourage a growth mindset, reminding YPs they can always “start over” from where they are. Remind them that this is their first attempt when they experience frustration, normalizing how challenging it can be. The banana turns black and shows tears if stitches are too tight; their “patient” is giving the YPs immediate feedback!
Closure (15 min)

Take a Stand: Applying Your Lenses to the Physician Assistant Career (10 min)

Share the “Take a Stand” protocol. A) After each statement is read, you will line up on a continuum based on how important the statement is to you. B) One end of the room is very important, the other not important—think of it as a 0-100 space where you can fill in all of the quantities in between. C) As each statement is read, reflect on how important each idea is to you and line up accordingly—fill in all along the line to reflect gradations of importance.

Read the following statements aloud.

- After the first sentence, pause and allow students to reflect and select their stance.
- Once they have settled on the line, share how the statement connects to the career of PA (second sentence).

SELF

- I am comfortable working around blood and sick and/or injured people. This is part of the work of a PA.
- I enjoy learning about the human body and doing labs. PAs need many science and anatomy classes.
- I work well with people. PAs need good bedside manner.

SECURITY

- I like having the ability to work all over the US. There is a growing demand for PAs in many areas.
- A median pay of $92,970 would offer me the lifestyle I want. That is the median salary for a PA—those who specialize can earn more!
- I would like to attend 3-4 years of college after high school. PA training is often 3-4 years—versus 12 or more for a doctor.

The value of this activity is not for students to determine if the PA career “is for them,” but rather to begin to understand their own values around careers. By explicitly connecting the activities of each lesson to future careers and opportunities, students are encouraged to think with an exploratory mindset and in a future-ready way.
SOCIETY

- I am interested in working in inner city/rural communities. Many of these communities do not have enough access to doctors. PAs help provide medical services to communities in need.
- I like the idea of a career that helps people. The PA is a healing/helping profession.

**Exit Ticket: Stairs and Stars (5 min)**

*In terms of careers, a physician assistant program takes 2-3 years, and PAs usually have either an undergraduate degree or hours of experience. Some people go straight into college to become a doctor. There are many pathways to being in the front line of the allied health professions, and all of them require focus and the ability to practice a growth mindset—to learn from each experience in the field. That is why all of these careers require labs, seminars, and practical experience.*

**What did you learn from your experience today?**

*Using your growth mindset, identify two stars (things you did well) and one step (something you would change or improve the next time).*
HEALING SKIN AND SUTURING: How Does Skin Heal?

Today’s Learning Objectives:

I can:

☐ Summarize informational text.
☐ Use a variety of media to develop and deepen understanding of a topic or idea.
☐ Use new knowledge about how a wound heals to reflect on common first aid practices.
☐ Practice suturing on a model.
☐ Collaborate as team member to practice a high-value study skill.

In this lesson, the skateboard accident victim is treated for his facial laceration. As a young Physician Assistant, I will participate in a laboratory exercise that is frequently used by physicians to practice their suturing skills, the Banana Suture Lab. A Gallery Walk of our attempts to suture is designed to give us a chance to find humor in our work. I will also engage with short informational texts to construct an understanding of skin as an organ of the body and how wounds heal. I will answer the question: How does skin heal?

Today’s Activities:

☐ Emergency Scenario
☐ How Does Skin Heal?
☐ Suturing Skills
☐ Take a Stand & Exit Ticket
Emergency Scenario: Facial Laceration Treatment

You have just been assigned an operating room to repair a severe facial laceration of a skateboarding accident victim. As a physician's assistant specializing in surgery, you often handle many issues a physician does: inserting breathing tubes, surgical drainage tubes, starting central IV lines, cutting and draining abscesses, as well as working as a part of a surgeon/anesthesiologist/nursing team. A physician's assistant can do about 80% of the general tasks in an emergency room. When something is more complicated, a physician or surgeon is always available to consult—or step in if needed.

You scrub up as the sterile tech and nurse gather the materials. The patient is wheeled into the room by a pair of orderlies, or professionals who work in hospitals but do not provide medical care. They get the boy settled on the operating table. You begin to inspect his wound and find that it is quite deep and includes some muscle tissue. It is 50.8 millimeters in length, extending from the side of his nose and through his top and bottom lips. Because this is a serious laceration on the face, today you will assist an experienced surgeon who will stitch the wound.

The nurse begins to irrigate the laceration with a saline solution. The wound must be cleaned very well, and flushing it with a salt-water solution reduces the chances of an infection. Because of the severity of the laceration, the anesthesiologist joins you at the table and begins to administer general anesthetic, or drugs that are given to a patient before a surgery in order to help him or her not feel pain.

And, finally, the surgeon is ready to begin suturing the wound. For smaller wounds or stitches on other parts of the body, you could handle the work yourself. Because of the visibility, depth, and length of the wound, a surgeon has been called. In addition to stitching the wound, your team’s goal is to make the sutures perfect so this patient will not have a prominent scar on his face.
# How Wounds Heal

Wounds heal in stages. The smaller the wound, the quicker it will heal. The larger or deeper the wound, the longer it can take to heal.

## 1. BLEEDING

*When you get a cut, scrape, or puncture, the wound will bleed.*

- The blood will start to clot within a few minutes or less and stop the bleeding.
- The blood clots dry and form a scab, which protects the tissue underneath from germs.
- Not all wounds bleed. For example, burns. Some puncture wounds and pressure sores don't bleed.

## 2. INFLAMMATORY STAGE

*Once the scab forms, your body's immune system kicks in to protect the wound from infection.*

- The wound becomes slightly swollen, red or pink, and tender.
- You also may see some clear fluid oozing from the wound. This fluid helps clean the area.
- Blood vessels open in the area, so blood can bring oxygen and nutrients to the wound. Oxygen is essential for healing.
- White blood cells help fight infection from germs and begin to repair the wound.
- This stage takes about 2 to 5 days.

## 3. TISSUE GROWTH AND REBUILDING

*The body rebuilds tissue and begins to repair itself.*

- Over the next 3 weeks or so, the body repairs broken blood vessels and new tissue grows.
- Red blood cells help create collagen, which are tough, white fibers that form the foundation for new tissue.
- The wound starts to fill in with new tissue, called granulation tissue.
- New skin begins to form over this tissue.
- As it heals, the edges pull inward and the wound becomes smaller.

## 4. SCARRING

*A scar forms and the wound becomes stronger.*

- As healing continues, you may notice that the area is itchy. After the scab falls off, it may look stretched, red, and shiny.
- The scar that forms will be smaller than the original wound. It will be less strong and less flexible than the surrounding skin.
- Over time, the scar will fade and may disappear completely. This can take as long as two years. Some scars never go away completely.
- Scars form because the new tissue grows back differently than the original tissue. If you only injured the top layer of skin, you probably won't have a scar. With deeper wounds, you are more likely to have a scar.
- Some people are more likely to scar than others. Some may have thick scars called keloids. People with darker complexions are more likely to form keloids.
Spider Map: Read, Recall, and Revisit
Lab: Suturing a Banana

Materials:

- Banana (1/2 per student)
- Dental Floss (approx.: 10 inches per wound)
- Curved Needle
- Tweezers/Forceps (if needed to pull skin away from wound)

Procedure:

1. Obtain a banana. This will be your mock patient.
2. Thread your suture material (floss) through your needle. You will need approximately 10 inches of floss per wound—modify as needed. Tie a square knot to hold the material in place.
3. Grasp the needle with the needle holder using proper holding technique.

**Continuous Stitches:** Begin your sutures slightly before your wound. Tie a square knot on your first incision. Continue with a non-interrupted stitch throughout the length of the wound. Finish with a square knot and cut off excess ends.

![Continuous Sutures](image)

Proper sutures will:

- Be uniform in distance.
- Showcase knots at both ends.
- Show tightness in suture material.
- Extend the whole length of the wound.

**Non-Continuous Stitches:** Begin your sutures slightly before your wound. Tie a square knot on your first suture. Continue with interrupted stitches throughout the length of the wound. Cut off excess ends.
Proper sutures will:

- Be uniform in distance.
- Showcase knots at both ends.
- Show tightness in suture material.
- Extend the whole length of the wound.
Exit Ticket: Use Your Growth Mindset!

Take a moment to reflect on today and think of two strengths (stars) and one thing you would work to improve the next time (step).

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