



NoteWorthy

Continuous Quality Improvement: The Relationship Between Experienced Professionals and Residents

- Jeremy Bliss Sherman, MS, CPO, LPO

"While working in a clinic, whether as a technician or clinician, anytime I heard the phrase continuous quality improvement (CQI), I thought of improving clinical outcomes, fabrication processes, or patient satisfaction. It was not until transitioning into academia that I started to include education in that thought process."

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Rolled Silicone: Accessing a Generational Advancement in Prosthetic Material Options

- Mariya Cameron, CEO of 14th Element Fabrication

"With advancing material technology, each generation of fabricators in the O&P industry faces a new set of materials and processes."

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Open-Book Management: Taking the Mystery Out of Business

- Nathanael Feehan, LPO, Certified Great Game of Business Coach

"Most of us entered the Orthotics & Prosthetics profession because we wanted to help people walk, work, and live better lives—not because we wanted to become business experts."

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Effective Hazard Communication for Chemicals in the Prosthetic and Orthotic Workplace

- Amanda S. Barizo, CTPO

"Working in the prosthetic and orthotic (P&O) laboratory setting comes with occupational hazards that are unique among traditional clinical settings."

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Masters of Prosthetics-Orthotics Research at the Northwestern University Prosthetics-Orthotics Center

- 2026 Thesis Defense Graduating Class Authors and Thesis Titles

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Continuous Quality Improvement: The Relationship Between Experienced Professionals and Residents

- Jeremy Sherman, MS, CPO, LPO

About the Author



Jeremy Bliss Sherman, MS, CPO, LPO

Jeremy is an Assistant Professor and Associate Program Director for Curriculum in the Orthotics and Prosthetics Program within the School of Health Professions at Baylor College of Medicine. He earned his Bachelor of Science from The University of Texas at Austin and his Master of Science in Orthotics and Prosthetics from the Baylor College of Medicine.

A certified and licensed prosthetist-orthotist, Jeremy is dedicated to advancing orthotics and prosthetics education through curriculum development, innovative teaching strategies, and applied research. His scholarly work focuses on clinical education, patient education, practitioner ergonomics, and professional training models in orthotics and prosthetics.

While working in a clinic, whether as a technician or clinician, anytime I heard the phrase *continuous quality improvement* (CQI), I thought of improving clinical outcomes, fabrication processes, or patient satisfaction. It was not until transitioning into academia that I started to include *education* in that thought process. Yet one of the greatest opportunities for quality improvement within orthotics and prosthetics is the relationship between experienced professionals and residents.

"Every interaction with a resident (whether traditional or integrated) provides an opportunity not only to improve another professional's skills, but also to examine and improve our own."

Residency Training is a Transition, not a Blank Slate

Students entering residency training may be perceived as "starting from scratch," but that is rarely the case. By the time residents finish their didactic education, they have been exposed to simulated patient care, fabrication, multiple projects across the entire breadth of the field, and clinical shadowing experiences. Because these experiences occur within a limited period and under a relatively small group of instructors, students are intentionally taught a limited number of methods for accomplishing a task. This standardization might be seen as a weakness, but it is designed to allow learners to develop consistency before being asked to compare multiple approaches.

Using transfemoral management as an example (it is one of the classes I teach), students learn the method of transfemoral casting as a structured two-person technique with defined ischial containment modifications. This method provides an excellent foundational skillset, but it is only one of many successful approaches used throughout the profession. Residency education and training then represent a dramatic shift. Suddenly, residents encounter numerous ways of accomplishing the very same task. For that same transfemoral patient, they may observe a single-person cast one day, a two-person cast the next day, and a three-part cast later during the week. Residents may encounter static casting, dynamic casting, free-hand casting, or casting with premade jigs or brims.

What seemed straightforward in school suddenly becomes a landscape of seemingly endless variation. This variation appears during even the most routine tasks. One clinician prefers free-hand casting an AFO, while another clinician prefers casting using alignment blocks. One technician skives pads on a Sutton; another tech prefers the Trautman. One makes wedging out of crepe, the second tech uses 2-part Pedilen foam, and yet another tech 3d prints the wedges.

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Improvement (continued)

Residents quickly discover that there is rarely only one correct way to fabricate a device. In fact, at a minimum, there are usually 10-12 different ways to fabricate a device.

Rather than viewing these differences as confusing contradictions, we should recognize them as opportunities for growth.

We Are All Products of Our Mentors

One realization that has become increasingly apparent throughout my career is that none of us have independently developed our skills and techniques.

As a graduate of Baylor College of Medicine, I had the privilege of learning from numerous clinicians and technicians, each with their own strengths. When I cast an AFO, I often find myself using techniques I learned from one particular CO. When casting a transfemoral patient, my approach is really a blend of methods taught by several different CPs and CPOs.

“When finishing an inner boot, I still remember the technician who showed me the simple trick of turning it inside out before finishing.”

Even something as seemingly straightforward as modifying a cosmetic cover often reflects techniques passed down from someone who taught me years ago.

I am the sum of the parts of everyone who has ever taught me.

None of us possesses a truly proprietary method. Most of our techniques have been inherited, refined through experience, and adapted to fit our own practice. Residency education and training is where that process continues for the next generation.

Teaching Principles Instead of Preferences

One challenge in residency education is distinguishing between principles and techniques.

A technique describes *how* we perform a task.

A principle describes *why* we perform it.

For example, one clinician may prefer a two-person casting technique while another clinician casts independently. Those are different techniques, but both clinicians are attempting to accomplish the same principle: obtaining an accurate, reproducible impression while maintaining control of the limb.

Similarly, technicians may have different approaches to skiving pads, finishing plastics, or modifying positive models. While the techniques vary, the underlying goals: accuracy, efficiency, repeatability, durability, and patient comfort remain consistent.

When we teach only our preferred technique, residents may mistakenly conclude that there is only one correct method or technique. When we explain the principle behind the technique, we equip them to evaluate new methods thoughtfully throughout their careers.

“Residents who understand this underlying principle will evaluate new techniques long after residency training has ended.”

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Improvement (continued)

Approach Residents with Curiosity

Experienced professionals often begin evaluating a resident the moment they watch the resident complete a task. While assessment is important, curiosity should come first. Before teaching a new technique, first determine what the resident already knows. Ask the resident to cast a patient, fabricate a pad, align a prosthesis, or modify a model without interruption. The results of this work will provide a baseline that allows you to tailor your teaching. Some residents need refinement of existing skills. Others need exposure to entirely new techniques. Beginning with assessment makes mentorship more efficient and more meaningful for both learner and teacher.

Instead of immediately correcting a resident, consider asking three questions that I hope the resident is asking as well:

- Where did you learn that technique?
- What outcome are you trying to achieve?
- Why do you prefer that approach?

The reasoning of the residents can be very revealing and can help determine if their goal was correct even if they were trying to achieve it in a way you might not have chosen. The benefit to this approach is discovery of an efficient method you have never previously considered.

Teaching is not simply transferring information; it is a conversation between professionals at distinct stages of development.

Residents arrive imitating the people who have taught them. In time, they will modify those techniques, develop preferences of their own, and eventually teach someone else.

“Our responsibility is not simply to replace the resident’s previous knowledge with our own, but to help build upon it.”

Measuring Growth

Technical skills can sometimes feel difficult to evaluate because there are many acceptable ways to accomplish the same task. However, that does not mean they cannot be measured. Instead of asking whether a fabrication technique is simply "good" or "bad," ask what concrete qualities can be observed, such as:

- Safety: Are the residents developing habits that will protect themselves and others throughout their career?
- Repeatability: Can the resident always give the desired/requested result? Or are the results inconsistent? If so, what fabrication skills or techniques are making the results inconsistent?
- Efficiency: Does the resident spend all day in the machine room for a 5-minute task? Or conversely, is the resident rushing and sacrificing quality to meet perceived deadlines?
- Accuracy / Quality: Is the resident giving the requested result? Or do you have to ask the resident to repeat the task?
- Patient comfort / overall outcome: Did the resident create a device in a different manner than expected? Was the outcome the correct one?
- Communication during the process: Do the residents communicate questions, concerns, achievements with you? Are they learning to be team players or a lone wolf?

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Improvement (Continued)

Clear expectations also produce better learning. Feedback such as, "This pad is terrible," provides little guidance for improvement. Instead, consider specific observations such as, "The edges are feathered enough that removing this pad after gluing may destroy it," or "This trim line could be straighter for a more cosmetic finish for the patient."

Concrete, actionable feedback allows residents to understand not only that something should change, but why it should change.

The Technician's Role

Residents might enter residency training expecting to learn primarily from clinicians. Though, many of the most lasting lessons will come from experienced technicians.

"Technicians teach efficiency, craftsmanship, troubleshooting, safety, and countless practical skills that are difficult to capture in a textbook."

They demonstrate not only how to fabricate a device, but how to recognize subtle problems before they become significant. These lessons are frequently remembered long after the residency has ended because they shape the habits residents carry throughout their careers.

Experienced technicians often recognize subtle fabrication problems before they become visible to others. Technicians know which shortcuts save time and which create problems later. These instincts are difficult to teach in a classroom but become invaluable when passed from technician to residents every day through demonstration, repetition, and conversation.

Continuous Improvement Goes Both Ways

Perhaps the greatest misconception about mentorship is that learning flows in only one direction.

Every resident brings new perspectives shaped by current graduate education, exposure to emerging technologies, and experiences from other clinical sites. Remaining curious allows experienced professionals to continue improving along with the residents they are teaching. The mentorship relationship should not end when a resident completes a rotation. Staying connected, answering questions, and learning from former residents strengthens both individuals and, ultimately, the profession itself.

In a previous NCOPE technician newsletter, Alex Wright called for more defined terminology and training regarding hand skills. I believe that effort should extend beyond terminology alone.

"We need shared expectations about what we expect residents to be able to do, how we evaluate individual progress, and how we continue learning from one another."

Continuous quality improvement in prosthetics and orthotics is not simply about producing better devices. More importantly, it is about producing better professionals. Every resident who enters our clinics represents another opportunity to improve not only their skills, but also our own. If we approach mentorship with curiosity, humility, and a willingness to share what others have shared with us, we strengthen the profession for everyone who follows.

After all, none of us arrived here alone.

Rolled Silicone: Accessing a Generational Advancement in Prosthetic Material Options

Mariya Cameron, CEO Of 14th Element Fabrication

About the Author



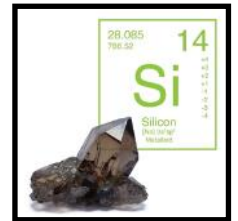
Mariya Cameron
CEO of 14th Element Fabrication

Mariya Cameron, the visionary founder and CEO of 14th Element Fabrication, proudly embraces her passion for silicone and innovative problem-solving. With over thirteen years of devoted experience in the prosthetics and orthotics sector, she has mastered the art of utilizing silicone. Mariya's professional journey commenced at a prominent U.S. prosthetics company, specializing in upper limb amputations and limb differences. Her dedication led her to Germany, where she received specialized silicone training from yet another leading prosthetics company before returning to the States to establish a cutting-edge silicone department and product line.

Having spent almost a decade working for others in the industry, Mariya took the leap in 2019, establishing her own venture, 14th Element Fabrication (14ELMT). With a strong desire to be an industry disruptor, Mariya's driving force behind 14ELMT is to combine silicone and new technologies with artistry, pushing the boundaries of what is possible in prosthetics. Her ultimate vision is to transform medical devices into personalized, functional fashion, truly bridging the gap between art and science.

Apart from her vision, what distinguishes her business from the competition is that it is woman-owned in male-dominated industry. Under her exceptional leadership, 14ELMT has flourished, creating unique and groundbreaking silicone prosthetic solutions.

With advancing material technology, each generation of fabricators in the O&P industry faces a new set of materials and processes. One of the current generational challenges and opportunities is centered on the use of silicone. For the past 15 years, I have worked exclusively in this medium including rolled silicone. This article will share my learned experiences to help-assess how and at what level to integrate silicone into a prosthetics care model.



The decision to specialize in silicone was an easy one. Early in my career at Arm Dynamics, we conducted a pilot study with transradial upper limb patients.

"The results were nearly unanimous: nine out of ten patients preferred a silicone inner liner to a thermoplastic one, while the tenth patient expressed indifference."

This study and years of successful fittings at all levels (upper and lower limb) demonstrated silicone's ability to provide increased range of motion, control, comfort, and suspension over thermoplastic. Some users even note that the silicone feels like an extension of their own body. Furthermore, published journal articles have shown that silicone can effectively treat scarring and help to close weeping wounds on the most demanding bilateral prosthetic users.

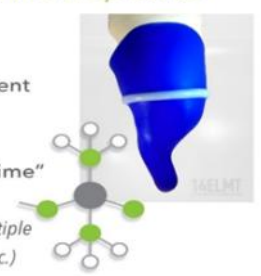
The high-performance results of the silicone are undoubtedly due to the unique properties of this revolutionary material.

SILICONE BENEFITS

14ELMT
14th ELEMENT FABRICATION

Clear advantages over traditional thermoplastics

- Biocompatible (elicits no immune response)
- Hygienic (does not support bacterial growth)
- Promotes wound healing & scar treatment
- Shown to increase suspension
- Shown to increase range of motion
- Increased comfort & prosthesis "wear time"
- High elasticity & compressibility
- Limitless customization (e.g. integrated multiple durometers, components, colors, straps, custom art, etc.)



See Fabrication, page 7

Fabrication (continued)

Compared to plastic, silicone is a much more stable, dynamic, biocompatible material that better accommodates the complex movements of a limb. From partial digit to interscapular level amputations, silicone simply outperforms thermoplastic in prosthetic devices. These results can be attributed to silicone's unique chemical make-up. Considered to be the missing link between organic and inorganic chemistry, silicone is a standalone material with its unparalleled combination of strength and flexibility. So then, what exactly is silicone?

Synthesized in a lab, silicone is primarily composed of silicon, the 14th element on the periodic table.

"Silicon is the second most abundant natural resource on the Earth's crust, mined in the form of quartz crystal."

When mixed with other constituents, silicon yields a highly flexible, temperature-resistant material that does not support microbial growth or elicit an immune response. Silicone can be manipulated into many forms, including gels, foams, fluids, and various rubbers.



At 14th Element Fabrication, we primarily work with solid silicone, or High Consistency Rubber (HCR). Often referred to as rolled silicone, parts A and B of the HCR are milled together on a silicone roller to catalyze the material and create Play-Doh like sheets that are draped over plaster models. The silicone is then rolled over with a hand tool and perforated to remove air pockets, before being vacuumed and cured in an oven. HCR silicone provides structure to the prosthetic appliance. In contrast, liquid silicone, or Room Temperature Vulcanizing (RTV) silicone, provides additional cushion, elasticity, and grip. RTV silicone is degassed in a vacuum chamber and injected into a custom mold.

HCR and RTV silicones are divided into two primary types based on their curing mechanism:

Tin Cure: A lower-cost, easy-to-use silicone that is unsafe for body or food applications due to the byproducts it produces.

Platinum Cure: The standard for medical-grade applications, as it produces zero byproducts and is completely skin-safe. This is the only type used at 14th Element Fabrication.

Both HCR and RTV come in a variety of shore values (hardnesses) and can be combined to create a multi-durometer product that closely mimics human tissue and limbs.

See Fabrication, page 8



Fabrication (continued)

“Over the years, we have developed ways to seamlessly integrate these different types of silicones at 14ELMT to create customized features.”

These features include our **ELASTO-fit** feature, designed to ease donning and doffing for individuals with bulbous limbs, custom cushions for limb sensitivities, and varied levels of tackiness to optimize suspension. We have also developed surface treatments to reduce tackiness on the inside and/or outside of the products to further ease donning and doffing.

Given the proven benefits of silicone applied to prosthetics, our goal is to see rolled silicone become accessible to everyone in need. At 14ELMT, we have leveraged our combined 40+ years of experience applying this material to upper limb prosthetics to take the guesswork out of the process for our customers. However, we also understand and encourage the desire for a practice to have at least minimal capabilities to modify and repair silicon in house. While no in-house capabilities are strictly required to work with us, we recommend establishing basic low-investment capabilities for repairs, modifications, and small diagnostic devices.

Below is a three-tiered framework for establishing in-house rolled silicone fabrication. For each level, we have included estimated price ranges, roller types, potential capabilities, and required accessories. For all three tiers,...

“...we recommend purchasing a silicone roller to eliminate the need to order pre-milled sheets.”

Please note that this list does not consider the cost of entry-level HCR training and serves as a general guideline.

Tier 1: Entry Level Rolled Silicone

Price Range: \$300-\$500

Roller Type: Polymer Clay Press machines readily available online in three configurations: manual, a detachable electric motor, or built-in electric motor.

Silicone Capacity: Capable of rolling an estimated 10 grams of 50 shore silicone.

Roller Gap Range: The adjustable range is between 0.08mm - 3mm.

Capabilities: Partial finger to some partial hand test liners, small repairs, and modifications to all levels.

Accessories: Teflon work mats, silicone primer*, silicone glue, small hand roller**, small, refrigerated space for silicone storage, a digital scale to measure grams of silicone, a heat gun or forced air oven to cure the silicone and a selection of HCR silicones.

*Use primer to clean and prep silicone before adding more HCR or silicone adhesive for repairs and modifications.

**Small hand tools can be made by modifying metal knurled dental tools. At your next dental appointment ask your dentist if any old hand tools are no longer needed.

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Fabrication (continued)

Tier 2: Mid Level Rolled Silicone

Price Range: \$8,000-20,000

Roller Type: Hand cranked silicone mill. These can be robust long-lasting machines requiring little maintenance. Prices and exact specifications vary greatly depending on the seller.

Silicone Capacity: Capable of milling 100 grams of 50 shore silicone.

Rolling Gap Range: The adjustable range is between 0.1mm - 5mm depending on the seller.

Capabilities: Partial finger, partial hand and short transradial.

Accessories: Teflon work mats, silicone primer*, silicone glue, medium to large hand roller, refrigerated space for silicone storage, a digital scale to measure silicone by the gram, a curing oven, and a selection of HCR silicones.

Additional Potential Fees: Broker fees to release your machine from customs and potential tariffs.

Tier 3: High Level Rolled Silicone

Price Range: \$20,000-50,000

Roller Type: Electric silicone mill. Pricing varies depending largely on silicone capacity and safety features.

Silicone Capacity: Capable of milling 500g or 1500g of 50 shore silicone depending on the roller size and capabilities.

Rolling Gap Range: The adjustable range is between 0.1mm - 20mm depending on the seller.

Capabilities: All upper and lower limb amputation level devices, repairs, and modifications.

Accessories: Teflon work mats, silicone primer*, silicone glue, large hand roller that may have to be made by a machinist, refrigerated space for silicone storage, a digital scale to measure silicone by the gram, an oven to dry plaster models and cure silicone, and a selection of HCR silicones.

Additional Potential Expenses: Dedicated circuit to power the machine, space to house the machine, hoist to get 300 lb desktop roller onto a countertop, broker fees to release your roller from customs and potential tariffs.

While the silicone roller determines your tier capability, the machine is only as good as the person operating it.

“Your largest and most important investment in high-level rolled silicone is your technician.”

Team players with skilled hands, good instincts and a sharp mind are invaluable. If you are fortunate enough to find such talent, treat these team members well. Tend to your investment by initiating your first step: creation of a safe and well-functioning work environment.

As you implement and install large electric silicone rollers, the risk of injury inherently and drastically increases. Ask yourself...how much is your finger or the finger of a colleague worth? If the answer to this question is priceless, then purchasing a machine with premium safety measures is well worth the investment. Ideally, the roller should have the following safety features:

- easily accessible emergency stops if you find your hand or a colleague's hands inside the roller.
- foot pedal controls for both forward and reverse operation.
- and an emergency release that opens the rollers fully.

Safety Tip: Most injuries occur while cleaning the machine. Always run the rollers in reverse during cleaning. When operated correctly, there is no need to place fingers where the rollers meet. All operators must be thoroughly trained on safety protocols to protect both themselves and the equipment.

Beyond machinery and safety, several operational factors should be considered when setting up an in-house rolled silicone laboratory.

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Fabrication (continued)

Silicone Quality

For the best outcomes, strictly use platinum-cured, skin-safe medical-grade silicone. However, quality can vary. Even HCRs sourced from major manufacturers with signed purity guarantees can occasionally arrive in poor condition. The most common issue seen is premature hardening of the silicone called "creping" or hardening where the raw silicone appears crumbly rather than gum-like. When milled, it may crumble at the edges or show what is described as structural "cracks." This state is largely caused by improper storage conditions. While high-quality silicone has minimal creping, small amounts can be resolved by passing the material through the mill up to ten times to let friction break the weak bonds. If the silicone does not reach a pliable consistency within ten passes, it is a bad batch.

Purchase Minimums

Large manufacturers often enforce minimum order volumes or values (\$500–\$1,200) because they typically serve industrial clients purchasing thousands of pounds. Ordering below these minimums can incur additional fees up to \$500, and individual items may carry minimum volume requirements of 10 to 50 lbs. Smaller distributors offer purchases of smaller amounts without penalties and provide faster turnaround times, though their selection is limited to in-stock items. However, it is ideal to maintain relationships with both types of vendors.

Silicone Lead Times

Lead times among distributors vary greatly. Small local distributors typically ship in-stock items immediately, including overnight options. Larger manufacturers may have lead times ranging from 1 to 6 months. Be certain to plan for continued fabrication by consistently auditing your inventory and lead expectations.

Clean Space

Unlike tin-cured options, platinum-cured medical silicones are highly susceptible to cure inhibition. Fabrication should take place in a clean space away from common contaminants like latex, sulfur, and general laboratory dust and debris. If you have expended the time, energy, and funds to source and purchase quality silicone, do not let your investment end there.



Based on the Arrhenius Equation, every 10–15°F increase above room temperature cuts the working time of your HCR in half.

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“Your workspace must be temperature-controlled, and a refrigerator is required to store pre-milled silicone to extend the shelf life.”

Silicone Roller Maintenance

High-quality electric rollers (such as those imported from Europe) require minimal but specialized maintenance. With a high-quality electric roller, when service is required, two options exist. Service will require either payment for an overseas technician to travel to your practice, or repairs can be managed in-house via video troubleshooting with the vendor.

Additionally, respect the machine's capacity ratings (gram weight and shore value). These ratings generally apply to wider gaps (e.g., 3mm and above) rather than tight settings like 0.1mm. If the motor laborers, the gap must be widened or the silicone flattened before feeding it through.

Drying/Curing Oven

Plaster models must be completely dry before applying silicone. A dual-purpose oven capable of drying plaster and curing silicone typically costs \$2,000–\$3,000. Ensure that the oven clearance can accommodate the size of both models and pipes.

Technician

Similar to 3D printing, the ultimate investment is talent. Training in advanced settings (such as the specialized programs in Germany) suggests that mastering silicone fabrication requires roughly three years of full-time immersive experience. Even after 15 years in the medium, members of our staff and I continue to refine our approach.



For practices that prefer to avoid the complexities of in-house manufacturing, 14th Element Fabrication is proud to offer comprehensive, established full-fabrication services. To see our cutting-edge applications for this material, please visit our website: www.14ELMT.com

About the Author



**Nathanael Feehan,
LPO/CEO**

Nathanael Feehan, a Spokane native, began his business journey early, helping run a family-owned animal feed store in Washington state. The store's profits supported his and his siblings' college education. In 2003, his father started an orthotic and prosthetic business, where Nathanael took on various roles, including patient interactions and fabrication. He earned a business degree in 2008 and completed a program in Orthotics and Prosthetics in 2010.

In 2012, Nathanael returned to his hometown in Silverdale, Washington to join his father's practice Master's Orthotics & Prosthetics. Following his father's passing in 2015, Nathanael took over the family business. In 2019, he adopted "The Great Game of Business" principles, resulting in a 1,500% profit increase and enhanced employee engagement by the end of 2022. He advocates for transparency in business operations, valuing employee involvement.

Nathanael studied the impact of inflation on the orthotic and prosthetic industry and healthcare. He believes open book management and the Great Game can help businesses navigate current and future challenges. Nathanael became a certified coach to spread these principles to small businesses and healthcare providers, enabling them to provide essential care while remaining adaptable. He sees the Great Game as a path for healthcare providers to achieve both excellence and

Open Book Management: Taking the Mystery Out of Business

- Nathan Feehan, LPO, Certified Great Game of Business Coach

"Most of us entered the Orthotics & Prosthetics profession because we wanted to help people walk, work, and live better lives—not because we wanted to become business experts. Yet every O&P practice eventually runs into the same reality. Reimbursements become tighter, costs continue to rise, and owners are forced to make difficult decisions that are not always obvious to the rest of the team.

For years, that described my company.

After my father passed away in 2014, I took over management of Master's Orthotics & Prosthetics. Like many business owners, I believed it was my responsibility to make the tough decisions and shield employees from the financial side of the business. Every time we delayed a purchase, held off on hiring, changed a process, or adjusted priorities, I found myself explaining—or defending—those decisions. It was not that our employees were unwilling to help. But in fact, they simply did not have the same information that I had.

Eventually I came to a simple realization: ...

"...people cannot make business decisions if they do not understand how the business functions and operates."

That realization led me to Open-Book Management and eventually to becoming a Certified Great Game of Business Coach. Open-Book Management is a business approach that focuses on shared financial and performance data so that employees take responsibility for effective operation of the business.

The philosophy behind Open-Book Management is surprisingly simple. Teach employees the language of business, give them the information needed to understand how the company succeeds, and trust them to use that knowledge to make better decisions. Contrary to what many people assume, Open-Book Management is not simply handing everyone an income statement. Financial transparency is only one part of the process. The real goal is to help every employee understand how the behaviors and choices made each day influence the health of the company.

The roots of this philosophy trace back to Springfield Remanufacturing Corporation (SRC) in Springfield, Missouri. During the recession of the early 1980s, SRC was a struggling division of International Harvester.

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Mystery (continued)

As layoffs swept through the company, plant manager Jack Stack and his leadership team made the extraordinary decision to buy the business. After dozens of banks turned them away, they secured financing with only about \$100,000 in equity to purchase an \$8.9 million company. With enormous debt and an 18 percent interest rate, failure simply was not an option.

Jack Stack realized something that has since become the foundation of The Great Game of Business®. If every employee understood how the company made money, where it lost money, and how their individual work affected those results, they could become active participants in improving the business rather than simply following instructions. Instead of hiding financial information, Jack and his management team taught everyone how to read and interpret the financial data.

“Instead of asking employees to trust management, they invited employees to understand the decisions made by management.”

That idea resonated with me immediately.

One analogy used during Great Game of Business training has stuck with me ever since. Imagine trying to bowl while someone has pulled a curtain in front of the pins. You can throw the ball, but you have no idea where your ball is aiming or how close you came to hitting the pins. You might occasionally knock down a few pins by chance, but you cannot consistently improve because you never receive meaningful feedback.

Now remove the curtain.

Suddenly you can see the target. Every throw teaches you something. You begin adjusting your aim, correcting your mistakes, and throwing more strikes.

Traditional management often asks employees to bowl with the curtain closed. Open-Book Management removes the curtain.

In 2022, we made the decision to become an Open-Book company.



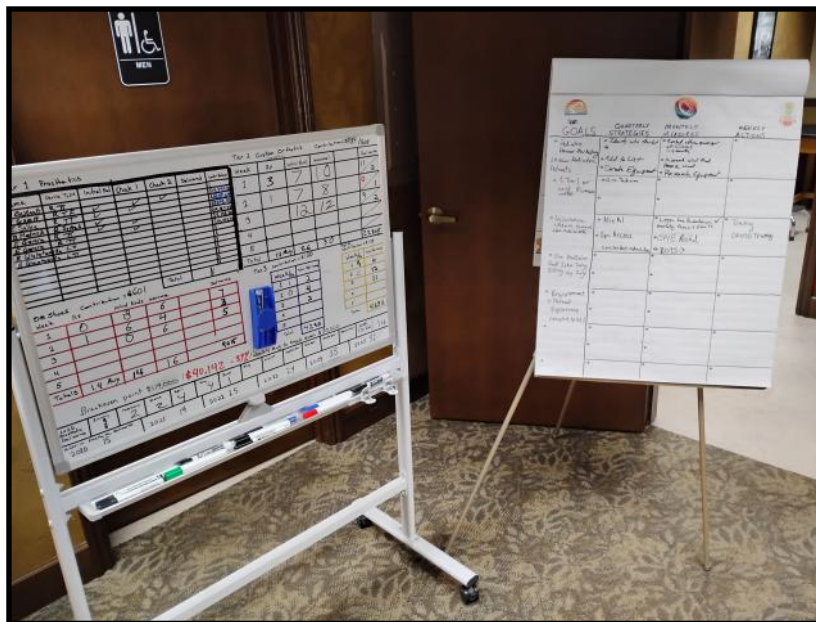
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Mystery (continued)

That did not mean posting financial statements on the breakroom wall and hoping everyone understood them. It meant teaching our team how our business actually works. We discussed revenue, gross margin, payroll, overhead, reimbursement challenges, and profitability. We explained why cash flow matters just as much as profit. Most importantly, we helped everyone understand how their daily decisions affected those numbers.

Every week our team gathers for a 30-minute huddle. About five minutes are devoted to reviewing the company's key numbers. We discuss what has changed, where we are headed, and whether we are on track to meet our goals. Employees are encouraged to ask questions, challenge assumptions, and offer ideas. Because everyone understands the numbers, those conversations are productive rather than intimidating.

Once each year, we complete a long-term planning process together. Rather than leadership developing goals behind closed doors, our entire team helps identify priorities for the coming year. We establish goals, define expectations, and select what The Great Game of Business calls our "Critical Number." The Critical Number is the single measurement that will have the greatest impact on the success of our practice during the coming year. Because profitability has fluctuated significantly over the past several years, profit has often become our Critical Number. Throughout the year we revisit established goals during our weekly huddles and adjust as conditions change.



What surprised me most was not the financial education. It was what happened when people realized they could genuinely influence the outcome.

One of our purchasing specialists approached us with a simple idea. If we bundled vendor orders instead of placing them individually, we could reduce shipping costs. It was not a revolutionary concept, and management certainly could have thought of it. The reality, however, is that managers have hundreds of competing priorities each and every day. This employee saw an opportunity because they understood that reducing expenses improved profitability—and that profitability benefited everyone.

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Mystery (continued)

We implemented that suggestion for placement of vendor orders.

Our shipping costs dropped by roughly 20 percent, saving several thousand dollars over the course of the year. Those savings flowed directly to the bottom line. Because we also have a profit-sharing program,...

“...the savings ultimately came back to every employee in the form of a larger bonus.”

That experience perfectly illustrates what Open-Book Management is all about. It is not about management having all the knowledge and all the answers. In reality, it is about creating an environment where everyone in the company is looking for ways and opportunities to improve the business and the provision of care.

Our first full year as an Open-Book company resulted in an approximately 1,150% increase in net profit. While that statistic is technically true, it also deserves some context. We had made very little profit the previous year, so we were essentially moving from about \$10,000 in profit to roughly \$100,000. The percentage makes for an impressive headline, but it is not the real story.

“The real story is that our employees stopped thinking like employees and started thinking like businesspeople.”

Technicians began considering material waste.

Office staff began identifying process improvements.

Our appointment scheduler became more aware of how no-shows affected productivity.

In every department, our staff members began asking not only, "What is my job?" but also, "How can I help to make the company stronger?"

That shift continued long after that first year.

The whiteboard displays financial data for three quarters (Ter 1, Ter 2, Ter 3) and a year-to-date summary. It includes tables for weekly contributions, total contributions, and a breakdown of expenses. The data is handwritten in black and red ink.

Ter 1	Ter 2	Ter 3	Year Total
1	2	3	4
2	3	4	5
3	4	5	6
4	5	6	7
5	6	7	8
6	7	8	9
7	8	9	10
8	9	10	11
9	10	11	12
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96	97	98	99
97	98	99	100

See Mystery, page 16

Mystery (continued)

Open-Book Management has also helped to make me a better leader.

Transparency requires humility. When everyone understands the numbers, you cannot hide behind vague explanations or simply say, "Because I said so." I have had to admit to mistakes made, learned how to explain my reasoning more clearly, and willingly accepted a change when someone else had a better idea. That level of accountability can be, and is at times, uncomfortable, but it has strengthened trust and support throughout our organization.

Open-Book Management is not for every company, and it is not for every employee.

When we first adopted this approach, most of our team embraced the change, but a few employees chose to leave. They preferred a workplace where they could focus solely on individual responsibilities rather than think about or be involved in the business as a whole. There is nothing inherently wrong with that mindset. Every workplace has its own culture, and every employee may have different expectations.

Today, financial conversations have become a normal part of how the practice operates. Staff members ask thoughtful questions, suggest meaningful improvements, and understand why difficult business decisions sometimes must be made.

Perhaps the greatest lesson I have learned is that information and knowledge create ownership. When staff members understand the score, they naturally want to improve it. They stop feeling like cogs in a machine and begin seeing themselves as members of a team working toward a common goal that benefits everyone.

Healthcare organizations spend tremendous effort teaching anatomy, biomechanics, fabrication techniques, documentation, and patient care. Those skills and products are absolutely essential. But perhaps we should spend a little more time teaching the business operations and processes that make all of those essential skills and products possible.

When employees understand how the business succeeds, they become partners in that success. In my experience, that's where Open-Book Management delivers its greatest value—not in the numbers themselves, but in the people who learn to improve them together.

Effective Hazard Communication for Chemicals in the Prosthetic and Orthotic Workplace

- Amanda S. Barizo, CTPO

About the Author



Amanda S. Barizo, CTPO

Amanda S. Barizo, BS, CTPO is a teaching associate and lab manager at the Division of Prosthetics and Orthotics at the University of Washington in Seattle, Washington. In year 2011, she completed the prosthetic & orthotic technical program at George Brown Polytechnic located in Toronto, Canada. Since graduation, Amanda has worked in various roles in orthotics and prosthetics, education, and the non-profit sector.

Working in the prosthetic and orthotic (P&O) laboratory setting comes with occupational hazards that are unique among traditional clinical settings. Many of these hazards align more with industrial or manufacturing work environments. According to the Occupational Safety and Health Administration (OSHA), health hazards can be classified as chemical, physical, biological, and ergonomic.¹ Figure 1 outlines some of the health hazards that may be present in the P&O setting.

The OSHA sets and enforces standards to ensure that workers can operate under safe and healthful working conditions, and the agency has clearly outlined how employers can effectively communicate chemical hazards to workers.² This article will summarize the OSHA's six steps in implementing an effective hazard communication program for chemicals and describe practical ways that these steps can be applied in the P&O workplace.

Figure 1

P&O Lab Hazards	
Examples of common hazard categories in a Prosthetics & Orthotics laboratory	
Hazard Category	Examples
 Chemical	• Resins and hardeners (epoxy, acrylic/polyester resins) • Solvents (acetone, thinners) • Adhesives (contact cement, cyanoacrylate/super glue) • Aerosols & lubricants (silicone sprays, spray adhesives, WD-40)
 Physical	• Noise (pneumatic saw and chisel, hammering, grinding) • Airborne dust and fibers (plaster, plastics, fiberglass, carbon fiber) • Thermal hazards (heat gun, oven, propane torch) • Rotating machinery (grinding, polishing) • Flying particles (breaking out, grinding, using compressed air) • Point of operation hazards (bandsaw)
 Biological	• Exposure to bloodborne pathogens • Exposure to liners or devices that may contain bacteria, viruses, or fungi
 Ergonomic	• Heavy lifting (plaster bags, casts) • Repetitive motions (grinding, modifying, hammering) • Vibration (pneumatic saw and chisel, grinding) • Prolonged standing, awkward or sustained postures (grinding, modifying)

Step 1: Learn the Standard/Identify Responsible Staff Members

The first step is to access and read the OSHA's Hazard Communication Standard (HCS) at www.osha.gov/hazcom. The HCS requires chemical manufacturers to inform customers about the hazards in the chemicals through standardized labeling and safety data sheets (SDS). The HCS also outlines requirements for employers to implement if their staff work with hazardous chemicals. Some examples of hazardous chemicals that may be present in a P&O workspace include solvents, adhesives, resins, and aerosols.

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Hazard (continued)

According to the HCS, employers must implement the following safety measures in their workplace: a) creation of a written hazard communication program; b) proper labeling for hazardous chemicals; c) safety data sheets; and d) ensure employee training. In addition,...

“...a responsible person must be delegated to coordinate and implement the HCS effective hazard communication program.”

This coordinator may be the clinic manager, lab manager, or lead technician. The employer also must identify who HCS will apply to, or specifically, which staff members will use the hazardous chemicals in the workplace.

Step 2: Prepare and Implement a Written Hazard Communication Program & Conduct a Chemical Inventory

The person responsible for implementing the HCS will draft a written hazard communication plan that must include details about how the workplace will label chemicals, provide and store safety data sheets, and provide employee training. Step 2 also involves conducting a thorough inventory of all hazardous chemicals present in the workplace. This list is created to simplify and track the status of your labels and the SDS. *It is imperative that the product identifier is the same name as the name listed on the original chemical container and its SDS.*

Key information to include in a chemical inventory is the Chemical Name/Product Identifier, Chemical Abstracts Service (CAS) number, Manufacturer/Vendor, Physical State (liquid/solid/gas) and Container, Quantity & Unit, Location, Hazard Classification, and whether an SDS is available. The table below shows a sample chemical inventory entry for acetone.

Chemical Name/Product	CAS	Manufacturer/Vendor	Physical State	Container	QTY	Unit	Locations	Hazard Classifications	SDS
Acetone ³	67-64-1	Fischer Scientific	Liquid	Bottle	1	Gallon	West Chemical Cabinet	Flammable2 Serious eye irritation 2A Specific target organ toxicity 3	Yes

Step 3: Ensure Containers are Labeled

The next step is to ensure that all containers are labeled. All hazardous chemicals must include the product identifier (i.e., Acetone, Barge Contact Cement) and general information regarding the hazards of each chemical. The HCS requires that pictograms depicting the exact hazard be displayed on the label. These pictograms are available for download at <https://www.osha.gov/hazcom/pictograms> and explanations of each pictogram is detailed in Figure 2.

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Hazard (continued)

Secondary Chemical Containers

If chemicals are stored in a container other than their original container,...

“...it is important to use secondary labels that contain the hazard information.”

Figure 3 depicts a sample secondary chemical container label filled out for acetone. Pictograms that are not in the chemical's SDS may be blocked out.

Step 4: Maintain Safety Data Sheets (SDS) involves acquiring and printing the safety data sheets for every chemical listed and included in your inventory. The SDS is provided with the chemical or may be downloaded from the supplier's web site. It is important to ensure that the SDS are readily accessible to staff members. Storing the SDS in a central location in a clearly visible, labeled binder may be the best option. In the event of an emergency, medical personnel must be able to immediately access a hard copy of a chemical's SDS.

“Staff must also be trained in where and how to access the SDS and how to interpret them.”

The [OSHA Brief on Safety Data Sheets](#) is a valuable resource on how to find vital information on the safety data sheets and can be found on the OSHA website.

Ensure that the SDS is in a central, visible, and readily accessible location in the P&O laboratory.

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Figure 2 HCS Pictograms and Hazards (osha.gov)

Health Hazard  • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	Flame  • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides • Desensitized Explosives	Exclamation Mark  • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazard Not Otherwise Classified (non-mandatory) • Hazardous to Ozone Layer (non-mandatory)
Gas Cylinder  • Gases Under Pressure • Chemicals Under Pressure	Corrosion  • Skin Corrosion/Burns • Eye Damage • Corrosive to Metals	Exploding Bomb  • Explosives • Self-Reactives • Organic Peroxides
Flame Over Circle  • Oxidizers	Environment (non-mandatory)  • Aquatic Toxicity	Skull and Crossbones  • Acute Toxicity (fatal or toxic)

Acetone











DANGER or WARNING [Choose proper signal word from the SDS]

Highly Flammable liquid and vapor. Causes serious eye irritation. May cause drowsiness or dizziness.

Chemical composition	%
Acetone	100

Name of Preparer: John Smith Date: 11/9/26

Figure 3: Sample secondary chemical container label filled out for acetone. Template at: <https://www.ehs.washington.edu/chemical/chemical-container-labels>

Hazard (continued)

Step 5. Inform & Train Employees

Newly hired staff members must be trained on the hazardous chemicals at the workplace before beginning to use them. Staff members must be trained in how to read chemical labels and to understand the hazards of each chemical. Staff must also know how to locate the SDS for a particular chemical. Staff should have a general knowledge of what information is available on the SDS and what protective measures to use with those chemicals (i.e., Personal Protective Equipment/PPE such as gloves, safety glasses, or respirators, or use only at certain locations in the lab with proper ventilation).

“Guidance on handling, storage, exposure controls, and personal protection is all information that can be found on the chemical’s SDS.”

Step 6. Evaluate and Reassess Your Program

The hazard communication program should remain current because the workplace must be reviewed periodically as the chemicals and hazards change. Reviews and modifications to the program may also be necessary when safety incidents do occur.

In summary, working in the prosthetics and orthotics field comes with possible exposure to several different occupational hazards. This article focused on chemicals and how employers can best communicate to their staff the hazards that come with working with these chemicals.

Guidelines set by OSHA are the gold standard when it comes to implementing an effective hazard communication program. One person needs to be delegated to coordinate and implement the program, all chemicals must be inventoried, properly labeled, and safety data sheets (SDS) must be readily available to staff and/or medical personnel. In addition, management must ensure that all users are trained in the proper use of the chemical, where the chemical may be used in the lab, what PPE needs to be worn, and how to find more specific information in the chemical’s SDS. Implementing a hazard communication program for chemicals in the P&O workplace is a vital component necessary to keep P&O clinicians and technicians healthy and safe!

1. [Safety Management - Hazard Identification and Assessment | Occupational Safety and Health Administration](#)
2. [Steps to an Effective Hazard Communication Program for Employers That Use Hazardous Chemicals](#)
3. [Acetone – Safety Data Sheet](#)

Northwestern's First Masters of Prosthetics and Orthotics-Research (MPO-R) Cohort Successfully Defends Theses and Completes Program

CHICAGO, Ill. (September 2026) – The Northwestern University Prosthetics-Orthotics Center (NUPOC) is proud to announce the successful thesis defenses and graduation of the inaugural cohort of students in the Master of Prosthetics & Orthotics Research (MPO-R) program at Northwestern University Feinberg School of Medicine. The six graduates comprise the inaugural graduating class of Northwestern University's Master of Prosthetics & Orthotics Research (MPO-R) program, the first and only degree program of its kind in the United States. Designed to develop future leaders in prosthetics and orthotics, the MPO-R combines rigorous clinical education with advanced rehabilitation research training to prepare graduates for careers as clinician-scientists. Over the course of nine academic sessions, MPO-R students completed all requirements of Northwestern's renowned Master of Prosthetics & Orthotics (MPO) program while undertaking additional coursework in research design, biomechanics, statistics, and scientific writing. The program culminates in an original thesis project and formal thesis defense, equipping graduates with the skills needed to serve as both clinicians and researchers. The inaugural cohort presented and defended six original research studies addressing critical questions in prosthetic and orthotic care:

Inaugural MPO-R Thesis Defenses (photos at full size for publication)

Amanda Kemper *Effects of Unilateral Myoelectric Prosthesis Use on Upper Body Musculoskeletal Dynamics During Goal-Oriented Tasks* Advisors: Russell Johnson, PhD, and Matthew Major, PhD



Left to right: Matthew Major, Amanda Kemper, Russell Johnson

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Masters (continued)

Owen Albrecht *The Kinematics and Kinetics of Walking with a Pediatric Powered Prosthetic Knee: A Single-Subject Study of Gait Training and Analysis*
Advisor: Matthew Major, PhD



Left to right: Matthew Major, Owen Albrecht

Christian Moran *The Effect of Prosthetic Foot-Ankle Stiffness on Rollover Shape Radius and Energy Return in Individuals with a Unilateral Transfemoral Amputation*
Advisor: Steven Gard, PhD



Left to right: Steve Gard, Christian Maron

Elyssia Robbins *Towards Precision Rehabilitation: Predicting the Effects of Personalized Ankle Foot Orthoses on Symmetry in Hemiparetic Gait*
Advisor: Russell Johnson, PhD



Left to right: Russell Johnson, Elyssia Robbins

Elizabeth Ibata-Arens *Effects of Damping Prosthetic Components on Dynamic Balance in Transtibial Prosthesis Users*
Advisor: Matthew Major, PhD



Left to right: Matthew Major, Elizabeth Ibata-Arens

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Masters (continued)

“Maria Gamez *Impaired Lower Limb Proprioception and the Minimum Foot Clearance in People with Unilateral Chronic Post-Stroke* Advisor: Russell Johnson, PhD



Left to right: Russell Johnson, Maria Gamez

The research presented by the inaugural cohort demonstrates the breadth and depth of inquiry fostered within the MPO-R program, encompassing upper-limb prosthetics, powered prosthetic technologies, gait biomechanics, orthotic intervention design, balance and mobility, and post-stroke rehabilitation. Through their thesis studies, students generated new knowledge with the potential to advance clinical practice and improve mobility, function, and quality of life for individuals with limb loss and neurological impairments.

The Northwestern University Prosthetics-Orthotics Center congratulates Amanda Kemper, Owen Albrecht, Christian Moran, Elyssia Robbins, Elizabeth Ibata-Arens, and Maria Gamez on their thesis defenses, graduation, and pioneering role as the first graduates of the Master of Prosthetics & Orthotics Research program.

A First-of-Its-Kind Educational Experience: More about MPO-R

The MPO-R program is unique within the United States prosthetics and orthotics profession. Building upon Northwestern's established MPO curriculum, the program provides students with intensive research training alongside the MPO clinical education.

Students work closely with faculty mentors and thesis committees to conceptualize, design, execute, and defend an original research study.

The result is a new generation of clinician-scientists prepared to bridge the gap between research and practice, translating scientific discoveries into improved patient outcomes while helping advance the evidence base that guides the profession.

About the Northwestern University Prosthetics-Orthotics Center

The Northwestern University Prosthetics-Orthotics Center (NUPOC), part of Northwestern University Feinberg School of Medicine, is a leader in prosthetics and orthotics education, research, and clinical innovation. Through its academic programs and research initiatives, NUPOC prepares practitioners and researchers to advance mobility, rehabilitation, and patient care worldwide.