Bone Healing: Normal, Disrupted and the Complication of Fat Embolism
Double Bent Extended Deep Tissue Retractor
Designed to help maximize exposure with 90° arms and deep tissue blades

PRODUCT NO: 1859

Large Exposure Self-Retaining Retractor
Designed by Vincent Ng, MD
Designed for effective exposure of large wounds

PRODUCT NO: 1581-01

Trauma/Spine Deep Tissue Retractor
Designed to help maximize exposure with 90° arms and deep tissue blades

PRODUCT NO’S:
- 1862 [4 Teeth]
- 1863 [7 Teeth]

MADE EXCLUSIVELY FOR INNOMED IN GERMANY

Self-Retaining Tension Retractor
The expandable design allows for a wide variety of blades to be used for exposure in total joint and trauma procedures

PRODUCT NO: 1586

Over 40 blades of various depths, widths, shapes, and styles available

Handle only – blades not included.

PRODUCT NO: 1586

Durham Offset Zelpi Retractor
Designed by Alfred Durham, MD
Staggered depth retractor designed for exposure during total hip and total shoulder surgery

PRODUCT NO’S:
- 1573-L [Left]
- 1573-R [Right]

FREE TRIAL ON MOST INSTRUMENTS
ISO 13485:2016

INNOMED

Scan to Launch Our Website

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1.800.548.2362
The purpose of the Journal is to advance the quality of surgical patient care by providing a forum for the exchange of knowledge in surgical technology and by promoting a high standard of surgical technology performance.
One Team. One Goal. Surgical Patient Safety

JOSEPH CHARLEMAN, CST, CSFA

BOARD MESSAGE

One Team. One Goal. Surgical Patient Safety. This is the motto of the Council on Surgical and Perioperative Safety (CSPS). The Council on Surgical and Perioperative Safety was incorporated as a nonprofit, 501(c)3 organization, in 2007. The Board of Directors consists of two representatives from each of the seven professional organizations. The organizations are: The Association of Surgical Technologists (AST), the American Association of Nurse Anesthetists (AANA), the American Association of Surgical Physician Assistants (AASPA), the American College of Surgeons (ACS), the American Society of Anesthesiologists (ASA), the American Society of PeriAnesthesia Nurses (ASPAN) and the Association of PeriOperative Registered Nurses (AORN).

The CSPS brings each member of the surgical team together to improve patient safety. The mission of the CSPS is to promote excellence in patient safety in the surgical and perioperative environment. The vision of the CSPS envisions a world in which all patients receive the safest surgical care provided by an integrated team of dedicated professionals. This collaboration between organizations allows for the free exchange of ideas and open communication regarding healthcare issues. In June of 2015, the Food and Drug Administration (FDA) and the Joint Commission passed the responsibility of the preventing surgical fires initiative and its responsibilities to the CSPS. The CSPS is the repository for the patient safety fire initiative and the resources on preventing surgical fires are linked on the CSPS website. In addition, the CSPS has numerous resources on surgical patient safety provided by all seven organizations easily accessible at CSPSTeam.org.

In the past, the AST has been represented on the CSPS by Sherri Alexander, CST, FAST; and Margaret Rodriguez, CST, CSFA, FAST; both were instrumental in advocating for patient safety from the viewpoint of the Certified Surgical Technologist (CST). Currently, the AST representatives on the CSPS are Gemma Fournier, CST, and myself. The recently published statement in the AST Journal on operating room head attire is an example of the multi-organizational collaboration that focuses on healthcare safety and standards.

The CSPS is focused on current issues affecting the surgical patient and the surgical team. The recent work by the CSPS team has produced materials on noise and distraction in the operating room, surgical team burnout, DNR/ DNAR/DNI and workplace violence. The AST membership should be aware that these materials and resources are freely available, for them and their healthcare facilities. It is important that the AST membership know that the voice and input of the CST is represented on issues of surgical patient safety. The professional collaboration between these organizations can only yield better outcomes for the surgical patient. We encourage all of the AST membership to advocate for patient and surgical team safety.

As I assume the role of chair of the CSPS, I welcome open communication from the AST membership on patient safety outcomes.

“Courage is what takes to stand up and speak; Courage is also what it takes to sit down and listen.” – Winston Churchill
### Thursday, February 7, 2019

<table>
<thead>
<tr>
<th>Time</th>
<th>Track One</th>
<th>Track Two</th>
<th>Track Three</th>
<th>Track Four</th>
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</thead>
<tbody>
<tr>
<td>10 am–5 pm</td>
<td>AST Registration</td>
<td>FiSTSA Accreditation Fundamentals for Educators (AFE)*</td>
<td>NBSTSA Updates NBSTSA</td>
<td>Successfully Completing the ARC/STSA Annual Report Part I Ron Kruzel, CST, ARC/STSA Executive Director</td>
</tr>
<tr>
<td>Noon–1 pm</td>
<td>ARC/STSA Lunch*</td>
<td>Promenade/Sunrise Patio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5–5:15 pm</td>
<td>Welcome!!! AST, ASA, ARC/STSA, NBSTSA</td>
<td>Fiesta Ballroom I/I</td>
<td>1 CE</td>
<td></td>
</tr>
<tr>
<td>5:15–6:20 pm</td>
<td>YOU! Super Start! Super Hero! Super Exhausted ... Linda Larsen, keynoter</td>
<td>Fiesta Ballroom I/I</td>
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<tbody>
<tr>
<td>7 am–6 pm</td>
<td>Registration</td>
<td>Exhibits</td>
<td></td>
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</tr>
<tr>
<td>7 am–5 pm</td>
<td>ARC/STSA-sponsored breakfast</td>
<td>Fiesta Ballroom I/I</td>
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<tr>
<td>7–7:45 am</td>
<td>Critical Thinking: Engaging the Student Brenda Korich, CST; Stormie Perry, CST</td>
<td>Fiesta Ballroom I/I</td>
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</tr>
<tr>
<td>8–8:50 am</td>
<td>Preceptor Complacency in the OR: The Struggle is Real Stefanie Vaughn, CST</td>
<td>Fiesta Ballroom I/I</td>
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<tr>
<td>Noon–12:50 pm</td>
<td>Lunch (Grab and Go)</td>
<td>Promenade/Sunrise Patio</td>
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**Time Track One:**
- 1–1:50 pm: Using Coaching Tools for Lab Instruction Michael Sells, CST, RN
- 2–2:50 pm: Innovative Strategies for Selecting Your Next Cohort Richard Frusconse, CST, FAST
- 3–3:50 pm: Preparing Your Students to Take the Certification Exam Jennifer Germany, CST
- 4–4:50 pm: Teaching Instrumentation: Learning With Speed and Repetition Lora Smith, CST, Med
- 5–5:50 pm: Motivating the Educator Alison Wilson, CST

**Time Track Two:**
- 1–1:50 pm: Building Career Skills Early: Professionalism, Teamwork, and Leadership Marcelo Chavez, CST
- 2–2:50 pm: Preceptorship–To Teach or Not to Teach April Anderson, CST
- 3–3:50 pm: Preparing a Template for a Program Handbook Carolyn Ragsdale, CST, FAST
- 4–4:50 pm: Fostering Positive Relationships Jennifer Mazey, CST
- 5–5:50 pm: Preparing the Surgical Technologist Before Clinical Placement David Camarena, CST

**Time Track Three:**
- 1–1:50 pm: NBSTSA Updates NBSTSA
- 2–2:50 pm: Restoring Professionalism in the OR Nadja Burgess, CST
- 3–3:50 pm: The Dance Continues... The Collaboration of the Site, Program, and Student Liza Chapa, CST
- 4–4:50 pm: Best Practices for Students: How to Take Notes, Study Effectively, and Improve Performance Jennifer Sands, CST
- 5–5:50 pm: Classroom Management Strategies Diane Jasper, CST

**Time Track Four:**
- 1–1:50 pm: Successfully Completing the ARC/STSA Annual Report Part I Ron Kruzel, CST, ARC/STSA Executive Director
- 2–2:50 pm: Successfully Completing the ARC/STSA Annual Report Part II Ron Kruzel, CST, ARC/STSA Executive Director
- 3–3:50 pm: ARC/STSA Beginner Site Visitor Training Part I
- 4–4:50 pm: ARC/STSA Beginner Site Visitor Training Part II
- 5–5:50 pm: ARC/STSA Advanced Site Visitor Training

**6–7 pm:** Reception

**Friday, February 8, 2019**

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<tr>
<th>Time</th>
<th>Track One</th>
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**Time Track One:**
- 1–1:50 pm: Preparing Your Students to Take the Certification Exam Jennifer Germany, CST
- 2–2:50 pm: Preparing a Template for a Program Handbook Carolyn Ragsdale, CST, FAST
- 3–3:50 pm: The Dance Continues... The Collaboration of the Site, Program, and Student Liza Chapa, CST
- 4–4:50 pm: Fostering Positive Relationships Jennifer Mazey, CST
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**Time Track Three:**
- 1–1:50 pm: Building Career Skills Early: Professionalism, Teamwork, and Leadership Marcelo Chavez, CST
- 2–2:50 pm: Preceptorship–To Teach or Not to Teach April Anderson, CST
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- 4–4:50 pm: Best Practices for Students: How to Take Notes, Study Effectively, and Improve Performance Jennifer Sands, CST
- 5–5:50 pm: Classroom Management Strategies Diane Jasper, CST

**Saturday, February 9, 2019**

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<tbody>
<tr>
<td>7:45 am</td>
<td>AST-sponsored breakfast</td>
<td>Exhibits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:30 am–3 pm</td>
<td>Registration</td>
<td>Exhibits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 am–4 pm</td>
<td>Conversations of 8</td>
<td>Exhibits</td>
<td></td>
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<tr>
<td>10:10 am</td>
<td>Implementing AST Guidelines in the Classroom, EPSC Panel Discussion</td>
<td>Fiesta Ballroom I/I</td>
<td></td>
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</tr>
<tr>
<td>11:10 am</td>
<td>LAB: Student Tested, Instructor Approved Shauna Jackson, CST</td>
<td>Fiesta Ballroom I/I</td>
<td></td>
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</tr>
<tr>
<td>12:15 pm</td>
<td>Lunch</td>
<td>Exhibits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–1:50 pm</td>
<td>Critical Thinking in a Computerized World Jeanne Glapion, CST</td>
<td>Fiesta Ballroom I/I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2–2:50 pm</td>
<td>Inter-Professional Simulation Tiffany Howe, CST, CSFA, FAST; Jade Hollister, CST; Krista Hagemann, CST</td>
<td>Fiesta Ballroom I/I</td>
<td></td>
<td></td>
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<tr>
<td>3–3:50 pm</td>
<td>Conversations of 8 Summary</td>
<td>Fiesta Ballroom I/I</td>
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</table>

**6–7 pm:** Reception

**Total:** 17 CE credits

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*This activity has been submitted to the Association of periOperative Registered Nurses, Inc. for approval to award contact hours. The Association of periOperative Registered Nurses, Inc. is accredited as an approver of continuing education by the American Nurses Credentialing Center’s Commission on Accreditation. Activities that are approved by AORN are recognized as continuing education for registered nurses. This recognition does not imply that AORN of the ANCC Commission on Accreditation approves or endorses any product in the presentation.*

*Separate registration at www.arcstsa.org*
HAPPY ANNIVERSARY!

Congratulations to the following state assemblies as they celebrate anniversaries this month! AST appreciates your hard work, dedication and all your years of service for making our state assemblies the backbone of this organization.

Kentucky – 14 years  
Louisiana – 17 years  
Massachusetts – 17 years  
Minnesota – 18 years  
New Jersey – 12 years  
Oregon – 18 years  
Texas – 18 years  
Utah – 12 years  
Virginia – 18 years

APPLY FOR FAST

Interested in being considered for the designation of the Fellow of the Association of Surgical Technologists or FAST? This prestigious honor began in 2006 as an opportunity to recognize those individuals who have upheld the highest professional, ethical and moral standards and traditions of the surgical technology profession, and whose professional activity has been devoted to the advancement of the profession toward improving the quality of surgical patient care.

Applications are available online and all applications are due by May 1. There are no exceptions.

Before Your Apply: Make sure to thoroughly read the selection criteria and gather all documents and information that are needed to complete the application prior to starting. Please plan ahead and allow for enough time to complete the application. If you close out of your window or browser before hitting submit, you will lose any details you have entered. Once you click submit, it will be submitted to the FAST Selection Panel. All required information must be completed before you are allowed to submit.

Selection Criteria: To see if you meet the criteria to apply to become a FAST, visit www.ast.org – Members – Fellows of FAST – and click on the link selection criteria.

To apply for FAST, you will need to use your login information to sign into your AST account. Then look for FAST and click on the application.

SCHOLARSHIPS

APPLY FOR A MEDICAL MISSION SCHOLARSHIP – DEADLINE IS DECEMBER 31

Have you recently served on a medical mission trip, or will have by the end of the year? Apply for assistance to help cover funds occurred while serving. The Foundation for Surgical Technology assists individuals who volunteer for medical missionary work. All applicants must be active AST members with currency. (A member is eligible to receive this award one time only.)

All applicants must be current AST members. Other eligibility requirements include:

- All applicants must provide a description or their membership history – join date and any AST involvement.
- All applicants must provide official documenta-
tion from the mission program they have described.

- All medical missions must include official receipts documenting the costs incurred by the individual and all costs must be shown in dollars. All assistance is determined after the medical mission trip has occurred and the appropriate documentation has been provided.
- Two letters of recommendation also must be provided.

Medical Mission applications are due by December 31, 2018. To apply, visit www.ast.org – About Us – Medical Missions.

CONTINUING EDUCATION CREDITS

THE 411 REGARDING CE CREDITS AND RECERTIFICATION

AST is responsible for verifying, processing and recording CE credits earned by the CST and CSFA to be applied toward the renewal of the credential. The CE credits are maintained in the members CE file.

Three Methods a Member Can Confirm CE Credits

1. When CE credits are recorded a CE Credit Letter confirming the number of CE credits that were accepted and recorded is mailed for personal records.
2. AST website using member login information at www.ast.org.
3. Every January, AST mails an annual CE Credit Letter to all members with the total number of CE credits that have been earned during the previous calendar year.

AST-APPROVED CE

AST is also the approval body for CE. Businesses and organizations that would like to offer CE to the CST and CSFA are required to submit their CE offerings to AST for review and possible approval. The CST and CSFA are required to earn AST-approved CE credits. However, this does not apply to healthcare facility in-services; live events that are planned and sponsored by professional organizations that are accredited by the Accreditation Review Council for Continuing Medical Education (ACCME); or live events approved through the American Dental Association’s Continuing Education Recognition Program (ADA-CERP) and Joint Commission on Allied Health Personnel in Ophthalmology (JCAHPO). Healthcare facilities are not required to complete the CE program approval process for in-services as well as ACCME-accredited professional organizations who sponsor a live event or live events approved through the ADA-CERP and JCAHPO are not required to complete the approval process.

SUBMITTING CE CREDITS

There are three ways to submit the AST CE Reporting Form with supporting documentation:

- Mail: AST, 6 West Dry Creek Circle, Suite 200, Member Services Dept, Littleton, CO 80120-8031.
- Fax: (303) 694-9169. Do not mail CE documentation that has been sent by fax.
- Email scanned documentation in PDF format to: memserv@ast.org. Do not mail CE documentation that has been sent by email.

It is encouraged that CE credits be submitted six months prior to recertification. On average, CE credits are processed within 10 business days upon receipt of the CE documentation, so plan accordingly.
The CST must earn 60 CE credits and the CSFA must earn 75 CE credits during the four-year certification cycle in order to renew the credential by continuing education.

Advantages of Earning CE Credits as an AST Member:
▲ Avoid paying the $400 nonmember CE processing fee.
▲ Ability to track earned CE credits online through the Members area of the AST website.
▲ Receive a yearly report of cumulative CE credits.
▲ Online CE can be earned through the AST website and multiple CE credit packages are available at a substantial discount.
▲ Savings on annual AST events including the Educators Conference and the National Surgical Technology Conference.

HEALTHCARE-FACILITY SPONSORED IN-SERVICES
Healthcare facility in-services are reviewed by AST for CE credits if they are relevant to the medical-surgical practice of surgical technology or surgical assisting. The following policies apply in regard to the acceptance of in-services:
▲ Healthcare facility orientation is not accepted for CE credits.
▲ ACLS, ADLS, BLS, BDLS, BTLS, CPR and PALS are accepted for CE credits. (Every 50-60 minutes in length = 1 CE)
▲ If the employer sponsors or provides funds for an employee(s) to attend a conference, forum, seminar, symposium or workshop or complete any other type of CE activity sponsored by an organization other than the healthcare facility, the program must be AST approved in order to have the CE credits count toward certification renewal.
▲ AST accepts annual mandatory CE activities relevant to the medical/surgical practice of surgical technology and surgical assisting, eg, fire safety.
▲ Training provided by a healthcare facility and work experience CE credits are not awarded for on-the-job training, healthcare facility orientation or work experience that the CST and CSFA completes as an employee of the healthcare facility providing the training. For example, a CST is completing on-the-job training in learning the first scrub role to be a member of the healthcare facility’s cardiovascular team. This training is distinct from attending healthcare facility sponsored in-services as described above.

▲ Submitting In-service CE Credits: A hospital certificate of attendance, transcript or sign-in sheet with an authorized signature, eg, surgery department supervisor, clinical educator or other individual authorized by the employer. The documentation also should include the name of the healthcare facility, indicate it as an in-service, title of in-service date of in-service, and number of CE credits. The documentation should be submitted with the AST CE Reporting Form.

AST CE ONLINE RESOURCE CENTER
▲ There are three free online CE credits per year: That’s 12 CE credits or 20% of the required 60 CE credits for the CST during the four-year certification cycle. Turn to page 473 for the list of free CE credits.
▲ AST Member CE Packages
  • Package 1: 21 CE Credit Package for $35 (2007)
  • Package 2: 18 CE Credit Package for $30 (2008)
  • Package 3: 10 CE Credit Package for $15 (2009 – Neurosurgical Specialty)
  • Package 4: 10 CE Credit Package for $15 (2009 – Orthopedic Specialty)
  • Package 5: 12 CE Credit Package for $19 (2010 – General)
  • Package 6: 12 CE Credit Package for $19 (2010 – General)
  • Package 7: 17 CE Credit Package for $29 (2011 – General)
  • Package 8: 8 CE Credit Package for $13 (2012 – General)
  • Package 9: 17 CE Credit Package for $29 (2013 – General)
  • Package 10: 22 CE Credit Package for $37 (2013 – General)
  • Package 11: 22 CE Credit Package for $37 (2013 – General)
  • Package 12: 13 CE Credit Package for $21 (2013 – General)
  • Package 13: 17.5 CE Credit Package for $29 (2013 – General)
  • Package 14: Members may access this package by logging into their account on the AST website.
  • Package 15: 16.5 CE Credit Package for $27 (2015 – General)
  • Package 16: 20 CE Credit Package for $33 (2017 – Guidelines) Members may access this package by logging into their account on the AST website.
  • Package 17: 11.5 CE Credit Package for $17 (2017 – Guidelines) Members may access this package by logging into their account on the AST website.
  • Package 18: 16 CE Credit Package for $26 (2017 – Guidelines) Members may access this package by logging into their account on the AST website.
  • Package 19: 9.5 CE Credit Package for $13 (Videos) Members may access this package by logging into their account on the AST website.
  • Package 20: 5.5 CE Credit Package for $10 (Preceptor Course) Members may access this package by logging into their account on the AST website.
  • Package 21: 10 CE Credit Package for $15 (Open Domain
Become a part of the UPMC Pinnacle team and work in a collaborative work environment with competitive wages and benefits.

Surgical services opportunities are available at all UPMC Pinnacle acute care hospitals:
- UPMC Pinnacle Carlisle
- UPMC Pinnacle Community Osteopathic
- UPMC Pinnacle Hanover
- UPMC Pinnacle Harrisburg
- UPMC Pinnacle Lancaster
- UPMC Pinnacle Lititz
- UPMC Pinnacle Memorial
- UPMC Pinnacle West Shore

For more information, visit UPMCPinnacle.com/NurseSurgTech.

Articles) Members may access this package by logging into their account on the AST website.
- Package 22: 17.5 CE Credit Package for $28 (Members may access this package by logging into their account on the AST website.)
- Package 23: 15 CE Credit Package for $24 (Members may access this package by logging into their account on the AST website.)

▲ Submitting Online CE Credits:
- Pay online and the CE credits post to your AST record automatically within 24 to 48 hours.
- You do not need to submit the certificate of completion or an AST CE reporting form if you are submitting online CE credits. These credits are non-refundable and cannot be processed to another certification cycle.

Find them online at www.ast.org, Earn CE Now or by logging into your account.

EVENTS

AST Surgical Technology Conference

▲ Submitting Conference CE Credits
- Member: CE credits are automatically recorded in your AST CE file. A CE credit conference confirmation letter is mailed for your personal records four to six weeks post-conference.
- Nonmember: A CE credit conference confirmation letter is mailed four to six weeks post-conference. Your conference registration fee includes one year of AST membership.

State Assembly
State assemblies provide CE during meetings as well as serve as the grassroots organization in regard to state legislative efforts. Announcements of state assembly meetings are published in The Surgical Technologist, on the state’s websites, and the AST website under the State Assembly tab. State Assemblies also contact state members regarding upcoming meetings through email and mailings.

▲ Submitting State Assembly CE Credits
- All state assemblies are required to complete the AST CE program approval process prior to the dates of the meeting in order for the CE credits to be approved. The participant should verify that the meeting has been AST approved.
- The State Assembly is required to provide a certificate of attendance to the participants.
  - Member: Submit a copy of the certificate to AST for processing. No AST CE Reporting Form is needed.
  - Nonmember: Include a copy of the certificate and the AST CE Reporting Form with the $400 nonmember processing fee.

To find even more ways to earn CEs, go to www.ast.org – Members – Professional Resources and click on the A to Z of Continuing Education and Recertification.
Step Up and Join the Movement

SHONDRA MCGILL, CST, FAST

STATE ASSEMBLY

So, you want to join your state assembly’s board of directors … but what position are you interested in?

To be a director or officer on your state’s Board, you must have been an AST member for at least one year. To be president, you must have served on your Board for at least one term. For all positions, you also must hold current certification through the National Board of Surgical Technology and Surgical Assisting (NBSTSA).

Additionally, you must have the willingness and time to devote to the commitment. This is not another notch on the belt, but a way of life that you want to share with others. Whether you serve on a committee or are president, there is no better feeling than knowing you have done your best to represent your membership’s best interests.

Any position you serve on your state assembly is not to be taken lightly. Like working in the OR, your state assembly is a team. By working together, you help each other to accomplish a common goal: to help each other, and those in your state, grow and be recognized in our profession. It is not always easy. Personality conflicts and differences of opinions frequently occur, and we do not all think the same way. However, that is what makes a good Board. One person may have a great idea that another can make it even better, while another opinion can put a totally different spin on it. The idea is to represent our membership to the best of our abilities and keep each other accountable for our decisions as well as our actions or lack thereof. Following policy, procedures and the bylaws of our national organization will help with most conflicts.

Unsure of what to do or where to turn? Our state assemblies are afforded with a State Assembly Leadership Resource website to help guide each board member along their journey. Can’t find what you are looking for or need more help? That is what your friendly State Assembly Leadership Committee (SALC) is here for. You can find your individual state representative in this edition on page 456.

Do you love what you do? Do you want to bring that passion to others? Each state has a state assembly. Visit www.ast.org and find your State Assembly’s website to learn when their next workshop or conference with elections are. You also can find this information on your AST Member Dashboard by logging in at www.ast.org.

As we prepare to celebrate 50 years, get to know your state’s Board of Directors and ask how you can join the movement for the next 50.
AST is in search of speakers for its golden anniversary conference next June in National Harbor, just 20 south of Washington DC. We are looking for passionate speakers to share their expertise with more than 1,500 attendees and partake in our golden celebration in 2019.

Know a surgeon who would make a good fit? You can find our speaker profile application by visiting www.ast.org - Educators - Events.
Bone Healing: Normal, Disrupted and the Complication of Fat Embolism

Teri Junge, CST, CSFA, CSPDT, MED, FAST

Following a bone fracture, complete bone healing is expected in eight to 12 weeks under optimal circumstances. For complete union of a fracture, the site of injury should be completely immobilized (by means of an internal or external fixation device) and be in proper alignment. Additionally, the patient should be in good general health, well nourished, infection free and all physiologic mechanisms to facilitate the normal process of bone healing should be intact.

Normal Bone Healing

The normal process of bone healing involves five stages: inflammation, cellular proliferation, callus formation, ossification and remodeling.

The inflammatory stage begins at the time of injury and lasts approximately two days. The fracture hematoma, which is a result of the extravasation of blood caused by the injury, is formed during this time. The blood clot serves as a foundation for the subsequent cellular proliferation stage.

The cellular proliferation stage begins approximately on the second day following the traumatic event. Macrophages debride the area and allow for the formation of a fibrin mesh that seals the approximated edges of the fracture site. The fibrin mesh serves as the foundation for

Learning Objectives

▲ Learn about the processes of bone healing
▲ Explain fat embolism and fat embolism syndrome
▲ List the contributors that help bones heal
▲ Review the factors that disrupt the bones from healing
▲ Discuss treatment options for fat embolism and fat embolism syndrome
capillary and fibroblastic ingrowth. A soft tissue or periosteal callus is formed on the outer surface or cortex of the fractured bone by the collagen producing fibroblasts and osteoblasts.

The callus formation stage lasts three to four weeks. Soft tissue growth continues and the bone fragments grow toward one another, bridging the gap. Osteoblasts form a matrix of collagen that invades the periosteal callus, bridging the fracture site and uniting the two ends of the bone. Fibrous tissue, cartilage and immature bone stabilize the fracture site.

The ossification stage begins two to three weeks following the injury and can last three to four months. The matrix of osteoblasts, now called the osteoid-calcifies, firmly unite the bone. The bone is capable of accepting mineral deposits.

The remodeling stage is the maintenance state of normal bone. Following a fracture, any devitalized tissue is removed, and the new bone is organized to provide maximum support and function. Osteoblastic and osteoclastic activity should be equal, constantly resorbing and reforming the bone. The process of remodeling continues throughout the life cycle and is affected by local stress on the individual bone, circulation, nutrition and hormones. Any disruption of homeostasis will result in a pathologic condition.

FACTORS THAT ENHANCE BONE HEALING
Several options are available to the clinician and the patient to enhance fracture healing.

- Good nutrition and overall health are two very important influences on fracture healing. The use of calcium and vitamin D supplements is extremely helpful. The recommended daily allowance of calcium for the average, healthy adult is 1,000 milligrams and the recommended daily allowance for vitamin D is 600 IU.
• Loading or placing stress on the bone is thought to produce a small electrical field that stimulates new bone formation.

• Treatment of osteoporosis, which is a gradual decrease in bone density, begins in the late 30s in both men and women.

• Note: Bisphosphonates are given to patients with osteoporosis to slow or stop the progression of the disease and increase bone mass. However, according to the FDA, there have been more than 300 reports of rare, serious, atypical femur fractures in patients who have been taking these medications for more than five years. According to the FDA, it is not clear if the bisphosphonates are the cause of the fractures or if the drugs simply have an optimal duration of use. Labels for these drugs were updated in 2010 to warn of the risk of fracture with extended use.

• Bone grafting is frequently used in conjunction with a fixation device to provide a matrix for new bone growth. Bone may be taken from the patient (called an autograft), another human – most likely a cadaver (called an allograft) or from a non-human source (called a xenograft). Xenograft materials include marine coral (coralline hydroxyapatite) and bovine collagen (collagraft). Xenografts are not actually bone replacements but are considered scaffolds or structural foundations for natural bone regrowth. The graft must be capable of being included in the new growth and undergoing the remodeling process.

• Growth factor proteins are key components in regeneration of functional bone. Additional amounts of growth factor proteins, such as morphogenic proteins, insulin-like growth factors, platelet-derived grown factors, transforming growth factor-beta and vascular endothelial grown factor are normally found in the body. Growth factor proteins that are harvested from a donor and injected at the fracture site of the recipient are capable of encouraging faster and stronger bone healing.

• Bone filler paste consisting of calcium sulphate (60%), hydroxyapatite (40%), along with a radiopacity enhancing agent is used for fracture stabilization. The paste is injected at the fracture site and within 12 hours, the tensile strength of the bone is restored. The paste is reported to stabilize the fracture during healing and undergo the remodeling process.

• Electrical bone growth stimulators and ultrasonic devices stimulate the normal cellular processes at the fracture site. The stimulator may be noninvasive or implantable and may be used alone or in conjunction with open reduction internal fixation, external fixation devices and various grafting techniques. The external electrical stimulation is thought to reproduce the same type of electric force that is naturally created when the bone is loaded.

Many new therapies are on the horizon that will enhance fracture healing by improving the natural course of healing. Some of these techniques will require surgical expertise and others will encourage physiologic bone healing, thereby making the patient’s post-injury course less painful and shorter in duration.

FACTORS THAT DISRUPT BONE HEALING
A disruption at any stage of bone healing can be responsible for a variety of abnormal conditions.

• Avascular Necrosis – occurs when the capillary network or collateral circulation cannot be reestablished following a traumatic injury or when the vascular system is disrupted by other means. Avascular necrosis can be idiopathic, caused by certain pharmacologic agents such as corticosteroids or be related to comorbid conditions such as high blood pressure, smoking or diabetes. Decreased blood supply to the bone may lead to irreversible necrosis. Treatments for advanced avascular necrosis include:
  – Core decompression during which the inner portion of the bone is removed to decrease pain and help to stimulate neovascularization and the production of new bone.
While fat embolism does not affect bone healing, fat embolism and the accompanying fat embolism syndrome are serious, potentially life-threatening conditions that usually develop after trauma, most frequently following fracture of a long bone.

- Autologous bone grafting to replace the necrotic bone (which is removed)
- Wedge osteotomy near the necrotic area to reduce the amount of weight on the damaged bone thereby reducing pain. Wedge osteotomy is a palliative treatment that may delay joint replacement
- Partial or total joint replacement when the bone is collapsed or conservative treatments do not provide pain relief or structural improvement
- Autologous stem cell implantation into an area in which the necrotic bone has been removed. Stem cells harvested from the marrow of a healthy bone are inserted to allow for potential new bone growth. The term regenerative medical treatment often is used to describe stem cell therapy.
- Osteomyelitis – inflammation of the bone, marrow and possibly the surrounding tissue, commonly due to a Staphylococcus aureus infection. Prevention is the main issue; although, occasionally wound contamination cannot be avoided due to the type of injury sustained (especially in the case of a compound fracture). Chronic infection can result if the acute condition is not recognized or treated quickly and appropriately. Treatments for osteomyelitis include:
  - Culture and sensitivity examination of the infected area to identify the exact organism causing the infection followed by intensive therapy with the appropriate antibiotic. Antibiotic therapy may be systemic and/or localized
  - Incision and drainage of the affected area to remove accumulated pus
  - Debridement of the infected area to remove devitalized tissue
  - Surgical removal of surgical implants or other foreign bodies
  - Amputation of the affected limb (as a last resort)
- Compartment Syndrome – increase in pressure within a closed space due to hemorrhage or edema. Excess pressure leads to neurovascular compromise. Tissue viability may be affected, increasing the risk for infection. Permanent nerve damage also may occur. Treatment of acute compartment syndrome is considered an emergency and a fasciotomy is performed. Following the fasciotomy, the tissue is left open to allow for reduction of the swelling, perfusion of the tissue and restoration of nerve function. Days or weeks later, when the swelling is sufficiently reduced, the wound is closed (skin grafting may be necessary).
- Malunion is the solid union of the fractured bone in an abnormal position. This results from either inadequate reduction or immobilization. Patient noncompliance is often a factor. Realignment of the bone is typically accomplished using an osteotomy followed by bone stabilization with the use of an internal or external fixation device.
- Delayed Union – may have one or several determining causative factors including pathologic (ie, osteoporosis), mechanical (ie, distraction of the fracture site or inade-
quate immobilization) or traumatic (the type of injury sustained such as a comminuted fracture). Treatment of delayed union is determined in response to the causative factor(s). For example, if the causative factor is pathologic the treatment may involve administration of a bisphosphonate. If mechanical, reduction of the fracture site or a more secure method of immobilization may be employed. Traumatic factors could require a different method of stabilization along with other variables to enhance bone healing.

- Nonunion is the failure of the bone fragments to calcify together. Oftentimes, the space between the fragments is too large or the soft tissue may be entrapped between the fragments. Improper immobilization and excess activity by the patient can disrupt an otherwise normal cycle of bone healing. Infection, nutrition, hormones and circulation also need to be considered. Treatments for nonunion of a fracture include removal of any soft tissue that may be preventing complete reduction of the fracture or filling any gaps between the bone fragments with a graft or bone filler paste, then stabilizing the bone with an internal or external fixation device. Additional factors to enhance bone healing, such as the use of electrical stimulation, ultrasound and/or osteobiologics, may be used in conjunction with surgical treatment.
**FAT EMBOLISM/FAT EMBOLISM SYNDROME**

While fat embolism does not affect bone healing, fat embolism and the accompanying fat embolism syndrome are serious, potentially life-threatening conditions that usually develop after trauma, most frequently following fracture of a long bone. However, the syndrome also has been associated with blunt trauma, intramedullary procedures, prolonged corticosteroid therapy, osteomyelitis, childbirth, liposuction, fatty degeneration of the liver, pancreatitis, systemic lupus erythematosus, diabetes, sickle cell anemia, severe burns, coronary artery bypass surgery, massive infection and conditions causing bone infarction.

Fat embolism and the accompanying fat embolism syndrome are conditions that develop when droplets of fat act as emboli. The fat droplets become impacted in the microvasculature, especially of the lungs and brain. The multisystem disorder also can affect the heart, kidneys, eyes and skin.

Fat embolism presents at two different levels. The subclinical microscopic form occurs in more than 90% of patients with long bone fractures and in patients undergoing operative procedures performed on long bones without the use of a tourniquet. Microscopic fat embolism is detected by examination of the serum, urine or sputum for evidence of fat. Fat embolism syndrome is the most serious form and occurs in 2-23% of patients suffering blunt trauma and related fractures. The varying percentage is related to the severity of the injury.

Recent studies have shown that fat embolism syndrome is not simply a mechanical obstruction by the fat droplets of the small vessels; it also causes endothelial injury. The lipoprotein lipase causes fatty acids to be released from the impacted fat droplets allowing increased permeability of the microvasculature; fluid leakage into the interstitial spaces ensues.

In 50-60% of patients, the onset of fat embolism syndrome is gradual, becoming apparent within 24 hours; 90% of all cases will become apparent within 72 hours. Patients with sudden onset of symptoms (usually within 12 hours of injury) with great intensity (referred to as a fulminant course) have a high mortality rate. The patient may first appear restless and complain of vague chest pain. The patient may become drowsy and show a decrease in urine secretion. Unexplained fever greater than 101 degrees F (38.3 degrees C) and tachycardia also may be present. A clinical diagnosis is based on the presence of all three of the following criteria within 72 hours following injury. The three main clinical features of fat embolism syndrome are:

1. Petechiae covering the conjunctiva, retina, oral mucosa or upper half of the body
2. Respiratory failure manifested on one or more of the following ways: dyspnea, tachypnea, cyanosis due to arterial hypoxemia or radiograph showing diffuse alveolar infiltrates
3. Cerebral dysfunction demonstrated by delirium, confusion or coma

**DIAGNOSIS**

The Mangled Extremity Severity Score (MESS) was developed to evaluate the potential viability of a limb following trauma and is a valuable tool in predicting fat embolism syndrome. A patient with a high mangled extremity severity score is more likely to require amputation of the limb and is also more likely to develop fat embolism syndrome.

No single specific diagnostic tool positively confirms the presence of fat embolism syndrome; however, several exams provide useful information.

- Gurd’s Diagnostic Criteria – When using Gurd’s Diagnostic Criteria, the patient must exhibit two major criteria or one major and four minor criteria to be clinically diagnosed with fat embolism syndrome. Gurd’s Diagnostic Criteria include:
  - **Major Gurd’s Diagnostic Criteria**
    - Pulmonary edema
    - Subconjunctival or axillary petechiae
    - Central nervous system depression that is not proportionate to hypoxemia
    - Hypoxemia (partial pressure of O2 in arterial blood (PaO2) greater than 60 mm Hg or fraction of inspired oxygen (FiO2) greater than 0.4)
  - **Minor Gurd’s Diagnostic Criteria**
    - Retinal exam reveals emboli
    - Urinalysis shows presence of fat
    - Erythrocyte sedimentation rate increased
    - Sputum analysis shows presence of fat globules
    - Pyrexia (temperature greater than 101.3°F or 38.5°C)
    - Tachycardia (heart rate greater than 110 beats per minute)
    - Drop in hematocrit or platelet count (sudden, inexplicable)

- Radiography – fat embolism exhibits a similar appearance to pulmonary edema – snowstorm appearance
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- Presence of “cotton-wool” exudates, pallor and edema in the macular region
- Transesophageal echocardiography – detection of the emboli as they enter pulmonary circulation during a surgical procedure

**TREATMENT**

Conventional treatment for fat embolism and fat embolism syndrome vary according to the severity of the symptoms. This is a self-limiting condition; therefore, no cure exists. The treatments are considered supportive until the patient spontaneously returns to a homeostatic state. Successful treatment depends on oxygenation to peripheral tissues. Several conventional treatment options are described.

- Administer corticosteroids
- Reduce and stabilize fractures as soon as possible
- Restrict fluid intake according to circulatory status to decrease pulmonary edema and administer diuretics, if necessary
- Provide pulmonary support (according to need). May include supplemental oxygen by face mask or mechanical ventilation (use of positive end-expiratory pressure (PEEP) may be helpful)
- Optimize cardiac output to maintain perfusion by maintaining blood pressure with fluid administration and use of inotropic agents such as dopamine and epinephrine, and maintain hematocrit with blood replacement products if necessary

Controversial treatment options include IV ethyl alcohol infusion to inhibit lipase and clofibrate (an antihyperlipidemic) to increase free fatty acid metabolism. Theoretically, use of lipase inhibitors is sound, as they increase the metabolism in intravascular lipids, but the formation of more free fatty acids may cause further damage to the pulmonary capillary endothelium. Administration of aspirin, heparin (also considered a lipase inhibitor) or dextran may be helpful in decreasing platelet adhesiveness; however, the benefits of the anticoagulants in treating fat embolism syndrome may be outweighed by additional risk of hemorrhage from recent trauma.

**OUTCOMES**

Most individuals with fat embolism syndrome recover fully within 2 to 3 weeks with appropriate supportive treatment. The overall prognosis is very good, with most patients suffering little to no residual effects of the event. Morbidity...
and mortality are related to the degree of pulmonary and central nervous system complications.

The patient may suffer from multisystem trauma, making diagnosis and treatment difficult. Other conditions to be considered include pulmonary or cardiac contusion, pulmonary embolism, septic or hypovolemic shock, intracranial injury, aspiration pneumonitis and other types of acute respiratory distress syndrome. Fat embolism syndrome may be accompanied by disseminated intravascular coagulation or osteonecrosis as part of a triad of pathological conditions.

The clinician should be suspicious of the development of fat embolism syndrome following any fracture, especially closed long bone, rib and pelvic fractures. The diagnosis is based on the clinical presentation of the syndrome, making diagnosis of an anesthetized patient difficult.

ABOUT THE AUTHOR
Teri Junge, CST, CSFA, CSPDT, MEd, FAST, is the program director of the surgical technology program at Triton College in River Grove, Illinois. Teri started her career in the operating room in 1974. She has authored and reviewed numerous articles for The Surgical Technologist.

REFERENCES
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1. How many stages are involved in the normal process of bone healing?
   a. 3
   b. 4
   c. 5
   d. 6

2. The fracture hematoma occurs in what stage?
   a. Inflammatory
   b. Cellular proliferation
   c. Callus formation
   d. Remodeling

3. During bone grafting when bone is taken from a non-human source it is called:
   a. Xenograft
   b. Allograft
   c. Collagraft
   d. Autograft

4. __________ is when the capillary network or collateral circulation cannot be reestablished following a traumatic injury or when the vascular system is disrupted by other means.

5. In _____ of patients, the onset of fat embolism syndrome is gradual, becoming apparent within 24 hours.
   a. 25-35%
   b. 40-50%
   c. 50-60%
   d. 80-90%

6. Cerebral dysfunction demonstrated by delirium, confusion or coma is one of the three main clinical features of fat embolism syndrome.
   a. True
   b. False

7. Most individuals with fat embolism syndrome recover fully within _____ of appropriate treatment.
   a. 5 days
   b. 12 weeks
   c. 2-3 weeks
   d. 1 month

8. Which stage allows the soft tissue to continue to grow and bridge the gaps between the bone fragments?
   a. Remodeling
   b. Callus formation
   c. Inflammatory
   d. Ossification

9. Which disruption to the bone healing process causes inflammation of the bone, marrow, and possibly the surrounding tissue, commonly due to a Staphylococcus aureus infection?
   a. Osteomyelitis
   b. Malunion
   c. Compartment Syndrome
   d. Nonunion

10. The _____ serve(s) as a foundation for the cellular proliferation stage.
    a. Macrophages
    b. Fibrin mesh
    c. Osteoblasts
    d. Blood clot

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BONE HEALING: NORMAL, DISRUPTED AND THE COMPLICATION OF FAT EMBOLISM

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The State Assembly Leadership Committee is currently composed of:

Pam Buff, CST, FAST
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Represents Arizona, Idaho, Illinois, Massachusetts, Michigan, Wisconsin

With more than 30 years as a CST, Pam has spent most of that time working with a group of neurosurgeons and an orthopedic spine surgeon. Pam also happily served as a preceptor during her time in the hospital setting. Pam has worked in the surgical technology education arena since 2003 in the Tulsa, Oklahoma, area. During that time, she has started three successful surgical technology programs and is currently serving as the director of the surgical technology program at National American University in Tulsa. Pam has served on the Oklahoma State Assembly and is currently serving her third term on the State Assembly Leadership Committee.
L Gene Burke, Jr
CST, FAST
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Represents Colorado/Wyoming, Delaware, Maryland, Nevada, New Hampshire/Vermont, Military Advisor—All States

Gene graduated with a diploma in surgical technology in 1992 from the Naval School of Health Science, in Portsmouth, Virginia, and began working at the Naval Hospital Charleston where he obtained the position of senior surgical technologist working in OB/GYN, orthopedics and oral/maxillofacial surgeries. While at Naval Hospital Charleston, Gene wrote and taught an orthopedic surgical technologist course for all orthopedic techs to complete in order to assist their surgeons during cases. He also worked in the dental department assisting with minor surgeries and reorganized the dental surgical suite for which he was awarded the Navy Achievement Medal. Gene has been a member of AST since 2004 and is serving his second appointed term as the military liaison for the State Assembly Leadership Committee. He became certified in 2005 when he accepted the position as the surgical technology program director at Augusta Technical College in Augusta, Georgia, and was awarded the FAST (Fellow of the Association of Surgical Technologists) credential in 2014 at AST’s national conference in Denver, Colorado. Gene also has served two terms as a director for the Georgia State Assembly, two terms as secretary and two terms as vice president.

Gene is currently employed at University Hospital Summerville Campus, and he has been married to his wife for 27 years.

Rochelle R Duplechian
CST, FAST
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Represents Georgia, Minnesota, Mississippi, South Carolina, Tennessee, Texas

With more than 23 years of experience as a CST, Rochelle has moved through the spectrum of CST practitioner and preceptor, to an educator for CSTs. At present, she is employed by Our Lady of Lourdes Regional Medical Center in Lafayette, Louisiana, where she specializes in robotics, general, bariatrics and burns.

She has been a member of AST since 1994, has served on the Board of Directors for the Louisiana State Assembly since 2007, and is currently fulfilling her second term as president. Rochelle was awarded the Fellow of Surgical Technology, FAST, in 2017 for her passion and love for her profession. She continues to serve on the State Assembly Leadership Committee to help others like herself become leaders of their states.

Rochelle has two daughters and one son. She enjoys family time, traveling, playing with her grandchildren and spending time with good friends.

Lisa Day
CST, CSFA
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Represents Connecticut, Montana, Nebraska, Rhode Island, West Virginia

Lisa is honored to be appointed to the committee as she celebrates her 20th year as a surgical technologist. She is a 1998 graduate of Our Lady of the Lake College in Baton Rouge, Louisiana, and a 2011 graduate of Meridian Institute of Surgical Assisting. She has served on the Virginia State Assembly as a director and vice president and is currently serving as the president. Her passion for her profession and rewarding career as a CST and CSFA has led her to the path of education. Lisa is currently the core instructor of surgical technology at Lord Fairfax Community College at Vint Hill, Warrenton, Virginia.

Lisa and her husband of 32 years have three adult daughters and she enjoys spending her free time with her family and very spoiled dogs, beekeeping and traveling in their RV. She is excited to be able to serve as a resource for other state assemblies.
Kim McDuffie  
CST  
scrugirl124@yahoo.com  
Represents Florida, Louisiana, New Mexico, North Dakota, Virginia  
Kim has been a CST for 10 years and began her AST involvement as president of the Association of Surgical Technologists Student Association. She is serving her third term as a State Assembly Leadership Committee Representative. She has served on the Texas State Assembly in various offices and is currently serving her second term as president. She has helped grow Texas membership and attendance at state workshops, resulting in Texas having a record-breaking attendance at its March meeting of more than 400 attendees. Kim also earned the FAST award this year at the AST national conference.

Kim still works behind the Mayo at a rural hospital and teaches surgical technology part-time at the local community college.

Kim is a grandmother of three. She enjoys riding horses and cowboy-mounted shooting with her husband, and loves everything about living in the country. She is true cowgirl at heart.

Shondra McGill  
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Represents Kentucky, Missouri, New York, North Carolina, Ohio  
Shondra has been a member of AST since October of 2003 and is honored and proud of her continued contributions to the SALC and for having received the FAST recognition in 2017 at the New Orleans Conference, 10 years after attending her first conference, which also happened to be in New Orleans. She previously served on the New Jersey State Assembly Board since its inception in 2006 as a director, secretary, vice president and president. Shondra graduated from Sanford Brown in 2004 and became certified in March 2005. She obtained her certification for ambulatory surgery sterile processing not long after. She enjoys working for SCA’s University Surgical Center in East Brunswick, New Jersey.

In her spare time, Shondra enjoys spending time with her amazing husband of nearly 29 years and two sons, as well as spending time with friends and family.

Kimberly Miller  
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Represents Alaska, Hawaii, Maine, New Jersey, Pennsylvania, Utah  
Kim is starting her third term on the State Assembly Leadership Committee. She has been a member of AST for 19 years and involved with the West Virginia State Assembly since its inception serving as president, vice president and director. She currently serves as treasurer. Kim was presented with the President’s Award at the 2016 AST Surgical Technology Conference in San Diego. Kim also has served on the Job Analysis Committee for the National Board of Surgical Technologists and Surgical Assistants (NBSTSA).

She is employed by Three Gables Surgical Hospital in Proctorville, Ohio. In her spare time, she volunteers for the Make-A-Wish Foundation and enjoys spending time with her family and friends.
Sherridan Poffenroth
CST, CRCST, FAST, Chair
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Represents Alabama, California, Iowa, Kansas, Oklahoma

Sherridan is currently serving her second term on the SALC and was recently appointed chairperson for the 2018-2019 year. Sherridan earned her bachelor’s degree in education from Whitworth University and her associate degree in surgical technology; both located in Spokane, Washington. She has been a member of AST for 12 years and has served on the Washington Board of Directors as president, vice president and director, and is currently serving as secretary. Sherridan also holds a current certification as a central service technician.

Sherridan has been employed at Spokane Valley Ambulatory Surgery Center since it opened in 2009, specializing in ENT and facial plastics. She also works at Providence Holy Family Hospital.

In her spare time, Sherridan serves on the Board of Directors for Korah Kids, an international child sponsorship program from Ethiopia. She enjoys running, baseball and spending time with her family.

Alison Wilson
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Represents Arkansas, Indiana, Oregon, South Dakota, Washington

Alison Wilson works at Brookline College in Tempe, Arizona. Alison received her associate degree in surgical technology in 2000, graduated with her bachelor’s degree in healthcare management in 2014 and her master’s degree in administration in 2016.

She has been with the company for five years and was recently promoted to director of education. She became the surgical technology program director in 2014 where she began rebuilding and growing the program that currently has more than 80 students. The program has had outstanding placement and retention rates under her leadership. Alison is the past president of the Arizona State Assembly and currently serves as treasurer. She also is an ABHES evaluator and was instrumental in helping her college receive a five-year institutional accreditation.
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Cape Coral Institute of Technology - FL
Spartanburg Community College - SC
Waukesha County Technical College - WI
Salt Lake Community College - UT
Northcentral Technical College - WI
Gwinnett Technical College - GA
Trinity Valley Community College - TX
Western Technical College - WI
North Arkansas College - AR
Spokane Community College - WA
Tennessee Technology Center-Jackson - TN
Chattahoochee Technical College - GA
Parkland College - IL
Bismarck State College - ND
Lanier Technical College - GA
Rolla Technical Center - MO
Tennessee Col of Applied Technology-Hohenwald - TN
Chippewa Valley Technical College - WI
Wilson Community College - NC
Edgecombe Community College - NC
College of Southern Nevada - NV
Lamar State College-Port Arthur - TX
Buckeye Hills Career Center - OH
Nebraska Methodist College - NE
Cuyahoga Community College - KS
Great Falls College-Montana State University - MT
Tennessee Technology Center-Murfreesboro - TN
Lakeland Community College - OH
Ivy Tech Community College-Columbus - IN
West Georgia Technical College - GA
Asheville-Buncombe Technical Community College - NC
South Central Louisiana Technical College
Lafourche - LA
Dartmouth-Hitchcock Medical Center - NH
North Central Texas College - TX
Paris Junior College - TX
Dixie State University - UT
Flathead Valley Community College - MT
Pennsylvania College Of Technology-PA
Technical College of the Lowcountry - SC
Robeson Community College - NC
Sentara College Of Health Sciences - VA
James Rumsey Technical Institute - WV
Washtenaw Community College - MI
Jefferson College of Health Sciences - VA
Des Moines Area Community College - IA
Washington County Career Center - OH
Blinn College - TX
American National University-Youngstown - OH
Cape Fear Community College - NC
Rasmussen College at Moorhead - MN
Lincoln Land Community College - IL
Monroe Community College - NY
New York Methodist Hospital - NY
Stark State College - OH
National American University - KS

*School statistics were pulled from August 1, 2017, through, July 31, 2018, and only include currently accredited surgical technology and surgical first assisting programs. This includes all candidates who test, not only WBT and current graduates, but previous graduates as well.
Congratulations to the following surgical technology and surgical first assisting programs for achieving a pass rate of 90 - 99% on the Certified Surgical Technologist (CST) or Certified Surgical First Assistant (CSFA) examination.*

Surgical Technology Schools – 90-99%

Aiken Technical College – SC
Albany Technical College – GA
Anoka Technical College – MN
Arkansas State University – AR
Baker College of Allen Park – MI
Baker College-Cadillac – MI
Baton Rouge Community College – LA
Bellingham Technical College – WA
Bossier Parish Community College – LA
Catawba Valley Community College – NC
Cincinnati State Technical and Community College – OH
Coastal Carolina Community College – NC
College Of The Albemarle – NC
College Of Western Idaho – ID
Columbia Basin College – WA
Davis Applied Technology College – UT
Del Mar College – TX
Delgado Community College – LA
Everest College-Thornton – CO
Gateway Technical College – WI
Horry-Georgetown Technical College – SC
Ivy Tech Community College-Valparaiso – IN
Kingsborough Community College – NY
Lenoir Community College – NC
Maine Medical Center – ME
McCann School of Business & Technology- Carlisle – PA
McLennan Community College – TX
Minnesota West Community & Technical College – MN
Nassau Community College – NY
Northern Michigan University – MI
Northwest Technical Institute – AR
Oakland Community College – MI
Onondaga Community College – NY
Ozarks Technical Community College – MO
Pima Community College – AZ
Rasmussen College-Brooklyn Park – MN
Sinclair Community College – OH
Smoky Mountain Health Sciences Consortium – TN
Southcentral Kentucky Community & Technical College – KY
Spencerian College – KY
Tarrant County College – TX
Temple College – TX
Tennessee College of Applied Technology- Crossville – TN

* School statistics were pulled from August 1, 2017, through, July 31, 2018, and only include currently accredited surgical technology and surgical first assisting programs. This includes all candidates who test, not only WBT and current graduates, but previous graduates as well.
New AST 5th Edition of Surgical Technology for the Surgical Technologist Now Available!

This just published textbook, written by CSTs, continues to focus on the knowledge, critical thinking and cognitive skills required by the surgical technologist.

Some of the latest changes in this new edition include:

• Two new comprehensively illustrated procedures have been added: Open Nephrectomy and Lumbar Laminectomy
• All case studies have been revised and many are new
• New information includes OR furniture, safety guidelines, for ionizing radiation, electrical, fire and laser hazards and sharps safety
• Minimally invasive surgery is now discussed under Biomedical Science and Minimally Invasive Surgery
• Emergency Situations and All-Hazards Preparation information has been substantially revised
• Surgical Pharmacology and Anesthesia topics have been streamlined
• General Surgery features an expanded laparoscopic instrumentation discussion

To order copies of the latest AST-authored textbook, please visit http://answerspluspro.cengage.com/b2bstore/index.html
GET CONNECTED

Staying connected with AST and your fellow peers in surgical technology has never been easier. Join in on ongoing conversations or send us a private message on our Facebook page. Follow us on Twitter and Instagram. Take a break and peruse our Pinterest page, especially our humor section, with content pulled specially for you, the tech!

It’s never been so easier to stay in the know and embrace the power of the surgical technology community!

Certified OR Techs* are needed to join the Good Samaritan Medical Center (GSMC) team and support a thriving OR which offers surgical specialties including: Breast; General; Gynecology; Orthopedics (spine, joint, hand, and foot); Oncology; Ophthalmology; Oral and Maxillofacial; Otolaryngology; Robotics; Thoracic; Trauma; Plastics; Podiatry; Urology; Vascular and Wound.

*OR Techs who join GSMC now may be eligible for a sign-on bonus. Speak with your recruiter or HR contact for details. https://bit.ly/2Mp0Ash

Good Samaritan Medical Center is an acute-care, 267-bed hospital providing comprehensive inpatient, outpatient, and Level III Trauma emergency services to Brockton and 22 neighboring communities. The hospital offers Centers of Excellence care in orthopedics, oncology, and cardiology, specialized care in surgery, family-centered obstetrics with level-two nursery, substance abuse treatment, and advanced diagnostic imaging. Good Samaritan Medical Center is part of Steward Health Care System. Additional information is available at www.goodsamaritanmedical.org.

Good Samaritan Medical Center surgical services are available for elective and emergent procedures from board certified surgeons who work collaboratively with our highly trained anesthesiologists, nurses, technicians, therapists and aides.

Together they provide a comprehensive surgical experience from pre-admission education and preparation through to discharge and follow-up care.

Good Samaritan Medical Center is the first in the area to feature the da Vinci xi Robotic Surgical System. Surgeons with robotic expertise include: General; Hernia; Urology; Gynecology and Uro-Gynecology.

The Orthopedic program has achieved gold standard accreditation from The Joint Commission as an Orthopedic Center of Excellence. The Joint Replacement Program has achieved Blue Cross /Blue Shield Blue Distinction Center+ Award - both for Hip and Knee Replacement. In addition, the medical center has received numerous awards and accreditation for the state-of-the-art imaging technology. The Center for Wound Care and Hyperbaric Medicine offers specialized, expert care under the medical leadership of a vascular surgeon specializing in wound care.
REVIEW: FRACTURES,
BONES AND HEALING

Each month we will offer a short review on varying topics related to the surgical technology profession. Test your knowledge and then look up the answers in the back of this edition to see how well you did.

1. Match the type of fracture with its description:
   - Avulsion: Broken ends of each bone are forced into each other, usually causing many fragments
   - Colles': Crosses the neck of the femur
   - Comminuted: Horizontal line through the bone
   - Compound: Bone breaks into more than two pieces
   - Greenstick: Fracture line curves around the bone
   - Impacted: Break caused by diseased bone
   - Pathological: Fracture occurs at central point with additional breaks radiating from the central point
   - Bimalleolar: Bone ends align involving minimal displacement
   - Spiral: Skin is pierced; bone may or may not be visible
   - Stellate: Break at its normal attachments
   - Stress: Incomplete fracture involving only one cortex of the bone
   - Transcervical: Fracture at the distal radius, forcing the hand into a dorsal and lateral position
   - Transverse: Break of the lower fibula often accompanied with a break medial malleolus of the tibia

2. Name and describe the two types of bone tissue:
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

3. The osteon, or Haversian system, is a structural unit of ____________, consisting of concentric layers of mineralized bone matrix.

4. Which type of bone marrow is present at birth?

5. In addition to calcium, name four other minerals that are stored within bone:
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

6. Which two minerals comprise hydroxyapatite?

7. Describe the five stages of osteogenesis.
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
8. Define the following terms:

Avascular necrosis

Diaphysis

Distraction

Delayed Union

Epiphysis

Malunion

Nonunion

Osteochondritis

Osteoma

Osteomyelitis

Osteoporosis

Osteotomy

Answers on page 478
**ARKANSAS STATE ASSEMBLY**

**Date:** October 27, 2018  
**Title:** Scrubtoberfest! Tricks & Treats  
**Location:** Arkansas College of Osteopathic Medicine, Lecture Hall #1, 7000 Chad Colley Blvd, Fort Smith, AR 72916  
**Contact:** Cynthia Lewis, PO Box 15772, Little Rock AR 72231, 501-951-3180, ARSA.ST@yahoo.com  
**CE Credits:** 6 approved by AST

**CALIFORNIA STATE ASSEMBLY**

**Date:** October 13, 2018  
**Title:** Surgical Technologist; the Anchor and Safe Harbor of the Operating Room  
**Location:** Doubletree by Hilton – San Pedro, 2800 Via Cabrillo-Marina, San Pedro, CA 90731  
**Contact:** John Springer, 1615 Yosemite Dr, Apt 310, Los Angeles, CA, 90041, 323-527-5108, californiastateassembly@gmail.com  
**CE Credits:** 7 pending submission for approval

**FLORIDA STATE ASSEMBLY**

**Date:** November 10, 2018  
**Title:** Eyes on Sarasota  
**Location:** Embassy Suites, 202 N Tamiami Trail, Sarasota, FL 34236  
**Contact:** Jo Lana Cota, 2120 21st Lane, Greenacres, FL 33463, 561-602-9256, cotaj@palmbeachstate.edu  
**CE Credits:** 7 pending submission for approval

**GEORGIA STATE ASSEMBLY**

**Date:** March 9, 2019  
**Title:** Advanced Surgical Techniques  
**Location:** Quality Inn, 2701 E Fowler Ave, Tampa, FL 33612  
**Contact:** Jo Lana Cota, 2120 21st Lane, Greenacres, FL 33463, 561-602-9256, cotaj@palmbeachstate.edu  
**CE Credits:** 7 pending submission for approval

**HAWAII STATE ASSEMBLY**

**Date:** November 17, 2018  
**Title:** Annual Meeting & Elections 2018/ Suture and Casting Workshop  
**Location:** Kaiser Permanente Medical Center – Moanalua Auditorium, 3288 Moanalua Road, Honolulu, HI 96819  
**Contact:** Ana Zarate, PO Box 2129, Ewa Beach, HI 96706, 910-599-2086, anazarat804@gmail.com or hawaiistateassembly@yahoo.com  
**CE Credits:** 7 approved by AST

**IDAHO STATE ASSEMBLY**

**Date:** November 10, 2018  
**Title:** 2018 Business Meeting and Conference  
**Location:** Saint Alphonsus Regional Medical Center, 1450 S Eagle Flight Way, Boise, ID 83714  
**Contact:** Leah Guili, 6120 E Grand Prairie Dr, Boise, ID 83716, 208-596-1774, IDSAST@gmail.com  
**CE Credits:** 6 pending submission for approval

**IOWA STATE ASSEMBLY**

**Date:** October 13, 2018  
**Title:** Iowa State Assembly Annual Business Meeting and Workshop  
**Location:** Western Iowa Tech Community College, 4647 Stone Ave, Sioux City, IA 51106  
**Contact:** Michael Sells, 208 Palo Road, Center Point, IA 52213, 319-651-4165, michael.sells@kirkwood.edu  
**CE Credits:** 7 pending submission for approval

**UPCOMING PROGRAMS**

**AST MEMBERS:** Keep your member profile updated to ensure that you receive the latest news and events from your state. As an AST member you can update your profile by using your login information at [www.ast.org](http://www.ast.org). You may also live chat at [www.ast.org](http://www.ast.org) or contact Member Services at memserv@ast.org or call 1-800-637-7433. AST business hours are Monday-Friday, 8 am - 4:30 pm, MST.
Responsibilities include assisting in direct patient care, assembling instrumentation, supplies and equipment for surgical procedures under the Association of Operating Room Nurses (AORN) and Certified Surgical Technician (CST) guidelines.

As a member of our team, our surgical techs have the opportunity to:

- Function as a surgical technician demonstrating responsibilities that include assisting in direct patient care it the Operating Room
- Anticipate the needs of the surgeon
- Select and prepare appropriate supplies and equipment for the surgical cases and operate all the surgical equipment

Contribute to a progressive, highly functional team to deliver the highest in quality patient care

**QUALIFICATIONS:**
Graduate of a nationally accredited education program for surgical tech with documented certification
OR
Experience as a surgical technologist during at least two of the three years immediately preceding January 1, 2017
OR
Licensed practical Nurse (LPN) licensed by the state of Oregon with surgical scrub experience

**COMPENSATION and BENEFITS:**
- Comprehensive benefits including medical, dental, and vision
- Excellent retirement package with up to a 4% employer contribution
- Generous time off package with additional paid holidays
- Great hours (No holidays, No nights, No weekends)
- Sign on Bonus (Inquire with HR)

---

**KENTUCKY STATE ASSEMBLY**
**Date:** April 19, 2019  
**Title:** Chris Keegan Spring Workshop 2019  
**Location:** Elizabethtown Community and Technical College, Regional Postsecondary Center (RPC) Room 212, 600 College Street Road, Elizabethtown, KY 42701  
**Contact:** Kentucky State Assembly, PO Box 206187, Louisville, KY 40250, ksao-fast@gmail.com  
**CE Credits:** 3 pending submission for approval

**Date:** September 20-21, 2019  
**Title:** 2019 Kentucky State Assembly of AST – Annual Fall Meeting  
**Location:** TBD, Louisville, KY  
**Contact:** Kentucky State Assembly, PO Box 206187, Louisville, KY 40250, ksao-fast@gmail.com  
**CE Credits:** 9 pending submission for approval

**Date:** April 17, 2020  
**Title:** Chris Keegan Spring Workshop 2020  
**Location:** Elizabethtown Community and Technical College, Regional Postsecondary Center (RPC) Room 212, 600 College Street Road, Elizabethtown, KY 42701  
**Contact:** Kentucky State Assembly, PO Box 206187, Louisville, KY 40250, ksao-fast@gmail.com  
**CE Credits:** 3 pending submission for approval

**Date:** September 18-19, 2020  
**Title:** 2020 Kentucky State Assembly of AST – Annual Fall Meeting  
**Location:** TBD, Louisville, KY  
**Contact:** Kentucky State Assembly, PO Box 206187, Louisville, KY 40250, ksao-fast@gmail.com  
**CE Credits:** 9 pending submission for approval

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**LOUISIANA STATE ASSEMBLY**
**Date:** October 13, 2018  
**Title:** All That Jazz  
**Location:** North Oaks Medical Center, 15790 Paul Vega Medical Dr, Hammond, LA 70403  
**Contact:** Rochelle Duplechian, 835 Vatican Road, Carencro, LA 70520, 337-302-7844, rduplechiancst@yahoo.com  
**CE Credits:** 6 pending submission for approval

**Date:** March 2, 2019  
**Title:** Spring Fling  
**Location:** Woman’s Hospital, 100 Woman’s Way, Baton Rouge, LA 70817  
**Contact:** Rochelle Duplechian, 835 Vatican Road, Carencro, LA 70520, 337-302-7844, rduplechiancst@yahoo.com  
**CE Credits:** 6 pending submission for approval

---

$500.00 Sign on Bonus!
Our Surgery Center is looking for a full time surgical technician to join our team. Excellent hours and benefits combined with highly competitive wages and a dynamic team!
### Maine State Assembly
**Date:** October 20, 2018  
**Title:** Annual Meeting and Elections  
**Location:** Maine Medical Center – Dana Center Auditorium, 22 Bramhall St, Portland, ME 04102  
**Contact:** Elisha Snowman, PO Box 36, Saint Albans, ME 04971, 207-416-6677, mainestateassembly@gmail.com  
**CE Credits:** 7 pending submission for approval

### Massachusetts State Assembly
**Date:** November 17, 2018  
**Title:** Fifty Shades of Joint Revision; We Are All in This Together  
**Location:** Lahey Hospital & Medical Center, 41 Mall Road, Burlington, MA 01805  
**Contact:** Jayne MacPherson, 3 Webster St, Natick, MA 01760, 508-596-0859, jmacpherson@bhcc.mass.edu  
**CE Credits:** 6 pending submission for approval

### Michigan State Assembly
**Date:** April 6, 2019  
**Title:** MSA Every Day Adventure  
**Location:** Baker College of Clinton Township, 34950 Little Mack Ave, Clinton Township, MI 48035  
**Contact:** Mary Jo Nowicki, 1548 S Renaud Road, Grosse Pointe Woods, MI 48236, 586-552-3135, maryjo.nowicki@gmail.com  
**CE Credits:** 6 pending submission for approval

### Minnesota State Assembly
**Date:** October 27, 2018  
**Title:** MN State Assembly Fall 2018 Workshop  
**Location:** North Memorial Health Hospital – Vance DeMong Classroom, 3300 Oakdale Ave North, Robbinsdale, MN 55422  
**Contact:** Amy Campeau, 10851 Olive Street NW, Coon Rapids, MN 55448, 612-644-7674, acampeau@sgs.mn  
**CE Credits:** 7 pending submission for approval

### Mississippi State Assembly
**Date:** October 13, 2018  
**Title:** Trick or Treat - Scrub and Meet!  
**Location:** St Dominic Hospital, 969 Lakeland Dr, Jackson, MS 39216  
**Contact:** Bonnie Malone, PO Box 442, Kosciusko, MS 39090, 404-218-4436, shilmalone@gmail.com  
**CE Credits:** 5 pending submission for approval

### Missouri State Assembly
**Date:** March 1-3, 2019  
**Title:** Spring Workshop  
**Location:** Columbia Area Career Center, 4203 South Providence, Columbia, MO 65203  
**Contact:** Tammy Pearson, 3143 Algoa Road Apt B, Jefferson City, MO 65101, 573-202-3947, trpearson@gmail.com  
**CE Credits:** 13 pending submission for approval

### Montana State Assembly
**Date:** October 13, 2018  
**Title:** From Field to Healed  
**Location:** Benefis Hospital - Cameron Auditorium, 1101 26th Street South, Great Falls, MT 59405  
**Contact:** Lori Heinen, 712 Riverview Dr E, Great Falls, MT, 59404, 406-781-3973, gfmgtgir@yahoo.com  
**CE Credits:** 7 pending submission for approval

### Nebraska State Assembly
**Date:** March 2, 2019  
**Title:** Winter 2019 Workshop and Annual Meeting with Elections  
**Location:** Nebraska Methodist College, 720 N 87th St, Omaha, NE 68114  
**Contact:** Casey Glassburner, PO Box 67034, Lincoln, NE 68506, 402-580-0057, nebrlastateassembly@gmail.com  
**CE Credits:** 6 pending submission for approval

### New Hampshire/Vermont State Assembly
**Date:** October 13, 2018  
**Title:** Fall Meeting and Workshop  
**Location:** Elliott Hospital, One Elliott Way, Manchester, NH 03103  
**Contact:** Brad Morrison, 323 Elm St, Concord, NH 03303, 603-565-5160 or 603-225-7625, msmaddog17@yahoo.com  
**CE Credits:** 6 pending submission for approval

### New Jersey State Assembly
**Date:** October 6, 2018  
**Title:** Annual Business Meeting/Fall Conference/Elections  
**Location:** HMH Palisades Medical Center, 7600 River Road, North Bergen, NJ 07047  
**Contact:** Carlos Sanchez, 273 Paulanne Terrace, Secaucus, NJ 07094, 201-981-7760, sedonasun100@hotmail.com  
**CE Credits:** 4-5 pending submission for approval

### New Mexico State Assembly
**Date:** October 13, 2018  
**Title:** Fall Fling  
**Location:** TBD, Albuquerque, NM  
**Contact:** Jennifer Richmond, 505-240-1980, jennbingham2232@gmail.com  
**CE Credits:** 4 pending submission for approval

### North Dakota State Assembly
**Date:** October 6, 2018  
**Title:** Annual Business Meeting and Elections  
**Location:** Dakota Medical Foundation, 4141 28th Avenue S, Fargo, ND 58104  
**Contact:** Leslie Heitkamp, 1514 2nd Street N, Fargo, ND 58102, 701-429-1851, leslie_heitkamp@outlook.com  
**CE Credits:** 6 pending submission for approval

### Ohio State Assembly
**Date:** October 13, 2018  
**Title:** Achieve Success in the OR  
**Location:** Hillcrest Hospital, 6780 Mayfield Road, Mayfield Heights, OH 44124  
**Contact:** Mary Shami, 196 S Grant Ave Unit 302, Columbus, OH 43215, 614-864-7929, tracieparsley@gmail.com  
**CE Credits:** 8 pending submission for approval

---

**CE Credits** refer to Continuing Education credits which are typically awarded for attending workshops, meetings, or other forms of educational events. The pending submissions indicate that the credits are currently being processed and are expected to be approved.
<table>
<thead>
<tr>
<th>State Assembly</th>
<th>Date</th>
<th>Title</th>
<th>Location</th>
<th>Contact</th>
<th>CE Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OREGON STATE ASSEMBLY</td>
<td>October 13, 2018</td>
<td>Fall Conference</td>
<td>Providence Willamette Falls Medical Center, 1500 Division St, Oregon City, OR 97045</td>
<td>Sonia Lopez, PO Box 1461, Wilsonville, OR 97070, 503-679-7753, <a href="mailto:mgaringeroast@outlook.com">mgaringeroast@outlook.com</a></td>
<td>7 pending submission for approval</td>
<td></td>
</tr>
<tr>
<td>PENNSYLVANIA STATE ASSEMBLY</td>
<td>March 23, 2019</td>
<td>Surgical Technologists – Oh the Places You’ll Go</td>
<td>UPMC Pinnacle Community Osteopathic, 4300 Londonderry Road, Harrisburg, PA 17109</td>
<td>Darin Smith, 3812 Kramer St, Harrisburg, PA 17109, 717-422-4258, <a href="mailto:darindurellesmith@gmail.com">darindurellesmith@gmail.com</a></td>
<td>6 pending submission for approval</td>
<td></td>
</tr>
<tr>
<td>RHODE ISLAND STATE ASSEMBLY</td>
<td>October 20, 2018</td>
<td>Annual Business Meeting and Workshop</td>
<td>New England Institute of Technology, One New England Tech Blvd, East Greenwich, RI 02818</td>
<td>Tracy Godin, 157 Old County Road, Smithfield, RI 02917, 401-499-6351, <a href="mailto:tgodin69@yahoo.com">tgodin69@yahoo.com</a></td>
<td>4 pending submission for approval</td>
<td></td>
</tr>
<tr>
<td>SOUTH DAKOTA STATE ASSEMBLY</td>
<td>October 12-13, 2018 (changed from Sept 14-15 &amp; 21-22)</td>
<td>South Dakota State Assembly – Fall Workshop</td>
<td>Western Dakota Tech, 800 Mickelson Dr, Rapid City, SD 57703</td>
<td>Heather Hemen, 6565 Southside Dr, Rapid City, SD 57703, 605-484-9130, <a href="mailto:heather.hemen@bhsh.com">heather.hemen@bhsh.com</a></td>
<td>9 pending submission for approval</td>
<td></td>
</tr>
<tr>
<td>TEXAS STATE ASSEMBLY</td>
<td>October 20, 2018</td>
<td>Education by the Riverwalk</td>
<td>Alamo College/ St Phillips Campus, 1801 Martin Luther King Dr, San Antonio, TX 78203</td>
<td>Sandra Luthie, PO Box 3381, Wichita Falls, TX 76301, 434-996-1354, <a href="mailto:TXSASStateAssembly@gmail.com">TXSASStateAssembly@gmail.com</a></td>
<td>8 pending submission for approval</td>
<td></td>
</tr>
<tr>
<td>TENNESSEE STATE ASSEMBLY</td>
<td>March 2-3, 2019</td>
<td>2018 TNAST State Convention</td>
<td>Embassy Suites Chattanooga Hamilton Place, 2321 Lifestyle Way, Chattanooga, TN 37421</td>
<td>Steven Noyce, 102 Morgan St, Tullahoma, TN 37388, 615-498-3164, <a href="mailto:stevennoyce@hotmail.com">stevennoyce@hotmail.com</a></td>
<td>13 pending submission for approval</td>
<td></td>
</tr>
</tbody>
</table>

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We are seeking to fill a Corporate Repair Specialist position in Hartford, Connecticut. Your CST, CBSPD, or CRCST experience is just the skillset we are looking for!

The ideal candidate is a well-organized self-starter with an aptitude for customer service. In this role, you will provide preventative maintenance services for Richard Wolf surgical instruments in customer accounts, facilitate repairs with our North Chicago facility, provide in-service/education, and act as a resource for instrument reprocessing to all Richard Wolf customers within your defined territory.

If you are interested, please send your resume and cover letter to Service@richardwolfusa.com

This position is available for immediate hire!
Opportunities in the Main OR, Ortho OR, and at Women and Babies Hospital/Suburban Outpatient Surgeries

We are a Level II Trauma Center, Orthopedic Center, Oncology Center and do Open Heart Surgeries.

Opportunities to grow your skills with Da Vinci Robot and a Career Ladder. 30 minute response time required for all Surgical Technologist positions.

Apply at www.LGHealthjobs.org to start conversations or call Sue Martin, Allied Health Recruiter at 717-544-4475

**ABOUT LANCASTER**

Penn Medicine Lancaster General Health is located in scenic Lancaster County, an easy day trip to New York, Baltimore, or Philadelphia.

* Lancaster General Perioperative Services has 37 operating rooms and a cystoscopy room throughout our three locations.
* Perform over 30,000 cases per year, including Da Vinci robotic surgery and hybrid OR cases
* Clinical ladder opportunity with financial incentive for surgical technologists
STATE ASSEMBLY ANNUAL BUSINESS MEETINGS

Members interested in the election of officers & the business issues of their state assembly should ensure their attendance at the following meetings:

<table>
<thead>
<tr>
<th>STATE</th>
<th>LOCATION</th>
<th>MEETING DATE</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARKANSAS</td>
<td>Fort Smith</td>
<td>October 27, 2018</td>
<td>Annual Meeting 2018 BOD &amp; 2019 Delegate Elections</td>
</tr>
<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td>CALIFORNIA</td>
<td>San Pedro</td>
<td>October 13, 2018</td>
<td>Annual Meeting 2018 BOD &amp; 2019 Delegate Elections</td>
</tr>
<tr>
<td>FLORIDA</td>
<td>Sarasota</td>
<td>November 10, 2018</td>
<td>Annual Meeting 2018 BOD &amp; 2019 Delegate Elections</td>
</tr>
<tr>
<td>GEORGIA</td>
<td>Lawrenceville</td>
<td>March 9, 2019</td>
<td>Annual Meeting 2019 BOD &amp; 2019 Delegate Elections</td>
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<tr>
<td>HAWAII</td>
<td>Honolulu</td>
<td>November 17, 2018</td>
<td>Annual Meeting 2018 BOD &amp; 2019 Delegate Elections</td>
</tr>
<tr>
<td>IDAHO</td>
<td>Boise</td>
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<td>Annual Meeting 2018 BOD &amp; 2019 Delegate Elections</td>
</tr>
<tr>
<td>IOWA</td>
<td>Sioux City</td>
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<tr>
<td>MINNESOTA</td>
<td>Robbinsdale</td>
<td>October 27, 2018</td>
<td>Annual Meeting 2018 BOD &amp; 2019 Delegate Elections</td>
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<tr>
<td>WISCONSIN</td>
<td>Waukesha</td>
<td>October 13, 2018</td>
<td>Annual Meeting 2018 BOD &amp; 2019 Delegate Elections</td>
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<tr>
<td>KENTUCKY</td>
<td>Louisville</td>
<td>September 20-21, 2019</td>
<td>Annual Meeting 2019 BOD &amp; 2020 Delegate Elections</td>
</tr>
<tr>
<td>MISSOURI</td>
<td>Columbia</td>
<td>March 1-3, 2019</td>
<td>Annual Meeting 2019 BOD &amp; 2019 Delegate Elections</td>
</tr>
<tr>
<td>RHODE ISLAND</td>
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<td>October 20, 2018</td>
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Program Approvals: The Date Request Form must be submitted to AST 120 days and the Application for Approval of State Assembly Continuing Education Programs 30 days before the program date to stateassembly@ast.org. How-to material and forms are available at stateassembly.ast.org, the State Assembly Policy and Procedure Online Manual. The completed Date Request Form must be submitted before the first of the current month to be published in the next month’s issue of The Surgical Technologist. A confirmation email as receipt received will be sent upon approval.

▲ Approved indicates a continuing education program approved by AST for CE credit.
▲ Pending submission of CE documentation indicates the state assembly has not submitted all required materials and signatures to AST for continuing education program approval.
▲ Accredited indicates a formal, college-based surgical technology or surgical assisting program that has been accredited by the Commission on Accreditation of Allied Health Education Programs (CAAHEP).

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Returned CE tests cost:
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### ORDER FORM

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**Answers - Review: Fractures, Bones and Healing**

1. Match the type of fracture with its description:
   - Avulsion fracture: break at its normal attachments
   - Colles’ fracture: break at the distal radius, forcing the hand into a dorsal and lateral position
   - Comminuted fracture: bone breaks into more than two pieces
   - Compound fracture: skin is pierced; bone may or may not be visible
   - Greenstick fracture: incomplete fracture and only in one cortex of the bone
   - Impacted fracture: broken ends of each bone are forced into each other, usually causing many fragments
   - Pathological fracture: caused by diseased bone
   - Bimalleolar ankle fracture: break of the lower fibula often accompanied with a break medial malleolus of the tibia
   - Spiral fracture: fracture occurs around the bone
   - Stellate fracture: fractures at central point with additional breaks radiating from the central point
   - Stress fracture: bone ends align, minimal displacement
   - Transcervical fracture: crosses the neck of the femur
   - Transverse fracture: horizontal line through the bone

2. Cortical bone (compact bone) consists of hard, dense tissue around the marrow cavity. It contains Haversian systems which give blood vessels access to the tissues. Cancellous bone (spongy bone) forms along stress lines, at the ends of bone and inside the medullary marrow cavity. It is porous and is composed of osteocytes and matrix.

3. Haversian systems are a structural unit of cortical bone, consisting of concentric layers of mineralized bone matrix.

4. At birth, bone marrow is red.

5. In addition to calcium, the other minerals that are stored within bone are phosphorus, magnesium, sodium, potassium, and bicarbonate.

6. Calcium and phosphorus are the two minerals in hydroxyapatite.

7. The five stages of bone healing (osteoogenesis) are:
   - Stage 1: Inflammation, injury to 48 hours, when the hematoma forms and clots.
   - Stage 2: Cellular proliferation begins after 48 hours. Macrophages begin to remove dead or damaged tissue from the wound and form the fibrin mesh.
   - Stage 3: Callus formation, lasting 3-4 weeks, during which the fibroblasts and osteoblasts form around the outer surface of the bone and bridge the fracture gap with a collagen matrix.
   - Stage 4: Ossification, a 3- to 4-month process during which the matrix calcifies and becomes firm bone.
   - Stage 5: Remodeling, osteoblastic and osteoclastic normalizes and the normal bone is maintained.

8. Define the following terms:
   - Avascular necrosis: Occurs when injury, drugs or disease disrupts the revascularization process, and circulation or the capillary network cannot be restored, potentially leading to the death of tissue
   - Diaphysis: The shaft of long bone that is composed of compact bone and contains the medullary cavity
   - Distraction: Bone fragments that separate and prevent bone contact, decreasing the blood supply and extending the time needed for healing
   - Delayed Union: A prolonged healing of a fracture due to traumatic, mechanical, pathological influences
   - Epiphysis: The ends of long bone that are composed of spongy bone and interface with the joint
   - Malunion: When the fracture heals in an abnormal position that affects the bone’s function
   - Nonunion: When the fractured pieces of bone do not heal due to infection and/or movement
   - Osteochondritis: Inflammation of the bone and cartilage
   - Osteomyelitis: Inflammation and infection of the bone, typically caused by bacteria
   - Osteoporosis: A condition brought on by loss of calcium from the bone without replacement, causing low bone density and greater risk for breakage
   - Osteotomy: Sawing or cutting of bone

References
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