Orthotic & Prosthetic Technology Programs

National Commission on Orthotic and Prosthetic Education

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Inside This Issue

Editor-In-Chief

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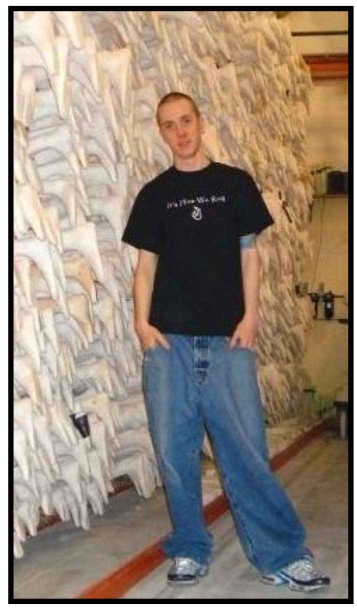
WHERE YOUR WORK MEETS YOUR LIFE

Before my education at Spokane Falls Community College (SFCC), and my clinical experiences with independent practices, I knew nothing about the O&P industry. My degree from SFCC and clinical experiences prepared me well for my ABC board exams and entering the workforce. After graduating from SFCC and earning my ABC technician credentials in both prosthetic and orthotic disciplines, I entered the job market. I interviewed with several O&P practices in multiple areas before deciding on Cascade Dafo in Ferndale, Washington. To achieve my goals, I was prepared to move outside my current city and state to interview with as many employers as possible. Not being bound by my hometown, I was able to pursue the best employer for me, rather than settling on an employer with a practice located near my home. After interviewing and a "hand skills" test, Cascade Dafo agreed to the salary I requested and added paid time off, 401K, health insurance (medical, dental, and vision), profit sharing, and moving expenses to make me a part of their team. I was hired and working two months after completing the program at SFCC.

My first year at Dafo, beginning in 2006, was dedicated to work within the Special Prosthetics and Orthotics Department which focuses on difficult and rare devices. Working in this department challenged my ability to adapt to new processes and designs. Plaster modification was taught in college to be a "practitioners only" process, thus I had the least experience in that area. My focus changed when I decided to turn my weakness into a strength during my second year at Dafo. Cascade Dafo was filled with many talented and skilled plaster modifiers. I learned the skills of plaster modification and became a proficient modifier.



After three years, I shifted gears and became entirely dedicated to digital modification. Processes like scanning and modifying positive models using C.A.D. software were not part of the curriculum at SFCC when I attended. Digital modification allowed me to create and replicate models not possible utilizing traditional plaster techniques. Since digital modifiers can work remotely, we were no longer limited to local modifiers. Digital modification provided access to all the best modifiers worldwide, regardless of location.

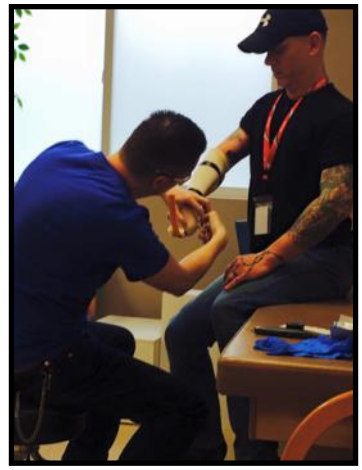
During 2009-10, I began the role of clinical assistant and became a Certified Assistant. Spending more time in the clinical setting allowed me to learn more about the needs and wants of the end user. Being able to span the gap between what was needed clinically and possible via manufacturing, I was able to link the two departments so both could function more efficiently. This change made it possible for central fabrication to focus resources where it mattered most thus assuring that patients would receive optimized devices.

My dream came true when I joined the Research and Development (R&D) Department in 2010-11. The Research and Development Department allowed me to utilize my creative problem-solving skills and everything else I learned along the way. I now design and test new devices, materials, processes, equipment, and tools. These improvements in design lead to better fit, better function, increased durability, increased operator safety, reduced waste, and increased profitability through efficiency. In addition to my work in R&D, I train other employees in different skill sets. Training other operators to fabricate devices, develop processes, and maintain high levels of quality has added to my value as an employee at the company. The ability for employees to teach and train other staff members is a skill desired by most employers.

See Work Meets Life, page 2

Work Meets Life (contd)

Before working at Cascade Dafo, I thought my career would be consumed at a "Mom-and-Pop" shop with 6 to 8 on-site coworkers, and I would be exclusively designing custom prosthetic limbs for a small adult population. Instead, I have found a home at a large central fabrication facility with hundreds of on-site and off-site coworkers working with both off-the-self and custom orthotic devices aimed at the world's pediatric market.



When I entered the O&P industry, I was concerned about the potential emotional toll that might accompany working with patients dealing with amputations, limb differences, and physical trauma. Working at Cascade Dafo has blessed me with many patient experiences over the last 15 years, like watching a patient start kindergarten and then years later seeing them start college, or watching a patient learn a new sport and then seeing them bring home a medal from the Paralympics after meeting the President of the United States.

When my wife (then girlfriend) and I graduated college in 2006, we set out to find jobs and establish ourselves as adults. The year we moved to Bellingham, Washington, the city was ranked as the number one U.S. city in which to live. Not knowing much about the area, we both decided to accept the job offers at Cascade Dafo and Western Washington University and after two years we got married in 2007. As husband and wife, we explored and learned more about the area. Access to the Pacific Ocean, crossing over into Vancouver, B.C. in Canada, dropping down to Seattle, riding at Mount Baker, and enjoying the various festivals in the surrounding cities made us decide to stay and build our life together here.

After two years of marriage, we expanded our family by having a son. Working for Cascade Dafo allowed us to prepare for the birth of our first child and made it possible for my wife to stay home and raise our child. After two years as new parents, we added our daughter to our family. Working for Cascade Dafo allowed me to financially support our growing family while my wife went through her second pregnancy and cared for our young son.

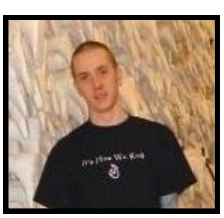
After two years, our little apartment was getting crowded with the four of us living there. We researched the different schools in the county and bought a home in an area that gave our children access to the best education. Whatcom County gave us access to rural, suburban, and metropolitan living possibilities.

Working at Cascade Dafo has allowed us to raise our kids ourselves and avoid paying for childcare by others. Our kids get to grow up in a rich environment with access to many different cultures. Cascade Dafo's paid time off program allows us to travel in the summer once the kids are out of school. Marriage, children, owning a home, and vacations are the aspects of my life made enjoyable and most affected by my work.

Key Points Learned from 15 years at Cascade Dafo, Inc.

- Be willing to move to a different city/area/state.
- Be willing to be flexible.
- Be willing to work late/overtime.
- Be willing to do jobs that other employees may not wish to do.
- Utilize the strengths of other members to learn the most from your team members.

About the Author



Lane was introduced to the world of orthotics and prosthetics from a teenage amputee who described how he used his prosthetic limb to ride his skateboard. Leaving behind a professional skateboarding career, Lane enrolled in and graduated from the Orthotics & Prosthetics Technology Program at Spokane Falls Community College in Spokane, Washington in 2006.

Lane completed his technical internships at the Preferred Prosthetics and Orthotics in Federal Way, Washington and at the University of Washington Medical Center in Seattle. After passing his technical ABC board exams, Lane began practicing at Cascade Prosthetics & Orthotics where he specializes in Cranial Remolding Orthoses and optimizing DAFOs. Lane enjoys spending time with his family while skateboarding and snowboarding in the Pacific Northwest.

Lane Guffy,CTPO, COA

MASTERING METAL

Introduction

The use of metal bar stock in the fabrication of orthotic devices is well-documented in the archives of orthotic technology. While metal structures have been largely superseded by thermoplastic constructs, the skills necessary to shape and contour metal bar stock are still relevant and valued in contemporary practice.

Metal Bar Stock

Round-edged	 Cross-section
Square-edged	 Cross section

The metal bar stocks used in the fabrication of orthotic devices are primarily aluminum and stainless-steel alloys. The most common alloys in use today are 2024 aluminum and 304 stainless steels. These alloys have been selected over time by their mechanical properties and ability to be manipulated using common tools and procedures. Thicknesses commonly range from 1/8" to 1/4" and widths from 1/2" to 3/4". Round-edged bar stock is preferred over square-edge bar stock because the radiused edges reduce indents caused by bending tools.

Mechanical Properties of Metals

The mechanical behavior of a given metal bar (upright) reflects its response or deformation in relation to an applied load or force. This response or deformation is related to the specific mechanical properties of the metal in use. Some of the more important mechanical properties of metals are elasticity, plasticity, strength, ductility, hardness, brittleness, toughness, stiffness, resilience, malleability, fatigue, and creep. Of these properties, elasticity, plasticity, hardness, and fatigue are major considerations when cold forming a metal upright.

Stress and Strain

To better understand what occurs when a metal upright is bent using the typical hand tools available to the fabricator, such as a pair of bending irons, a definition of elasticity, plasticity, hardness, and fatigue as well as the internal and external forces arising from bending the material is necessary.

Bending irons

Elasticity is the ability for a metal upright to return to its original shape after the stress is removed.

Plasticity refers to a permanent change of shape (direction) even after the stress is removed.

Hardness is a measurement of plastic deformation and is used to describe the strength of the metal.

Fatigue results from repeated stresses exerted on the metal upright weakening its strength and causing catastrophic failure even when a relatively low stress is applied.

Stress is an external force exerted on a given area of the metal upright. Stresses can be tensile, compressive, torsional, or any combination thereof.

Strain can be described as the deformation of the metal upright, both internal and external, resulting from the applied stress(es).

What Occurs When Side Bending an Upright

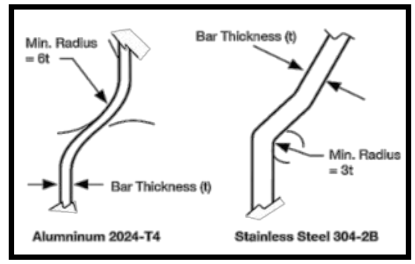
Now that we have a better understanding of the mechanical properties of metals, let us discuss what happens when a metal upright is bent along its side. Keep in mind that although aluminum and stainless steel have different hardness properties, both metals will respond to external stresses in a similar fashion.

A typical procedure used in bending metal uprights involves securing one end of a bending iron in a vise and placing the metal upright in the fork of the opposite, or free, end. The free-end fork of a second bending iron is placed over the metal upright at a given point adjacent to the free end of the secured bending iron.

When the hand-held end of the second bending iron is either pulled or pushed it exerts a force (stress) on both sides of the metal upright. The convex side of the bend experiences tensile, or stretching, stress and the concave side is compressively stressed. If the force exerted is below a certain limit, the metal upright will bend a slight amount but return to its original shape when the exerted force is removed. This demonstrates the mechanical behavior known as elasticity.

See Metal, page 4

Metal (contd)



If the force applied to the metal upright exceeds a certain limit, the upright is permanently bent even when the force is removed. In this instance the metal comprising the upright undergoes a plastic deformation. The radius of the newly created bend is influenced by the cross-sectional dimensions of the upright, how much force is applied by the tools, and the relative placement of both tools on the upright. Aluminum and stainless-steel uprights have different minimum radii of bends that if deviated from will compromise the integrity of the upright.

Another consequence of side bending is the creation of linear indentations across the width of both sides of the upright. This break in the surface integrity of the upright decreases the thickness of the material and increases stresses in that region and is referred to as a stress riser. If the metal upright is subjected to repeated bending-straightening cycles, additional stress risers are created and internal strain increases, propagating throughout that region. Eventually, one or more microscopic cracks will appear on the surface, increasing in width and depth until the upright breaks.

Edge Bending

Bending an upright along its edge using specialized bending irons creates greater stresses and strains because the forces generated by the tools act on a smaller area and create larger indentations across the edges. Torsional stress is sometimes introduced as well when performing this procedure.

Pearls

The information presented above provides a useful background for what I consider best practices to follow when bending and contouring metal uprights. The device that you fabricate will be used by a person who relies on that device for independence and safety when performing daily activities.

- Select only new bar stock for your fabrications.
- Before you begin fabricating, take some time to plan where you will edge-bend and contour the uprights. Consider the location and orientation of any joints, where the uprights must be straight and where edge-bending is necessary.
- While changing the curvature of a bend is often necessary, try to minimize the number of corrections needed to achieve the desired results.
- If the upright was edge-bent in the wrong direction, do not attempt to reverse the bends. Instead, use a new upright.
- Be aware of introducing any unwanted twists along the length of the upright as you are bending.
- When you are satisfied with the shape of your construct, temporarily attach any bands to the uprights and further evaluate contours and joint alignment. Make any needed adjustments before surface conditioning the uprights.
- If any adjustments are made to the upright contours of the device during the patient fitting appointment, recondition all surfaces before the final delivery.

If you have little or no prior experience with bending metal uprights, begin by using previously bent uprights and work on straightening them out. Develop a feel for the intrinsic characteristics of the piece you are working on, such as how much force you apply to produce a certain amount of curvature and how bending iron placement when using a similar amount of force influences the resultant curve. With practice and experimentation, you will master metal.

About the Author

Following graduation in 1980 from the University of Washington BS Program in Prosthetics and Orthotics, Bernard practiced in Minnesota and Wisconsin before returning to the Pacific Northwest in 1987.

In 2004, Bernard assumed the position of orthotics instructor in the Orthotic Prosthetic Technology Program at Spokane Falls Community College (SFCC) in Spokane, Washington. While at SFCC, he became known as an expert on the art of metal bending. After serving on several local, regional, and national O&P organizational committees, Bernard retired in 2015 but still provides support to the O&P Technology Program when needed.

Bernard Hewey,CPO

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- ✓ Have a minimum 3.0 GPA (O&P Technician Scholarship Only)
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- ✓ Demonstrate financial need
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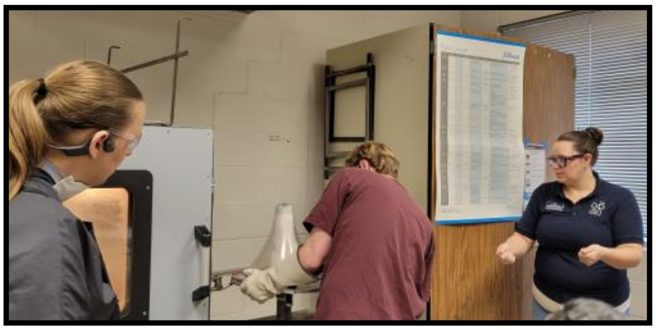
TEACHING AND LEARNING:
HIGHER ED vs THE FIELD

In 2013, I graduated from the Orthotic & Prosthetic Technology Program at Spokane Falls Community College (SFCC) in Spokane, Washington. After fabricating and helping patients for nearly a decade in clinics, I recently returned to SFCC to serve as the Instructional Support Technician for the O&P Technology Program.

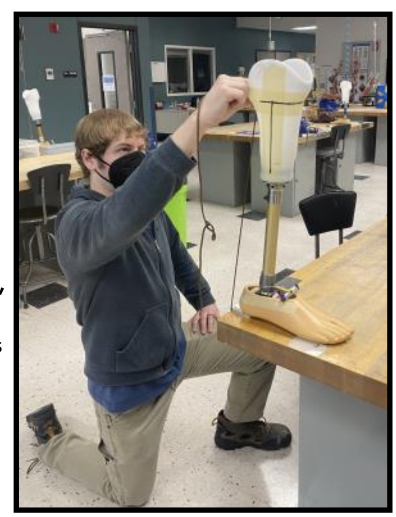
During the past ten years, I trained technicians hired off the street as well as technicians who started as students earning a certificate or degree. For clarity, I refer to technicians in the field with no previous knowledge of O&P as apprentices, and technicians with higher education training are referred to as students. Reflecting on my first year of teaching in a formal setting, I have observed similarities and differences when equating teaching and learning in higher education compared to teaching and learning in the O&P field.

As a mentor in the field or as the support tech in the classroom, I have similar responsibilities and roles that dictate similar interactions. In both teaching situations, my responsibility is to ensure quality and safe device production for all devices created for patients. From the beginning when teaching an apprentice or student, it is important to emphasize the foremost goal: to make an attractive, functional, and safe device for the patient to wear proudly and confidently.



Safety must never accept a shortcut. After all, a device failure is a liability to the technician, the practitioner, and the O&P practice. Emphasizing and assuring that quality is imperative when devices are being made - a patient device must be void of any major workmanship errors. My role is to equip both apprentices and students with the necessary knowledge and skills to foster individual growth as a technician. By providing direction, counsel, input, and assistance to the technician trainee, growth will eventually lead to independent fabrication of devices.

There are many differences when comparing teaching in an O&P practice versus teaching in a classroom. The most notable difference I have experienced is teaching methodology. In both settings, the end goal is to have a fabricated device that can be delivered to a patient. When educating and training, I prefer to teach using cognitive apprenticeship. Cognitive apprenticeship is a teaching method that incorporates concentration in hand skills and knowledge of building devices, such as traditional apprenticeship. Additionally, cognitive apprenticeship encourages and fosters overall growth and understanding. I teach a cognitive approach instead of a traditional approach because I want the learner to develop proactive thinking, identifying potential problems and solutions as they arise, while being able to understand the big picture or small concepts and principals throughout his/her career.



Another difference between teaching in the field and classroom teaching is the structure of learning. An apprentice will start with the easiest tasks, such as plaster work and then foot orthotics. However, based on the needs of the practice, the apprentice may suddenly need to begin a moderately hard task, such as making an articulated AFO with a plantarflexion stop, before being ready mentally or skill wise.

In an operational practice, the intention is that every fabricated device will be provided to a patient. Only after an apprentice has made a safe, quality device with no major shortfalls is that device placed for delivery to a patient. But to learn, failure and errors are part of the process, and teaching apprentices in the field may result in additional costs to the clinic practice and to the patient. In contrast, a student technician will start with basic instruction: lectures, demos, and lab time that all build on one another. In my experience, this segmented process makes it easier to connect the dots between concepts and principals because the student has a linear progression based on the compounding of concepts coupled with skills.

A classroom student will experience reading about alignment of a dummy, hearing a lecture about desired dummy alignment, and partaking in discussion that occurs simultaneously with a demonstration. It is only after curriculum objectives have been completed that a student proceeds with device fabrication. For example, device fabrication for orthotics starts with plaster modification, progresses to foot orthotics and shoe lifts until the student has fabricated both conventional and metal KAFOs. This teaching process ensures that the student is confident in his/her abilities to fabricate the next level of device without pressure. Whereas an apprentice in the field may be confused having to-function without a full understanding based on clinic patient needs. In both settings, it is important to nurture a mindset of growth and learning with positivity, patience, and reassurance among new technicians whether apprentices or former classroom students. This approach leads to a more competent technician who will grow into a more independent thinker.

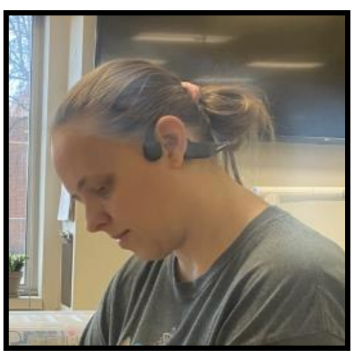
See Teaching, page 6

(Teaching, contd)

When I first started teaching and training technicians, I taught the best way I knew how. I noted the successes while I learned and took accountability for the failures. As I look back and reflect upon my teaching experiences, I have gained knowledge in different settings and grown intellectually over the years. As a result, I try to be fluid in my teaching style and instructional strategies, tailoring my abilities to each specific student. I am more intentional when explaining techniques, making sure each student is left with no questions and completely understands the task at hand. If any part of the explanation is unclear, I take the needed time to dive deeper into the explanations and demonstrations about the topic ensuring full understanding with the student.

Currently, I am proud to be teaching cognitive apprenticeship to students in higher education. I am proud of the education and training I accomplished while working in the field and of the apprentices I trained while being there. I feel fortunate that I can compare, contrast, and evolve my teaching methods while being compassionate to the challenges facing novice technicians.

About the Author



Patience graduated in 2013 from the O&P Technology Program at Spokane Falls Community College (SFCC) in Spokane, Washington and became dual certified in 2014. For six years, Patience worked throughout the Pacific Northwest in traditional O and P clinics.

Prior to employment with SFCC, she worked in San Diego fabricating only prosthetics devices. Patience is now employed as an Instructional Support Technician in the O&P Technology Program at SFCC. In this role, she manages and maintains the lab, supervises lab activities, and participates in teaching fabrication techniques. Patience enjoys spending time out of doors with family and friends, and she recently acquired a 117-year-old home that she is renovating.

Patience Nicholls, CTPO

CREATING CHANGE…Going the extra mile

Creating Change within a practice or organization, regardless of size, is never easy. Change disrupts our comfort zones, forces us to question old methods, and requires conscious thought to perform new tasks or respond in different ways. Sometimes, when we talk of adopting a new device or process, we get excited because we think the change will be easy to accomplish and will make our practice more attractive to patients. Then we realize, it's not the "practice" that needs the change! Rather it is us, the clinicians and staff, and that information often creates anxiety and resistance.

Much of the change that we see evolving in healthcare and the O&P profession focuses on increased contact with others: patients, physicians, co-workers, and visitors. Increased contact requires improved communication skills and the desire to be an effective team player. This type of change is more difficult because all staff members involved are asked to be more responsive. We are asked to be efficient and productive as well as being more caring and sensitive. Yikes! Change focusing on enhanced productivity while being more caring and sensitive, requires each person involved to "go the extra mile!"

Going the extra mile is an old concept that was formulated by Napoleon Hill around 1937 while working with Andrew Carnegie. **Going the extra mile means giving more and better service than that for which one is paid or requested and giving it with a positive mental attitude.** While this concept is often successfully employed by many individuals and businesses, it remains somewhat new to others, including many within the healthcare industry. And it seems, the extra mile concept enables one to profit by the law of contrast since many people do not practice the extra mile habit.

In any situation, to go the extra mile means to do more than you are asked to do…to give more than is expected or requested. To do little things that may go unnoticed or big things that offer no promise of reward. To do unimportant things that no one, except you, will ever know. And to do this, to give this extra effort, day after day after day! Some people seem to think that if they do a bit more or give something extra on one day, they can slack-off or do less of their usual work on the next day. Ah contraire. If that were the case, it would not be an "extra mile!"

Going the extra mile really does mean giving more than is expected or requested and doing so with a positive attitude, expecting nothing in return. What? Expecting nothing in return? Well, not really nothing, but not anything tangible when you do your mile! Of course, we expect to see a return on our extra effort, but it may not come in the usual manner, nor be returned by the person or party who received it. We go the extra mile because we care and take pride in doing the very best job possible, even if it means extra time, extra thought, and extra effort.

And there is a payoff! Any O&P practice that is willing to go the extra mile, to give that something extra, will have no difficulty attracting patients and experienced, productive staff members. From the clinician's perspective, that is the payoff! An even bigger payoff exists for the technician or staff member who gave more…who went the extra mile. You leave feeling swell! You feel a sense of accomplishment and satisfaction knowing that you have the audacity to be memorable by going the extra mile and giving to others!

Ruthie H Dearing, MHSA, JD
Editor in Chief
O&P Tech Newsletter