

Sim *Suture

Training Guide

-Simple Interrupted and Running Sutures-
-Instrument Ties-
-Vertical Mattress Sutures-
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Suggested Exercises and Homework Assignments

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Sim *Suture

Suggested Exercises

Welcome to this learning system that should provide you ample practice opportunities to develop your skill in suturing tissue using simple interrupted, running, vertical mattress, and subcuticular techniques. This skill will be applicable primarily to the closure of skin wounds, however, your future success with working with other tissues such as fascia, intestine and vessels is predicated on the skills that you will learn from these exercises. This guidebook will initially give you some tips on various suturing techniques and then outline a plan of practice to guide you in your learning process. Hopefully, when you are in the operating room or emergency department and are given the opportunity to suture a wound on a patient under supervision, you will have developed an understanding of the principles of wound closure and will be able to proceed with some confidence.

As with our other learning systems, Sim*Vivo believes that the training for all of your skills must be initially provided by interactive sessions with experienced mentors. Initial hands-on training under direct supervision is the key element for acquiring each skill and your mentor should be satisfied with your abilities before proceeding. We don't want you to extensively practice a skill that has not been learned correctly.

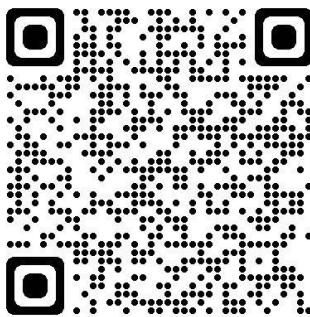
Your training materials and supplies for this module are completely portable so practice can be done in the simulation lab, at home, in the call room, or any place that you find comfortable. The timeframe for practice is also flexible. The suggested exercises will encourage you to practice enough to become proficient in the suturing activities that you are pursuing. After you complete each exercise, place a check in the box to document its completion.

We also suggest that at about the mid-point of this series of exercises that you return to the simulation lab to meet with your mentor to make sure that you are performing the tasks correctly so that remediation, if necessary, can be undertaken. This should be followed by the completion of more practice exercises after which you should meet with your mentor for final verification of your skill. When you have completed the competency testing, you should ask for some documentation of completion which can be added to your educational portfolio. In this world of increasing scrutiny over medical care providers, it is always nice to have a document that certifies your proficiency in all of the tasks that you may be required to perform. For your own personal edification, you will always have your completed suture board filled with the fruits of your efforts!

One final note: you may be taking these instruments to places where your non-medical friends and relatives (or even children) may have access to them. Please remember that that some this equipment is sharp and can be dangerous if not secured and protected properly. Please be careful! When you are done with the sharp scalpels, put the protective cover back on. Expended needles can be driven completely into the foam and

the residual suture cut off. Additionally, none of this equipment and these supplies is sterile or is certified to be used on humans or animals. End of disclaimer!

An additional tool has recently been added to the Sim*Vivo arsenal of instructional materials. We now provide free **instructional videos** on our website which can be used to demonstrate the techniques that you will be practicing with this module. They are accessed through <http://www.sim-vivo.com> or through our QR code:



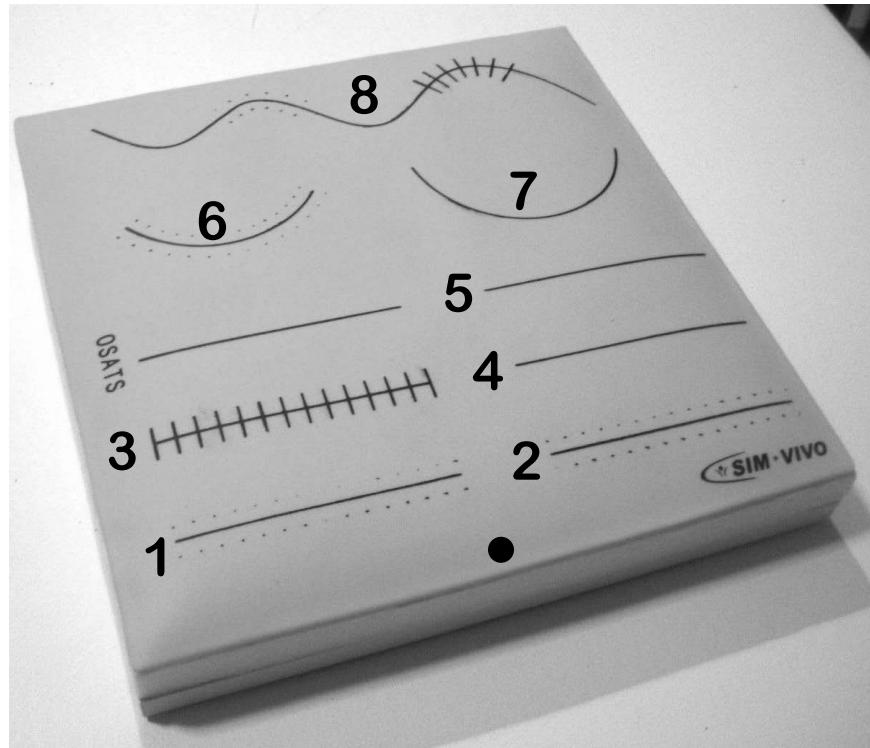
On the web site, navigate to the "Guides + Video" page where you will find a link to seven video segments that provide practical directions for learning the suturing techniques covered by this module. The seven videos focus on:

- 1- The Contents of the Sim*Suture Module
- 2- Holding and Using the Instruments and Sutures
- 3- Placing a Simple Suture
- 4- The Instrument Tie
- 5- Running Simple Sutures
- 6- The Vertical Mattress Suture
- 7- Running Subcuticular Suture

Please feel free to access these instructional videos as much as you want as you move through this guide book. We will reference the videos on the left of the text at the appropriate point in the training sequence. Let's get started!

Video 1: The Contents of the Sim*Suture Module

On the next page is a picture of the standard suture board with the areas for practice noted. Some of the lines will be used as a guide for closing wounds and incisions with interrupted, running, vertical mattress, or subcuticular sutures. For reference later, the lines have been numbered.



Demonstrate

Simple interrupted and running sutures, instrument ties

[Video 2: Holding and Using the Sutures and Instruments](#)
[Video 3: Placing a Simple Suture](#)

To begin with, your instructor should discuss the proper technique for holding the instruments and loading the needle. We recommend placing your thumb in one ring and your ring finger in the other. Do not insert your digits into the rings farther than the distal interphalangial joint. Your index finger can be placed at the joint of the arms of the needle holder for stability. The forceps are always held like a pencil in your non-dominant hand.

Start with the blue 3-0 nylon on a 30-mm needle. This needle is a bit bigger than you might use clinically but its large size is helpful in learning the basic hand maneuvers for simple suturing. The needle should be held near the tip of the needle holder and placed in a perpendicular position. The jaws of the needle driver are placed at a point about two-thirds back from the point of the needle. Grasping should still be on the part of the needle that has a flat edge. Practice loading the needle on the driver a few times ... be careful, don't stick yourself!!!!

Let's start with something simple: Put the board on a table and sit or stand a comfortable distance that will allow you to place sutures without strain on your back or elbows. Always sew towards yourself. With a pen, make a dot about a centimeter from the middle of the lower edge of the board (see the large dot in the picture). Place the needle

into the dot, rotate it around with a twist of your wrist, and exit through the foam edge just below the skin. Remember to enter and exit the surface at a 90° angle. Once you have placed the suture and the needle protrudes from the foam – let it go! The radius of the curve of the needle should be slightly greater than the depth of your bite. Now, with your hand in the prone position (palm down), grasp the needle and gently rotate it out of the foam. Pay particular attention to rotating the needle smoothly in the direction of its curve. You have just performed the basic hand motion for placing sutures. Now here is your first exercise for practice:

Place a suture into the skin through the dot on the base of board and bring it out the foam. Grasp the needle on the other side with the needle holder and gently rotate the needle out. Pull the suture through completely. Repeat 10 times



How was that? Are you getting good at pronating your hand and rotating the needle smoothly? While this may seem tedious, remember: this is may be the core element of your career! You certainly want to get good with the basics.

OK. Now for step two. With the guidance of your instructor, make an incision along the full length of line 1. You will have to use your index and thumb to place lateral traction on the skin as you do this. You will note that there is a thin layer of cottony material between the skin and the deeper foam. This represents subcutaneous tissue and allows for a more realistic flexibility of the skin. Don't forget to put the guard back on the scalpel blade when you have finished making the incision.

Now it's time to use two hands for your suturing skills. We are going to place another suture on a set of dots on either side of the line. Pick a pair of dots somewhere in the middle of the line. Grasp the edge of the skin with the Adson forceps just to the left of the dot that you have chosen on the side of the incision away from you (grasp to the right of the dot if you are left handed). Pull the edge of the skin up as you place the suture at right angle. You will be able to watch the needle go through the depths of the incision that you have made. Aim the needle toward the dot on the other side but don't engage the skin with the needle tip ... yet. Release your Adson forceps and now grip the downside of the incision just to the left of the target dot. Gently pull up on the edge of the inferior aspect of the skin to help guide the needle into the dot. As the needle begins to protrude the skin at a right angle, **don't let go of the skin with your forceps!** The needle will stay "parked" in the skin. Grasp the tip of the needle with your driver in your pronated hand and gently rotate it out of the skin in the direction of the curve of the needle. Continue to hold the lower (inferior) edge of the skin with the Adson's to stabilize it while the suture needle goes through. Despite common practice, there is no need to hold or stabilize the needle with the Adson forceps after the tip has come through. Now for the second exercise:

Place a suture into the skin through a second pair of dots of line 1. Use the Adson forceps to grasp the edges of the skin as you place and retrieve the needle. Repeat 10 times



Video 4: The Instrument Tie

Time to progress to step three. Place a suture through the skin in the middle of line 1 as you learned in the previous exercise. Pull the suture almost all the way through ... leave about 2 inches of the end protruding out from the skin. Release the needle and hold the long strand (with the needle attached) straight up from the board. Starting away from you, pull the needle driver into the suture (in a direction towards yourself) that you are holding. Wrap the suture around the needle driver twice (this will be the first throw of a surgeon's knot) and then grab the loose end of the strand. Pull the needle end of the suture away from you while you continue to bring the needle holder towards you. The first throw of your knot will gently come down to the skin. Release the end of the suture with your instrument and, once again, hold the long end of the strand up. This time start with your needle holder near you and push it into the strand that you are holding. Wrap the strand one time around the needle holder and grab the end of the suture once again. This time push the needle driver away from you as bring the free needle end towards you. The second throw of the knot will come neatly down. Repeat this one more time by bringing the needle driver towards you and wrapping the long strand once around the needle holder. Set that throw down and repeat in the opposite direction. Alternate (needle driver towards you and then away from you) until you have six throws laid flatly on the board. Pull the knot away or towards you to get it out of the wound and cut both ends of the suture with about a 5 mm tail. Congratulations, you have just completed an instrument tie!

Place a suture across line 1 and complete an instrument tie. Remember – six alternating throws. Repeat this exercise five times.



Using the dots as a guide, place simple interrupted sutures along the entire length of the incision on line 1 using instrument ties. This is done by tying an instrument knot after each throw. As you are placing the suture, try to practice the wrist pronating rotation that allows the needle to enter and exit the skin at 90° angle. Three lengths of sutures should be required for the entire exercise. Each knot should have six throws. Now look at your work: are the sutures evenly placed? Are the knots alongside but not on the incision? Do the knots look secure? If your mentor is happy, then check off the box below:

Simple interrupted suture closure under supervision



Video 5: Running Simple Sutures

Now go to line 2. Again, with the guidance of your instructor, make an incision along the full length of the line. Your instructor will demonstrate a simple running suture (or watch the instructional video). Using the dots as a guide, place a running suture along the length of the incision. For these exercises, please advance the suture in the subcutaneous tissue and keep the extracutaneous suture parallel to other sutures. When you are done,

the exposed suture should look like railroad tracks. The knots at both ends should be performed with instrument ties. Once again, if your instructor is happy, then check off the box below.

Simple running suture closure under supervision

Now, cut out all your carefully placed sutures with the cool Sim*Vivo suture scissors and let's go on to the next exercise.

Interrupted vertical mattress sutures

Video 6: The Vertical Mattress Suture

Let's say that you are closing a modestly gaping wound and for some reason, you don't want to place subcutaneous sutures to take the tension off the skin closure. You might think that if you placed simple sutures with big bites (ie, take a lot of skin with each suture) that you might be able to take the tension off the wound with these humongous cutaneous sutures. You would be right ... except that, skin being what it is, this technique will usually cause the wound edges to be rolled inward (inverted), and you would have created an epidermis-to-epidermis contact which won't heal properly. When you take the sutures out you will find that there remains a big gap of unhealed tissue right down the length of the wound. If this were to happen, you wouldn't be happy, your supervisor wouldn't be happy, and you would have to try and explain to the patient what the funny wet red line is in the middle of a supposedly healed wound. The *vertical mattress* suture was invented just to avoid this situation.

The vertical mattress suture consists of a large bite of skin and subcutaneous tissue in one direction which will take the tension off of the wound edges ... and ... a little, tiny bite of skin at the wound edges coming from the other direction that is designed to evert the skin edges to promote perfect approximation.

Take out all of the sutures from line 2. Pick a dot that doesn't look too beat up. Place a simple suture across the wound to connect two of the dots. Remember to sew towards yourself. Now, place the needle **backwards** in the needle driver (we call this "backhanding" a suture). Grasp the edge of the skin closest to you in the same plane as your initial bite and using a *reverse pronation* motion, place a suture from bottom to top across the very edges of the skin. Tie to the end of the suture. See how the skin edge everts slightly. This reverse backhanding takes some practice, so here goes:

Place vertical mattress sutures into the skin of line 2. Use the dots as guides. Try and put the skin-edge suture as close as possible to the cut edge. Tie with instrument ties. Pay particular attention to practicing the backhand part of this suture. Repeat 10 times, If the instructor approves, check the box.

Running subcuticular sutures

Video 7: Running subcuticular suture

For small procedures with clean wound edges, it is very convenient to place the sutures “under the skin”. Subcuticular sutures are placed in the dermis and the resultant closure is usually reinforced with Steri-strips or tissue glue. Suture removal is unnecessary.

Usually, this suture technique involves a continuous suture that is anchored at either end with a knot in the subcutaneous tissue.

For this exercise, you will use the 4-0 nylon on a 19-mm needle. Usually an absorbable suture such as polyglactin, polydioxanone, or poliglecaprone is used, but nylon has the same characteristics for practice purposes. To begin, incise line 3 that has the crosshatches across it. Because you want the forceps in front of the suture, you will probably want to sew from right to left. As a first practice step to get the feel of the subcuticular bite, grasp the top of the incision about an inch from the right corner apex with the forceps. Pick a crosshatch. Place the needle so that it enters the substance of the skin edge at the crosshatch at about a 30° angle and exits about 2-3 mm to the left just about the point that you are grasping with the forceps at another crosshatch. Exit and enter on the crosshatches. You will find the skin of this model to be quite flexible and difficult to stabilize but this is how it is on real skin! You may have to pull the skin edge up and away from the board to stabilize it as the needle goes through. The first couple of times, it might be frustrating but keep practicing ... you will get it!

Pull the suture through until about 2 inches remains. Now, place another suture in the same fashion at the next pair of crosshatches. Continue until you have placed sutures through nearly the entire length of the upper skin edge. Repeat for practice. Now do the same thing on the lower skin edge and repeat. You will find that there are different hand motions for sewing on the upper and lower skin edges.

Now for real thing: Start your suture line on the right by taking a bite of the deep subcutaneous tissue (that would be the foam) and tie a knot with the instruments. You can get started by backhanding a suture into the subcuticular apex of the incision. Enter the skin on the undersurface of the apex and push the needle out just below the surface of the skin right at the apex of the cut surface. Now, place a bite in the upper edge of the incision just to the left of the apex and retrieve the needle at the next crosshatch. The next bite is placed in the matching crosshatch on the other side. The crosshatches should align. Continue down the incision while trying to keep the crosshatches even. At the other end, complete the suture line with a final bite that starts subcuticularly in the apex and continues deep into the subcutaneous tissue. A loop is left in the next to final bite to be used for the tie. After tying the knot, the loop is cut off and the remaining end connected to the needle is brought from the depths of the wound out through a spot in the normal skin a centimeter or two from the incision. . The suture is cut flush with the skin. Voilà ... you have just completed a subcuticular closure!

Now practice:

Remove the previously placed subcuticular suture and place another one to close line 3. Repeat one more time. If the instructor thinks that this is OK, check the box.

Practice ... on your own time

Now that your instructor has signed off on your performance, it is time to “solo”. Take your suture board to a quiet place (or if you work better under stress, go to a noisy place) and either stand at a table with the board a comfortable distance from your shoulders (while standing straight – no backaches from this module!) or sit with the board at about three-quarters of an arm’s length away and at mid-chest level. Make sure there is good light and that all of your instruments are within easy reach. If you feel comfortable, you can transition your practice of the simple and mattress suturing techniques with the smaller 24 mm needle on the black nylon which is closer to the real needle that is used.

Start on line 1. Close this “skin incision” with simple interrupted sutures. Instrument ties should contain six throws. Don’t forget to use the curve of your needle. Needle orientation on entry and exit should be perpendicular. How does it look? Would you accept this if you were the patient?	<input type="checkbox"/>
Now go to line 4. Using the scalpel (as demonstrated in the skill’s lab), make an incision the entire length of the line. Close this incision with simple interrupted sutures. Are you still doing pretty well even though there are no dots to guide you.	<input type="checkbox"/>
Back to line 2. Close this incision with a running simple suture. Don’t forget to keep some tension on the suture line as it is progressing. Does this look as good as the one you did for the instructor?	<input type="checkbox"/>
Move on to line 4. . Cut out all of the interrupted sutures. Close this incision with a running simple suture. Are the external crossover sutures parallel? Remember that, no matter how good you are, the patient only sees the skin closure. Make it a work of art!	<input type="checkbox"/>
Incise line 5. Close the incision with interrupted vertical mattress sutures. Are the edges inverted? How is your spacing?	<input type="checkbox"/>
Take out the sutures in line 5. Close it again with running subcuticular suture. Are there pleats on either side? There shouldn’t be! Take it out and do it again, if necessary to avoid any pleating.	<input type="checkbox"/>

Remove the sutures from lines 3 and 4. It's time to go back to your mentor for a check-up.

Verification and Demonstration

The purpose of this session it is to make sure that you have learned and are performing the tasks correctly. In front of your instructor, do the following:

Go first to line 4. Close this incision with simple interrupted sutures. If you are doing well, have your instructor initial next to the box.	<input type="checkbox"/> _____ initials
Now go to line 5. Close half of this incision with a running simple suture. Good enough for initials?	<input type="checkbox"/> _____ initials
Close the other half of line 5 with interrupted vertical mattress sutures. Are the edges apposed?	<input type="checkbox"/> _____ initials
Take out the sutures on line 5. Close it again with a subcuticular suture. Do you think that the patient would approve of your job?	<input type="checkbox"/> _____ initials

Suturing on curves can be a pretty difficult task. The key to success is to make sure that the sutures on the outside of the curve are placed the normal distance apart while those on the inside of the curve are squeezed together. Make a mark at the mid-point of line 6. Now incise the line with a smooth stroke of the scalpel. Make sure your instructor or mentor checks you out as you complete this exercise.

Close the left side of the line with interrupted sutures. Does the incision come together without dog-ears?	<input type="checkbox"/>
Close the right side of the line with a running suture. Are all of the --over sutures parallel? Would you want your wound to look like this?	<input type="checkbox"/>
Take out the sutures and close the entire curve with a subcuticular closure. Of course, there are no pleats ... are there?	<input type="checkbox"/>

Practice ... anywhere you want!

On your own time and in a comfortable, convenient environment complete the following exercises:

Take out all the sutures on line six and close it again with vertical mattress sutures. Are the skin edges everted?	<input type="checkbox"/>
Make a mark at the midpoint of line 7. Smoothly incise the line. Close the left half with interrupted sutures and the right half with a running suture. Do your sutures	<input type="checkbox"/>

seem to radiate from a single point in the center of the curvature? No wrinkles or dog ears, right?	
Now is the daddy of all exercises. Incise line 8 along its entire length. Close the left half of this incision with a running simple suture. Beware of the curves! As a reminder: one of the curves has the dot guides. Only check the box, if you are happy with the result. If not ... then repeat the exercise.	<input type="checkbox"/>
Close the right side of line 8 with a running subcuticular suture. Use the hatch marks to help you navigate around the curve. Remember to enter the subcuticular tissue at the same level that you exited on the other side. Do you feel comfortable suturing around curves? If it doesn't look good, do it again.	<input type="checkbox"/>

If you have areas of weakness, practice all you want. When you are ready, schedule a time to return to the skills lab with your mentor to get "checked out."

Competency Testing

Back to the skills lab. Calm your nerves, take another deep breath. Have your instructor look at your work on lines 6, 7, and 8. Satisfied? If so, you may proceed.

Your testing exercise will be on line 9 labeled OSATS (Objective Structured Assessment of Technical Skills). It is simple ... but you must be precise and careful. Make a mark at the midpoint of the line. Incise the line entirely. Close the right half with an interrupted suture (make one or two of them a vertical mattress suture) and the left half with a running suture.

Cut out the sutures and then close the entire line with a subcuticular suture.

Is the instructor satisfied? If so ... congratulations! You have successfully completed this module! Be proud of your work! Feel free to show your completed suture board proudly to all your friends and family. Send us a picture at simsales@sim-vivo.com! We are proud of your accomplishments too.

After completing this exercise, you shouldn't rest on your laurels. Dust off your suture board occasionally and practice a little. Remember that Shaq became a maestro of basketball by shooting 500 baskets a day for his entire life. Practicing a few sutures every now and then will certainly maintain your skills (although it might not get you a contract with the NBA). Good luck in achieving all your career goals.

JBF
Revised 12/10/2016

Module Contents

Suture Practice Board

Hegar Needle Driver

Adson Forceps

Suture Scissors

Scalpels (#10 and #15)

Suture material 10 each:

3-0 nylon on 30 mm reverse cutting needle (blue)

3-0 nylon on 24 mm reverse cutting needle (black)

4-0 nylon on 19 mm reverse cutting needle (black)

Guidebook

Some materials made in China and Pakistan. Proudly assembled in the USA in Naples, FL

No materials in this module are sterile. All contents are to be used for educational or demonstration purposes only. Not approved for use on humans or animals. Please dispose of sharp materials in a safe manner



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Sim*Cath – an inexpensive complete central venous catheter kit to facilitate the placement of central lines in all available manikins.

Sim*Dissect – a novel module that allows for the practice of two-handed dissection skills

Sim*Supply –

- practice sutures (3-0, 4-0, 5-0, and 6-0 nylon, 2-0 and 3-0 silk, #1 nylon) with needles
- practice ties (0-nylon, 3-0 silk, 6-0 nylon)
- simulated bowel
- common surgical instruments
- instructional surgical kits (skin closure, dissection, vascular)
- practice bandages

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