# Collaborative Rehabilitation: Co-Treatment Approaches for Vision and Mobility Challenges in a Client with Limb Loss

Brooke Kruemmling, Ph.D.  Julie Quinlan, MPO



**Abstract**

*Introduction:* This case study explores the benefits of interprofessional practice between certified orientation and mobility specialists (COMS) and certified prosthetist-orthotists (CPOs) in addressing the needs of individuals with both vision impairment and limb loss.

*Methods:* The client, a 32-year-old woman with vision impairment and limb loss resulting from a traumatic event, participated in co-treatment sessions with COMS and CPOs. Data were gathered through observational assessments during mobility training, and progress was evaluated based on her ability to navigate environments safely and independently.

*Results:* Collaborative interventions led to notable improvements in the client's mobility, orientation, and overall functional independence. The integration of prosthetic support and orientation training allowed the client to adapt effectively to her environment, enhancing her quality of life.

*Discussion:* This case highlights the importance of interprofessional approaches in intervention. The collaborative work between COMS and CPOs allowed for tailored strategies that addressed both visual and physical impairments, demonstrating the value of combining specialized expertise.

*Implications for Practitioners:* Practitioners working with clients who have additional disabilities should consider collaborative treatment models that involve specialized professionals. By working together, COMS and CPOs can develop individualized plans that support greater client autonomy, safety, and well-being in diverse settings.

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## Introduction

Certified orientation and mobility specialists (COMS) provide instruction for a wide range of clients. At some point in their careers, COMS may serve individuals who have limb loss. These individuals present with mobility needs in addition to those related to vision loss. Certified prosthetist orthotists (CPO) can be excellent resources and support for both clients and COMS.

A certified prosthetist-orthotist (CPO) is a healthcare professional who evaluates, designs, and fits artificial limbs (prosthetic) and braces (orthotic devices) for those with limb loss due to injury or disease or musculoskeletal impairments. Prosthetists design artificial limbs for those who have lost limbs due to injury or disease, while orthotists fabricate devices that support, stabilize, or correct physical differences or loss of function. The scope of practice includes assessing clients' needs, taking impressions, designing, and fitting prosthetic and orthotic devices to enhance individual's mobility and function. CPOs ensure proper fit, alignment, and function of these devices while educating patients on their use, maintenance, and care. Following initial fitting, the patient typically undergoes rehabilitative therapy with a physical or occupational therapist to learn how to use it effectively. Throughout this process, the CPO works closely with the therapy team, adjusting the device as needed to ensure optimal fit and function. CPOs continue follow-up care when the patient is discharged from therapy, making any modifications necessary to ensure the device is meeting the client's needs (Krajbich et al, 2023).

This case study explores the interprofessional, collaborative efforts of these professionals, examining how co-treatment can improve outcomes for clients with concomitant visual impairments and mobility challenges.

## Case Presentation

The client, Grace, was a 32-year-old, 5'6" tall, 120-lb African American woman who presented with significant vision loss and limb loss as a result of a traumatic event. Prior to this event, her physical and visual development was unremarkable.

In 2021, the client was placed in a medically induced coma, resulting in optic atrophy. Her distance visual acuity was measured at no light perception in the right eye and 20/600 in the left eye using digital Snellen. She had severe 360 degree generalized visual field constriction in the left eye with a functional hill of vision that is inferior nasal, measured by confrontation. The Mars Contrast Sensitivity Test demonstrated severe loss of contrast in the left eye.

Grace had a left transtibial amputation in 2021. A transtibial amputation means that the client's leg below the knee was surgically removed. Her left residual limb was fully

healed, with no skin breakdown or callusing, and her sensation remained intact. Her amputated limb volume did not fluctuate (i.e., the size of her limb remained consistent). After her amputation, her CPO fit her with a pin-locking suspension system, carbon fiber socket, and Össur Pro-Flex carbon fiber foot which allowed her to ambulate without difficulty. However, the pin-locking suspension was challenging to use as a result of her visual impairment. To ameliorate this, her prosthetic suspension was switched to a suction system with a knee sleeve allowing her to don and doff the prosthesis more easily.

At the same time, the first and second toes of Grace's right lower limb were amputated. She presented with a 35-degree plantarflexion contracture in her right ankle, which means it was fixed at a 35-degree downward angle, preventing her from flexing her foot normally. As a result, she had excessive pressure on the ball of her foot when walking which caused a recurring wound on the ball of her foot. She was being concurrently treated in wound care during this episode of care.

Subsequent to the traumatic event, coma and amputations, Grace was placed in a rehabilitation center for approximately 4 months. During this time, she received services from a CPO, an occupational therapist, and a physical therapist. She did not receive a referral to a vision professional, therefore her visual rehabilitation needs were not addressed.

Upon discharge from the rehabilitation center and return to her home community, Grace's primary care optometrist referred her to the low vision department at a comprehensive optometric clinic for an optometric low vision evaluation. The low vision department housed low vision optometrists, certified orientation and mobility specialists, certified low vision therapists, and certified vision rehabilitation therapists. She was referred by the low vision optometrist for an orientation and mobility evaluation.

## Management and Outcomes

### Orientation and Mobility

Grace reported using a variety of mobility aids: a two-wheeled walker, a four-pronged support cane, and a manual wheelchair. Grace stated that at home she used her wheelchair when she was not wearing her prosthesis. It is common for people with amputations to remove their prosthesis while at home. Grace reported that outside of her apartment she used her walker. When asked about her goals, Grace said she wanted to "ditch her walker" and learn how to walk with a long cane.

Grace's evaluation occurred in the clinical setting. During the initial session, Grace walked with her walker and was guided by her boyfriend. Her boyfriend held on to her walker and "steered" her. Grace was observed walking at a moderate pace. She relied on the walker for balance and to support her right limb as it was not

appropriately managed. Grace's uneven weight distribution and pain in the right foot resulted in a modified use of the walker in order to establish her balance; she tended to advance the walker as she was taking a step, so that when her right foot was stepping, her upper body and the right side of the walker also advanced.

When asked to walk independently, without the assistance of her boyfriend, Grace tended to walk close to objects on the left, likely as a result of the severe visual constriction of the left eye. She was able to visually identify large objects (e.g., large pieces of furniture, cars) if there was sufficient contrast. She had difficulty with depth perception that resulted in over or under reaching (e.g., locating the seat of a chair).

Grace was asked to demonstrate her ability to walk using her support cane only. Using a four-prong cane, she was able to walk about 20 feet before she had to stop walking due to pain in her right foot (the foot with the partial amputation) and fatigue from trying to hold herself upright. Grace reported that the pain in her right foot was so significant that it impacted her balance, as it made weight bearing challenging. Additionally, her balance was observed to be very unsteady. Grace was presented with the option of using her walker and a modified cane simultaneously, but she was adamant that she did not want to continue with the walker. Grace was committed to learning how to walk with a long cane and support cane. Due to Grace's poor balance and reported pain, the COMS made a referral to the certified prosthetist orthotist (CPO).

## Orthotics and Prosthetics

Grace has experienced difficulty walking and maintaining balance due to vision impairment, lower back pain, and lower limb involvement. The objective of the treatment was to evaluate her gait and make any necessary adjustments to improve her balance and decrease pain.

### *Physical Examination*

The client's 35-degree plantarflexion contracture was accommodated by an externally attached heel lift on shoe that does not allow the foot to bend. The lift lacked the necessary angle to fully accommodate the contracture and did not include an integrated rocker sole. This resulted in substantial pressure on the lateral side of the foot from mid-stance through pre-swing phases of gait. The pressure reduced her ability to ambulate with a smooth rollover which increased her energy consumption. The wound on the bottom of the fifth metatarsal was exacerbated by contact with the shoe during ambulation, complicating the healing process and impacting her gait. While the left trans-tibial prosthetic socket was properly fit, it required further adjustments to achieve optimal function. The client's hip obliquity was evaluated and found to be 7.5 mm higher on the right side.

### *Gait Analysis*

During the gait analysis, the client stated that she has experienced chronic lower back pain since the amputations. Grace exhibited antalgic (pain avoidance) gait due to the leg length discrepancy caused by the inappropriately accommodated plantar flexion contracture resulting in lower back pain. There was an evident imbalance, leading to the reliance on a walker (Lusardi et al, 2012).

### *Treatment*

The prosthesis was lengthened to accommodate her height so that her legs were equal length. An additional heel lift was added inside her shoe to adequately accommodate the plantarflexion contracture of the right ankle.

### Co-treatment

Once Grace's balance was improved and her pain was decreased, the COMS commenced instruction in the simultaneous use of a long cane and support cane. The CPO was present for the first two instructional sessions to provide consultation and to make any necessary modifications to the orthosis and prosthesis. Grace demonstrated the ability to use the long cane and support cane in the clinic (an indoor familiar environment with no drop offs) proficiently after two sessions. She continued with additional sessions to increase stamina. When Grace transitioned to an outdoor environment, the CPO returned for co-treatment to monitor balance and pain when ascending and descending hills. Minor modifications in the orthosis were made to accommodate back pain.

Grace's O&M instruction is ongoing. At the time of publication, she used an Ambutech graphite folding cane with a hook-on roller marshmallow tip. She was proficient in both constant contact and two-point touch and was able to switch between technique as needed while maintaining adequate coverage, being in step and simultaneously using her support cane. She was learning advanced orientation and mobility skills including street crossings of increasing complexity and was able to walk for about a mile using her support cane and long cane simultaneously.

## Discussion

Upon initial evaluation of Grace, the COMS' impression of her balance was such that the recommendation would have been to continue with the walker and a modified long cane as her balance was not stable enough to walk safely with a combination long cane/support cane. However, through the referral and co-treatment process, the CPO was able to make modifications that improved Grace's stability and that afforded her the ability to, as Grace put it, have "freedom from the walker" and use

mobility devices that she felt more reflected her identity as a blind woman, rather than as an orthopedically disabled person.

This case highlights the importance of interprofessional practice for individuals with significant vision loss, limb loss, and mobility challenges. Grace did not receive a referral to a vision rehabilitation professional during her 4 months of inpatient rehabilitation; this resulted in the loss of critical time for vision-related intervention and rehabilitation. This underscores the need to enhance awareness and education about the contribution of vision professionals in comprehensive rehabilitation care.

By collaborating, the COMS and CPO were able to create a comprehensive plan that addressed both Grace's vision and physical needs. This collaboration ensured that her mobility devices as well as orthotic and prosthetic interventions were optimized for Grace's mobility goals. Co-treatment fostered a more holistic approach to rehabilitation, that in turn promoted greater autonomy and improved overall outcomes for Grace. Interprofessional practice also allows COMS and CPOs to learn from each other, which serves to enhance the care that they provide. By sharing information on the client's specific needs, both providers can deepen their understanding of how to best support the individual. This continuous learning also equips the providers with insights and strategies that can improve future clients' outcomes.

More information about Certified Prosthetist-Orthotists can be found on the American Academy of Orthotists & Prosthetists website (www.oandp.org).

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**Brooke Kruemmling**, Ph.D., COMS, Salus at Drexel University; **Julie Quinlan**, MPO, MS, CPO, ATC, FAAOP, College of Health Sciences, Education and Rehabilitation, Salus at Drexel University.

Corresponding Author: Brooke Kruemmling, email: bk834@drexel.edu.

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