

## Laceration Repair for Emergency Physicians

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Submitted: June 22, 2017; Accepted: September 19, 2017; Electronically Published: October 15, 2017; <https://doi.org/10.21980/J8TP7K>

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### ABSTRACT:

**Audience:** This team-based learning (TBL) is appropriate for medical students and all levels of residents.

**Introduction:** Lacerations are one of the most common chief complaints presenting to the emergency department, representing 8.2% of ED visits.<sup>1</sup> Wound management is one of the emergency medicine milestones.<sup>2</sup> As such, it is an essential skill to cover when training emergency physicians. Historically, training programs correlate competency with quantity of procedures, with little focus on the quality.<sup>3</sup>

**Objectives:** By the end of this educational session, the learner will:

1. Understand indications and contraindications for suture repair of lacerations.
2. Compare when various types of wound repair are appropriate: such as sutures, staples, tissue adhesive and tissue tape, as well as what size of suture material is appropriate depending on the location of the laceration on the body.
3. List the appropriate types and sizes of suture for various locations and types of lacerations.
4. Understand the definitions of the three types of wound closure (primary, secondary and delayed primary) and when they are appropriate.
5. Understand the basics of local anesthetic including which anesthetic to use and the maximum dose for each.
6. Understand when sutures should be removed.
7. List various suturing techniques and their indications.
8. Improve comfort levels in performing various suturing techniques including: simple interrupted, horizontal mattress, vertical mattress, and corner repair. If desired, instructors can individually assess the learner sutures using the attached complete validated suture checklist to show proficiency in these techniques. Please see the brief wrap-up section at the end of the manuscript.

**Method:** This is an mTBL (modified team-based learning) session.

**Topics:** Wound repair, lacerations, suturing.



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## Learner Audience:

Medical students, interns, junior residents, senior residents

## Time Required for Implementation:

Instructor Preparation: 60 minutes

Learner Responsible Content: 15 minutes

In Class Time: 90-120 minutes

## Recommended Number of Learners per Instructor:

Up to 30 learners per instructor

## Topics:

Wound repair, lacerations, suturing.

## Objectives:

By the end of this educational session, the learner will:

1. Understand indications and contraindications for suture repair of lacerations.
2. Compare when various types of wound repair are appropriate: such as sutures, staples, tissue adhesive and tissue tape, as well as what size of suture material is appropriate depending on the location of the laceration on the body.
3. List the appropriate types and sizes of suture for various locations and types of lacerations.
4. Understand the definitions of the three types of wound closure (primary, secondary and delayed primary) and when they are appropriate.
5. Understand the basics of local anesthetic including which anesthetic to use and the maximum dose for each.
6. Understand when sutures should be removed.
7. List various suturing techniques and their indications.
8. Improve comfort levels in performing various suturing techniques including: simple interrupted, horizontal mattress, vertical mattress, and corner repair. If desired, instructors can individually assess the learner sutures using the attached complete

validated suture checklist to show proficiency in these techniques. Please see the brief wrap-up section at the end of the manuscript.

## Linked objectives and methods:

This suture TBL utilizes blended learning techniques to engage the learners. The learner responsible content, iRAT and gRAT covers indications and contraindications for suture repair (objective 1), the various types of wound repair (objective 2), the appropriate types of sutures and sizes (objective 3), the definitions of the three types of wound closure (objective 4), the basics of local anesthetic (objective 5), and when sutures should be removed (objective 6). The group application exercise using suture material and pig's feet demonstrates that the learner "knows how" to apply the concepts of various suture repairs and exhibit a "does" level of behavior. During this part of the exercise instructors review indications for various suturing techniques (objective 7) and learners practice with all the techniques allowing learners to feel more comfortable with new or less common suturing techniques (objective 8).

## Recommended pre-reading for instructor:

- Thomsen, TW, Barclay DA, Setnik GS. Videos in clinical medicine. Basic laceration repair. *N Eng J Med*. 2006;355:e18. doi: 10.1056/NEJMvcm064238
- Lee H, Abubshait L. Paucis Verbis card: laceration repair and sutures. ALiEM. <https://www.aliem.com/2017/03/pv-laceration-repair-and-sutures/>. Published March 9, 2017. Accessed May 20, 2017.
- Lin M. Paucis Verbis card: suture materials. ALiEM. <https://www.aliem.com/2011/01/paucis-verbis-card-sutures/> Published January 7, 2011. Accessed May 20, 2017.

## Learner Responsible Content (LRC):

- Thomsen, TW, Barclay DA, Setnik GS. Videos in clinical medicine. Basic laceration repair. *N Eng J Med*. 2006;355:e18. doi: 10.1056/NEJMvcm064238
- The article and associated video are available for most institutions who have a subscription to NEJM.

## Results and tips for successful implementation:

This mTBL was first implemented during a residency conference with approximately 25 learners (medical students to senior residents). The exercise received extremely positive verbal and written feedback, with all learners rating the session as "above average (4)" and "excellent (5)" on a 1-5 Likert scale. We recommend using a computer and projector to show learners the suture videos for the group application exercise, although you could have learners watch the videos on their own devices.



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## Prepare:

1. Read all instructor pre-reading.
2. One week in advance, the instructor should post the pre-reading on a learning management system or email it to learners.
3. Prepare gRATs by making it an IF/AT (immediate feedback/assessment technique; see picture of example shown in gRAT section of manuscript). You will need to buy scratch-off stickers; these can be purchased at Amazon ([https://www.amazon.com/Silver-Rectangle-Scratch-off-Stickers-Labels/dp/B00TO3WPY8/ref=sr\\_1\\_5?ie=UTF8&qid=1500753752&sr=8-5&keywords=scratch+off+stickers](https://www.amazon.com/Silver-Rectangle-Scratch-off-Stickers-Labels/dp/B00TO3WPY8/ref=sr_1_5?ie=UTF8&qid=1500753752&sr=8-5&keywords=scratch+off+stickers)) to prepare a gRAT-IF/AT for each group. Cut the scratch-off stickers to the appropriate size and place over the letter choices or fill-in answers on the gRAT. During the exercise, groups will scratch off their answer choice and get immediate feedback as to whether they got the right answer.
4. Purchase enough pig's feet for each learner to have one. To get more use out of the pigs' feet, they can be cut into smaller pieces as shown below:



5. Purchase or borrow one set of suture equipment for each learner (needle driver, pick-ups, and scissors).
6. Purchase several scalpels to make practice lacerations in the pig's feet.
7. Purchase enough suture material for each learner to complete at least six separate sutures (we recommend having a variety of suture material so learners can practice with various types – ie absorbable sutures, non-absorbable sutures in various sizes).

8. Purchase either penrose drains or rubber “animal balloons” to act as the blood vessel for practicing figure of eight stitch.
9. Optional: We recommend the instructor order vertical half sheet flyers of the ALiEM PV Cards for your learners to use during the TBL and during their clinical rotations.
  - a. Lee H, Abubshait L. Paucis Verbis card: Laceration repair and sutures. ALiEM blog. <https://www.aliem.com/2017/03/pv-laceration-repair-and-sutures/> Published March 9, 2017. Accessed May 20, 2017.
  - b. Lin M. Paucis Verbis card: Suture materials. ALiEM blog. <https://www.aliem.com/2011/01/paucis-verbis-card-sutures/>. Published January 7, 2011. Accessed May 20, 2017.

For the in-classroom didactic session, you will also need to prepare the following:

1. One copy of iRAT for each learner
2. One copy of gRAT for each team (4-5 learners per team)
3. One copy of key for RAT for the instructor
4. One copy of group application exercise for each team or learner

In-class implementation:

1. Learners will start the session by taking the iRAT. Give your learners 5-10 minutes to complete the iRAT. Learners should not be allowed to use the article or other material during the iRAT.
2. Once learners have completed the iRAT, break them up into groups of four. We recommend evenly distributing the number of senior and junior learners in each group. The instructor should assign the groups, rather than allowing learners to self-select.
3. The session is best implemented in small round or square tables with four learners at each table.
4. Give each group one copy of the gRAT. Give the groups 10 minutes to complete the gRAT IF/AT. This is also done without the article or electronic resources. Instruct learners to scratch off ONLY the best answer. The goal is for each group to have the least number of answer choices scratched off (in other words, make sure learners do not just scratch off all the answers to find out the answer quickly). For fill-in answers, have the groups write their answers, then scratch off the answer. Walk around the room during the activity to ensure learners are on task and answer questions.



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5. Go over the gRAT answers as a group. Provide explanations and answer any further questions they may have (10 minutes).
6. If you are going to show learners the suture videos on a projector instead of having them watch it on their own devices, you should pull up the videos in advance on a computer connected to a projector.
7. Give each group (or learner) a copy of the GAE (group application exercise), give each learner a pig's foot, a set of suture equipment, and suture material.
8. Have learners make four linear lacerations (deep), one Y-shaped laceration, and a laceration with the penrose drain or animal balloon in their pig's foot. Alternatively, the instructor can prepare these lacerations in advance to save time during the activity.
9. As a large group or individually, watch the suture videos and have learners practice each suture type listed on the GAE. Walk around the room to answer questions. If you have additional faculty available, you can have them use the suture checklist to evaluate the learners' work.

### References/suggestions for further reading:

1. Singer AJ, Thode HC Jr, Hollander JE. National trends in ED lacerations between 1992 and 2002. *Am J Emerg Med.* 2006;24(2):183-188. doi: 10.1016/j.ajem.2005.08.021
2. The Accreditation Council for Graduate Medical Education, The American Board of Emergency Medicine. The Emergency Medicine Milestone Project. 2013:1-29.
3. Hayden SR, Panacek EA. Procedural competency in emergency medicine: The current range of resident experience. *Acad Emerg Med.* 1999;6(7):728-735. doi: 10.1016/j.annemergmed.2012.10.019



## Suturing for Emergency Physicians: individual Readiness Assessment Test (iRAT)

1. Which of the following is false regarding staple wound closure?
  - a. They can be rapidly placed
  - b. They provide meticulous wound-edge approximation
  - c. They are appropriate for use on the scalp, torso, arms, legs, hands and feet.
  - d. They are less painful than sutures
  
2. Which of the following methods of wound closure are appropriate for wounds under tension (may choose more than one)?
  - a. Suturing
  - b. Staples
  - c. Tissue adhesive
  - d. Tissue tapes
  
3. Match the following types of wound closure with its description
  - Primary
  - Secondary
  - Delayed primary

Type of Closure	Definition
	Approximation after 3-5 days. Appropriate for large or cosmetically important lacerations that are not appropriate for primary repair.
	Immediate approximation, allowing for rapid healing and minimal scarring.
	Spontaneous closure through granulation and reepithelialization.

4. Which of the following wounds is most likely to be suitable for primary closure?
  - a. A facial laceration that is 16 hours old
  - b. A grossly contaminated laceration to the hand that is 8 hours old
  - c. An arm laceration on an immunosuppressed patient that is 12 hours old
  - d. A scalp laceration that is 48 hours old



## LEARNER MATERIALS

5. The addition of epinephrine to lidocaine provides which of the following benefits?
- Decreases duration of action
  - Reduces bleeding
  - Increases the amount of anesthetic required
  - Decreases the intensity of the anesthesia
6. What size suture material should be used for facial lacerations?
- 1-0
  - 3-0
  - 5-0
  - 6-0
7. Why should reverse-cutting needles be used for percutaneous sutures?
- They provide a better angle for percutaneous stitching
  - They prevent the needle from cutting the tissue that is closest to the wound
  - They cut more easily through skin
  - They are large enough to pass through the depth of most skin lacerations
8. Match the following anesthetics with their duration of action and maximum dose

**Duration**

30 min

60-240 min

240-480 min

**Maximum Dose**

4.5 mg/kg

7 mg/kg

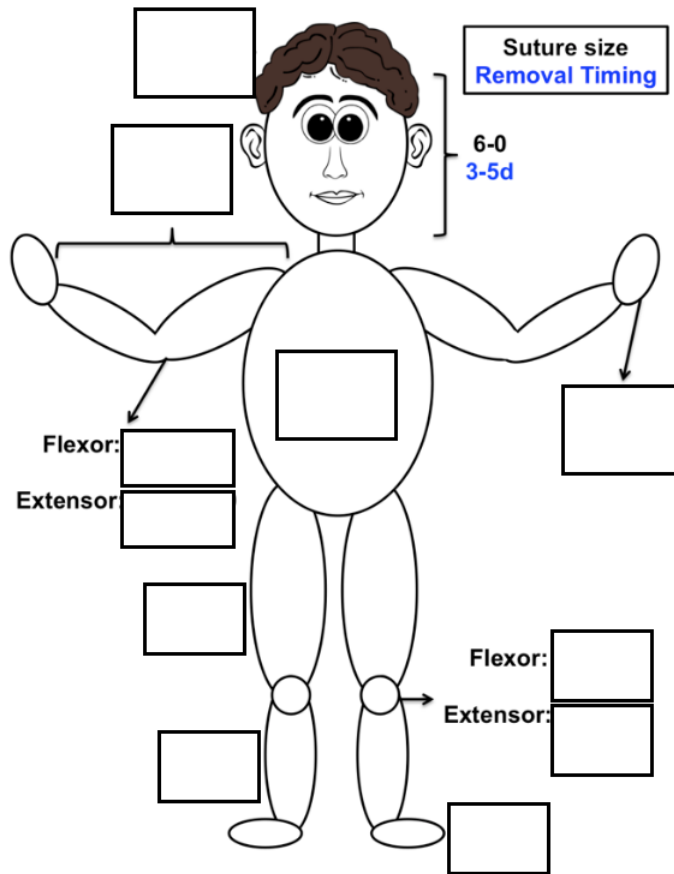
3 mg/kg

Agent	Duration	Maximum Dose
1% Lidocaine with Epinephrine		
1% Lidocaine		
0.25% Bupivacaine		



## LEARNER MATERIALS

9. True or false: Irrigation is not required, and may be detrimental, in wounds involving highly vascular, loose areolar tissue such as the eyebrow.
- True
  - False
10. Fill in the suture size and number of days before suture should be removed into each blank section on the body. For example, the face would be sutured with 6-0 sutures and be removed in 3-5 days.





# LEARNER MATERIALS

## Suturing for Emergency Physicians: group Readiness Assessment Test (gRAT)

We used: 2"x1" Silver Rectangle Scratch Off Labels Sticker - Pack of 500 from [www.amazon.com](http://www.amazon.com)  
See picture of how the scratch off stickers are placed gRAT below:

**Suturing for Emergency Physicians: gRAT**

- Which of the following is false regarding staple wound closure?
  - They can be rapidly placed
  - They provide meticulous wound-edge approximation
  - They are appropriate for use on the scalp, torso, arms, legs, hands and feet.
  - They are more painful than sutures
- Which of the following methods of wound closure are appropriate for wounds under tension?
  - Suturing
  - Staples
  - Tissue adhesive
  - Tissue tapes
- Match the following types of wound closure with its description
  - Primary
  - Secondary
  - Delayed primary

Type of Closure	Definition
[Redacted]	Approximation after 3-5 days. Appropriate for large or cosmetically important lacerations that are not appropriate for primary repair.
[Redacted]	Immediate approximation, allowing for rapid healing and minimal scarring.
[Redacted]	Spontaneous closure through granulation and reepithelialization.

- Which of the following wounds most likely to be suitable for primary closure?
  - A facial laceration that is 16 hours old
  - A grossly contaminated laceration to the hand that is 8 hours old
  - An arm laceration on an immunosuppressed patient that is 12 hours old
  - A scalp laceration that is 48 hours old
- The addition of epinephrine to lidocaine provides which of the following benefits?
  - Decreases duration of action
  - Reduces bleeding
  - Increases the amount of anesthetic required
  - Decreases the intensity of the anesthesia



# LEARNER MATERIALS

6. According to the NEJM article which of the following areas should not be blocked using epinephrine?

- Fingers
- Nose
- Pinna of ear
- Penis
- B, C and D
- All of the above

7. What size suture material should be used for facial lacerations?

- 1-0
- 3-0
- 5-0
- 6-0

8. Why should reverse-cutting needles be used for percutaneous sutures?

- They provide a better angle for percutaneous stitching
- They prevent the needle from cutting the tissue that is closest to the wound
- They cut more easily through skin
- They are large enough to pass through the depth of most skin lacerations

9. Match the following anesthetics with their duration of action and maximum dose

- |                 |                     |
|-----------------|---------------------|
| <b>Duration</b> | <b>Maximum Dose</b> |
| 30 min          | 4.5 mg/kg           |
| 1-2 hours       | 7 mg/kg             |
| 2-4 hours       | 3 mg/kg             |

Agent	Duration	Maximum Dose
1% Lidocaine with Epinephrine		
1% Lidocaine		
0.25% Bupivacaine		

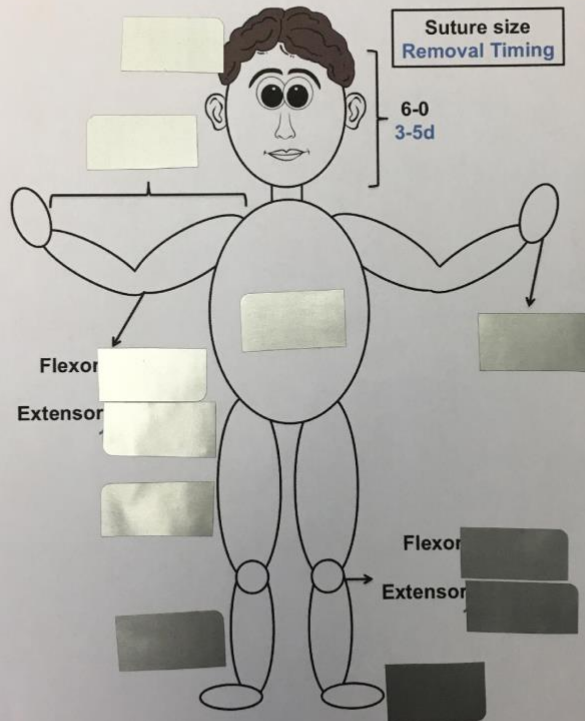
10. True or false. Irrigation is not required, and may be detrimental, in wounds involving highly vascular, loose areolar tissue such as the eyebrow.

- True
- False



# LEARNER MATERIALS

11. Fill in the suture size and number of days before suture should be removed into each blank section on the body. For example, the face would be sutured with 6-0 sutures and be removed in 3-5 days.





## Suturing for Emergency Physicians: group Readiness Assessment Test (gRAT)

1. Which of the following is false regarding staple wound closure?
  - a. Staples can be rapidly placed
  - ★ Staples provide meticulous wound-edge approximation
  - c. Staples are appropriate for use on the scalp, torso, arms, legs, hands and feet.
  - d. Staples are more painful than sutures
  
2. Which of the following methods of wound closure are appropriate for wounds under tension?
  - ★ Suturing
  - ★ Staples
  - c. Tissue adhesive
  - d. Tissue tapes
  
3. Match the following types of wound closure with its description
  - Primary
  - Secondary
  - Delayed primary

Type of Closure	Definition
Delayed Primary	Approximation after 3-5 days. Appropriate for large or cosmetically important lacerations that are not appropriate for primary repair.
Primary	Immediate approximation, allowing for rapid healing and minimal scarring.
Secondary	Spontaneous closure through granulation and reepithelialization.

4. Which of the following wounds is most likely to be suitable for primary closure?



## LEARNER MATERIALS

- ★ A facial laceration that is 16 hours old
  - b. A grossly contaminated laceration to the hand that is 8 hours old
  - c. An arm laceration on an immunosuppressed patient that is 12 hours old
  - d. A scalp laceration that is 48 hours old
5. The addition of epinephrine to lidocaine provides which of the following benefits?
- a. Decreases duration of action
  - ★ Reduces bleeding
  - c. Increases the amount of anesthetic required
  - d. Decreases the intensity of the anesthesia
6. What size suture material should be used for facial lacerations?
- a. 1-0
  - b. 3-0
  - c. 5-0
  - ★ 6-0
7. Why should reverse-cutting needles be used for percutaneous sutures?
- a. They provide a better angle for percutaneous stitching
  - ★ They prevent the needle from cutting the tissue that is closest to the wound
  - c. They cut more easily through skin
  - d. They are large enough to pass through the depth of most skin lacerations
8. Match the following anesthetics with their duration of action and maximum dose

**Duration**

30 min

1-2 hours

2-4 hours

**Maximum Dose**

4.5 mg/kg

7 mg/kg

3 mg/kg

Agent	Duration	Maximum Dose
1% Lidocaine with Epinephrine	1-2 hours	7 mg/kg
1% Lidocaine	30 min	4.5 mg/kg
0.25% Bupivacaine	2-4 hours	3 mg/kg

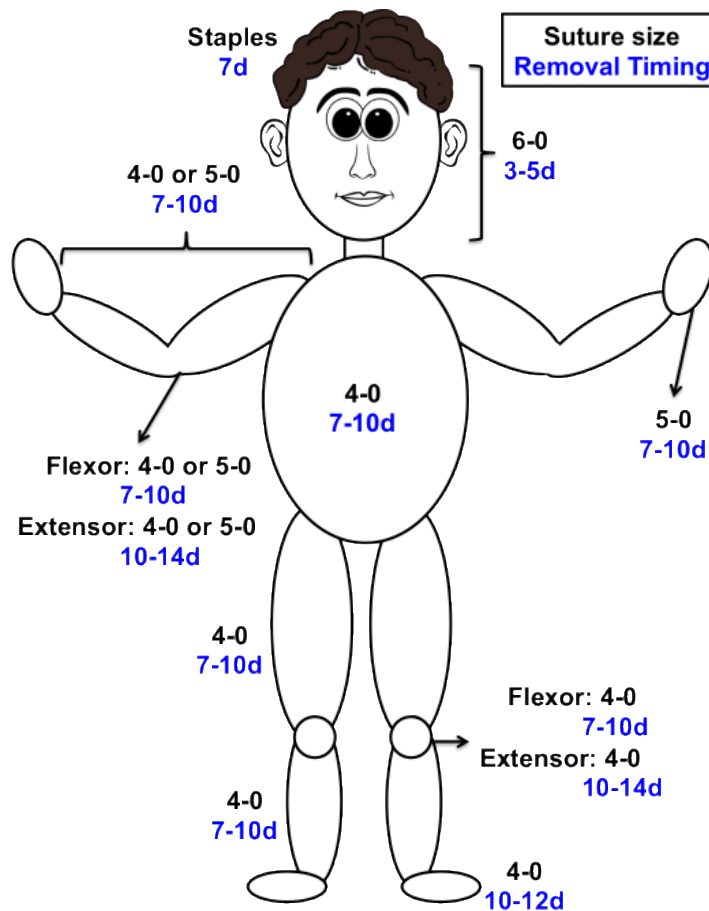


## LEARNER MATERIALS

9. True or false. Irrigation is not required, and may be detrimental, in wounds involving highly vascular, loose areolar tissue such as the eyebrow.

- ★ True
- b. False

10. Fill in the suture size and number of days before suture should be removed into each blank section on the body. For example, the face would be sutured with 6-0 sutures and be removed in 3-5 days.





## LEARNER MATERIALS

### **Suturing for Emergency Physicians: Group Application Exercise (GAE)**

The group application exercise is a hands-on activity that involves practicing a variety of sutures on pig feet. You will need:

- 1) 1-2 pig feet per learner
- 2) One suture repair kit per learner (pick-ups, needle driver and scissors) plus a scalpel for each group so learners can make their lacerations to repair (alternatively the instructor can make the lacerations ahead of time)
- 3) Suture material in various sizes. We recommend 3-0, 4-0, 5-0 and 6-0 in both absorbable and non-absorbable materials.

The GAE handout gives step-by-step instructions on which sutures to practice. It also provides sample videos of each suture for demonstration. We recommend the instructor just show each stitch at the beginning of each practice suture; however, if you are having learners work completely at their own pace they can watch the videos themselves on their devices.

To increase the group involvement, you could gamify this GAE by giving the group a set amount of time for each suture and making it a competition within each group for the “best” suture (see below for checklist on how to assess sutures).



## LEARNER MATERIALS

### Suturing for Emergency Physicians: Group Application Exercise (GAE)

#### 1. Simple interrupted sutures

Sample video: <https://lacerationrepair.com/basic-suturing-techniques/simple-interrupted-sutures/>

Make a linear laceration in your pig's foot.

Practice simple interrupted sutures. Try to ensure good approximation of skin.

We recommend practicing with a variety of suture material including very fine 5-0 or 6-0 suture that would be used for pediatric facial lacerations.

#### 2. Vertical mattress sutures

Sample video: <https://lacerationrepair.com/basic-suturing-techniques/vertical-mattress-sutures/>

Make a deep linear laceration in your pig's foot.

Practice vertical mattress sutures. Try to ensure good approximation of skin.

#### 3. Horizontal mattress sutures

Sample video: <https://lacerationrepair.com/basic-suturing-techniques/horizontal-mattress-sutures/>

Make a deep linear laceration in your pig's foot in an area of high tension (such as over the edge of the foot)

Practice horizontal mattress sutures. Experiment trying to get good approximation of tissue and note that it is rather difficult with horizontal mattress sutures. As stated in the sample video, these are best used as a temporary stitch for bringing together high tensile wounds and then closing with simple interrupted sutures.

#### 4. Deep dermal sutures

Sample video: <https://lacerationrepair.com/basic-suturing-techniques/simple-interrupted-dermal-sutures/>

Make a deep linear laceration in your pig's foot in an area of high tension (such as over the edge of the foot)

Practice deep dermal sutures. Try to ensure good approximation of skin.



## LEARNER MATERIALS

### 5. Corner stitch

Sample video: <https://lacerationrepair.com/basic-suturing-techniques/the-corner-stitch/>

Make a stellate laceration with three branches.

Practice using the corner stitch to bring the corner together with good approximation.

### 6. Figure of Eight Stitch

Sample video: <https://www.youtube.com/watch?v=F9xXh3QFTLI>

Make a small laceration in the pig's foot and drop a rubber animal balloon or penrose drain into laceration to act as your blood vessel.

Practice making a figure of eight stitch to tie off the "blood vessel."

Sample videos courtesy of:

- 1) Lin, B. Closing the gap ~ Wound closure for the emergency practitioner. LacerationRepair.com. Accessed on June 12, 2017. Available at <https://lacerationrepair.com>
- 2) Wright, A. Figure 8 suture: Proper technique example 1. Youtube.com. Accessed on June 14, 2017. Available at <https://www.youtube.com/watch?v=F9xXh3QFTLI>



# LEARNER MATERIALS

## Brief Wrap Up (optional):

The instructor should rotate around the room during the GAE and assess the learners' completion. If you want you can have learners flag the instructor when they are done with each practice laceration repair for assessment and feedback from the instructor.

The instructor should provide feedback on:

- 1) Equal bites on either side of wound
- 2) Distance between sutures
- 3) Adequate dermis bite
- 4) Square knot with adequate number of throws
- 5) Stitch perpendicular to wound edge
- 6) Eversion and approximation of wound edge

If you plan to have instructors observe the learners throughout the entire procedure instead of assessing the final suture when they are done, you could use the attached complete validated suture checklist that this is modified from: Khan MS, Bann SD, Darzi AW, Butler PE. Assessing surgical skill using bench station models. *Plastic and reconstructive surgery*. 2007; 120(3): 793-800).

## Suturing for Emergency Physicians: Complete Validated Suture Checklist

Learner: \_\_\_\_\_

No of Step	Procedure	Correctly Performed	Incorrectly Performed
1	Selection of appropriate instruments and suture		
2	Correct placement of needle in holder		
3	Correct insertion of needle into tissue >80% of bites (i.e. at 90°)		
4	Equal bites on either side of the wound		
5	Correct entry and exit points for the given needle		
6	Distance between sutures		
7	Curvature of needle followed		



## LEARNER MATERIALS

8	Smooth passage of needle, no hesitancy		
9	Careful handling of skin edge with forceps		
10	Dermis handled to cause eversion of edge		
11	Adequate dermis bite		
12	Square knot from first two throws		
13	Adequate number of throws		
14	Knot moved from suture line to cause eversion if necessary		
15	Stitch perpendicular to wound edge		
16	Eversion and apposition of wound edge		

Modified from: Khan MS, Bann SD, Darzi AW, Butler PE. Assessing surgical skill using bench station models. *Plastic and reconstructive surgery*. 2007; 120(3): 793-800).



## INSTRUCTOR MATERIALS

Answer keys to all exercises with explanations, are on the following pages.

Learners: please do not proceed.



# INSTRUCTOR MATERIALS

## Suturing for Emergency Physicians: Readiness Assessment Test Key (RAT Key)

1. Which of the following is false regarding staple wound closure?
  - a. Staples can be rapidly placed
  - ★ Staples provide meticulous wound-edge approximation
  - c. Staples are appropriate for use on the scalp, torso, arms, legs, hands and feet.
  - d. Staples are more painful than sutures
  
2. Which of the following methods of wound closure are appropriate for wounds under tension?
  - ★ Suturing
  - ★ Staples
  - d. Tissue adhesive
  - d. Tissue tapes
  
3. Match the following types of wound closure with its description
  - Primary
  - Secondary
  - Delayed primary

Type of Closure	Definition
Delayed Primary	Approximation after 3-5 days. Appropriate for large or cosmetically important lacerations that are not appropriate for primary repair.
Primary	Immediate approximation, allowing for rapid healing and minimal scarring.
Secondary	Spontaneous closure through granulation and reepithelialization.

4. Which of the following wounds is most likely to be suitable for primary closure?



## INSTRUCTOR MATERIALS

- ★ A facial laceration that is 16 hours old
  - b. A grossly contaminated laceration to the hand that is 8 hours old
  - d. An arm laceration on an immunosuppressed patient that is 12 hours old
  - d. A scalp laceration that is 48 hours old
5. The addition of epinephrine to lidocaine provides which of the following benefits?
- a. Decreases duration of action
  - ★ Reduces bleeding
  - c. Increases the amount of anesthetic required
  - d. Decreases the intensity of the anesthesia
6. What size suture material should be used for facial lacerations?
- a. 1-0
  - b. 3-0
  - c. 5-0
  - ★ 6-0
7. Why should reverse-cutting needles be used for percutaneous sutures?
- a. They provide a better angle for percutaneous stitching
  - ★ They prevent the needle from cutting the tissue that is closest to the wound
  - c. They cut more easily through skin
  - d. They are large enough to pass through the depth of most skin lacerations
8. Match the following anesthetics with their duration of action and maximum dose

**Duration**

30 min

1-2 hours

2-4 hours

**Maximum Dose**

4.5 mg/kg

7 mg/kg

3 mg/kg

Agent	Duration	Maximum Dose
1% Lidocaine with Epinephrine	1-2 hours	7 mg/kg
1% Lidocaine	30 min	4.5 mg/kg
0.25% Bupivacaine	2-4 hours	3 mg/kg



## INSTRUCTOR MATERIALS

9. True or false. Irrigation is not required, and may be detrimental, in wounds involving highly vascular, loose areolar tissue such as the eyebrow.

- ★ True
- b. False

10. Fill in the suture size and number of days before suture should be removed into each blank section on the body. For example, the face would be sutured with 6-0 sutures and be removed in 3-5 days.

