

# IPRO 309: Orthotics and Prosthetics Education in Latin America and the United States

Professor Kevin Meade

Ross Allen, Elliot Barlow, Lydia Bengler, Seth Buntain,  
Marisa De Nicolo, Robert LaRue, Emily Moore,  
Gregory Quandt, Stefanie Rozborski, Heather Selby

# What is an Orthosis or Prosthesis?

- **Orthosis** – an appliance designed to straighten or support a body part; an exoskeletal device designed to assist, resist, align or stimulate normal functioning

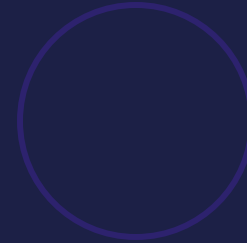


- **Prosthesis** – a device, either external or implanted, that substitutes for or supplements a missing or defective part of the body



# Meet Maas

## *Stroke Survivor*




# Orthotic & Prosthetic Treatment

- O&P Training Programs need Certification

- American Board for Certification (ABC) in Orthotics & Prosthetics

- International Society for Prosthetics & Orthotics (ISPO)

	Fabrication	Direct Patient Care	Research and Development
Category I	III	II	I
Category II	III	II	
Category III	III		



# Problem

Latin America currently has:

- Over 500 million people
- An estimated 2.5 million people with unmet orthotic or prosthetic needs
- Only one Category II O&P educational program accredited by ISPO (Don Bosco University, El Salvador)
- Four other O&P educational programs (locally accredited only)
- Fewer than 50 certified category II practitioners and 1,500 uncertified practitioners



# Purpose



- Improve the educational opportunities in orthotics and prosthetics in Latin America and the United States
- Support development of first Category III International Society for Prosthetics and Orthotics (ISPO O&P) program in Latin America, at Centro Don Bosco High School (Bogotá, Colombia)
- Support development of the orthotics and prosthetics technician program at Joliet Junior College (similar to the program in Colombia)



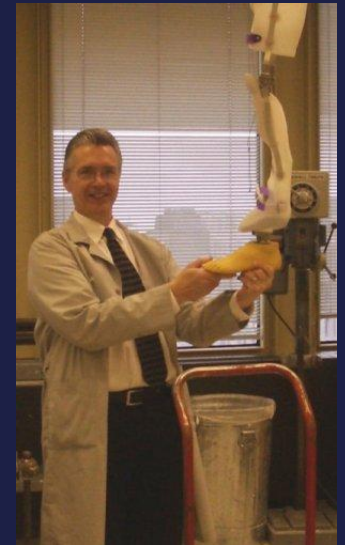
Bryan Malas, MHPE, CO

Director, Moira Tobin Wickes Orthotics  
Program, Children's Memorial Hospital



# History of IPRO 309

- First IPRO 309 – Spring Semester 2006
  - Need for this type of care spurred a need for the project
- 5 Semesters of IPRO 309
  - Educational Modules
  - Work with professionals in Colombia & the U.S.
- This semester
  - 3 more educational modules
  - Conference in Bogotá, Colombia
- Next semester
  - IPRO 309 will continue to provide learning opportunities to people interested in prosthetics & orthotics





# I PRO 309 Timeline

- I PRO 309 – Spring 2006
  - “Academic” orthopedic biomechanics educational modules
  - Four day conference in Bogotá – modules delivered by five-student team
- I PRO 309 – Fall 2006
  - “Clinical” orthopedic biomechanics educational modules
  - Demonstration with students from NUPOC and JJC
- I PRO 309 – Spring 2007
  - Comprehensive review and revision of all educational modules
  - Parallel I PRO 309 in Bogotá at los Andes – modules translated into Spanish
  - Planning for four day conference in Bogotá

# IPRO 309 Educational Modules

- Anatomical Review
- Orthometry
- Materials for Orthotics & Prosthetics
- Manual Muscle Testing
- Palpation of Anatomical Landmarks
- Observational Gait Analysis
- Seated Evaluation
- Walking Aides: Walkers, Canes, & Crutches
- Range of Motion
- Upper Limb Orthotics & Prosthetics
- Spinal Trauma
- Spinal Cord Injuries
- Spinal Cord Neurology
- Spinal Orthotics
- Club Foot
- Drop Foot
- Cerebral Palsy
- Diabetes
- Osteoporosis
- Stroke
- Pediatric Orthotics & Prosthetics
- Adult Orthotics & Prosthetics
- Geriatric Orthotics & Prosthetics

## How does the prosthetic fit?

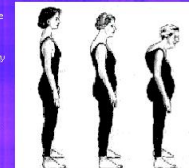
- Custom fitted socket
  - Prosthetic socks (soft yet strong fabrics vs. wool) cushion the area in contact with the socket (polypropylene)
    - Pylon materials
      - Titanium
      - Aluminum
      - New Carbon Fibers
- Attaching to the body
  - Knees cuffs and belts

## El Rango de Movimiento (ROM)



## Factors that Determine Bone Strength

- Normally, bone density accumulates during childhood and reaches a peak by around age 25.
- After age 35, both men and women will normally lose 0.5 to 0.8% of their bone density per year as part of the aging process.
- Estrogen is important in maintaining bone density in women.
- When estrogen levels drop after menopause, bone loss accelerates.
- Approximately 40% of persons 65 years or older fall every year.
- 1.8M fragility fractures in the US yearly.



What osteoporosis looks like

## Deformities in Club Foot



- Ankle joint is flexed (Equinus deformity)
- Heel is turned in (Varus deformity)
- High medial arch (Cavus deformity)
- Foot is beak shaped and curled outer border (Adductus deformity)

[http://www.gobal-help.org/publications/books/help\\_ipro09e4i.pdf](http://www.gobal-help.org/publications/books/help_ipro09e4i.pdf)

## Types of Diabetes

### How our bodies use insulin and glucose

**NORMAL FUNCTIONING**  
Insulin is the key to letting the glucose enter the cell. Glucose in the cell is transformed into energy for the body.



### TYPE I DIABETES

In Type I diabetes, the pancreas is not producing insulin; therefore the glucose is not able to enter the cell.



### TYPE II DIABETES

In Type II diabetes, the pancreas still produces insulin, but not enough to help adequate amounts of glucose into the cells.



○ glucose ■ insulin ○ cell

# Goals

- Create 3 educational modules addressing pathologies of different age groups
  - Pediatric Module
  - Adult Module
  - Geriatric Module
- Translate all educational materials to Spanish for use in Latin American Schools and in Joliet Junior College
- Present material at prosthetics and orthotics conference in Bogotá, Columbia in May 2008



# Team Organization

- Pediatric Category

- Lydia Bengler (Mechanical Engineering)\*
- Robert LaRue (Mechanical Engineering)
- Stefanie Rozborski (Art History)\*

- Adult Category

- Ross Allen (Aerospace Engineering)
- Elliot Barlow (Aerospace Engineering)
- Seth Buntain (Aerospace Engineering)\*

- Geriatric Category

- Marisa De Nicolo (Materials Science and Engineering)
- Emily Moore (Aerospace Engineering)\*
- Gregory Quandt (Mechanical and Materials Engineering)
- Heather Selby (Biomedical Engineering)\*

*\* Returning Students*



# Team Leadership

- *Project Manager:* Emily Moore
- *Project Content Manager:* Seth Buntain
- *Webmaster:* Lydia Bengner
- *Vocabulary:* Marisa De Nicolo
- *Minutes Recorder:* Heather Selby
- *Poster Designer:* Stefanie Rozborski & Heather Selby
- *Time Sheet Coordinator:* Stefanie Rozborski
- *Work Schedule Specialist:* Robert LaRue
- *International Conference Coordinator:* Ross Allen
- *Ethics Consultant:* Elliot Barlow
- *Presentation Skills Consultant:* Greg Quandt



# Research Methodology

- Overview of age group
- Age-specific impairments
- Types of care
- Orthotic & prosthetic treatment
- Fabrication & Materials
- Case study highlighting age group
- Vocabulary handout
- Summary brochure

## Activities of Daily Living (ADLs)

- ADLs are the things we normally do in daily living including any daily activity we perform for self-care, work, and leisure. The inability to perform ADLs is a practical measure of disability.
- The ADLs of a child will change as the child grows and becomes more independent of his parents.



## Lower Limb Prostheses

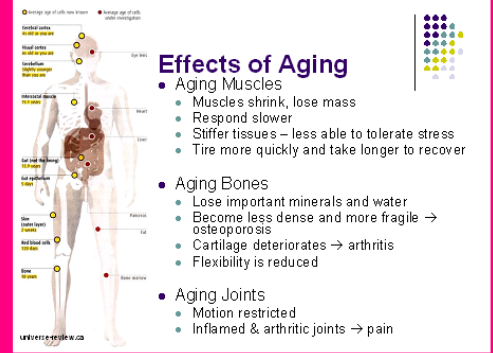


- **Trans-Tibial**
  - Prostheses for amputations below the knee (top left).
  - Requires either a fixed ankle joint and rocker, an articulated ankle, or an energy-return design made of flexible, springy material.
- **Trans-Femoral**
  - Prostheses for amputations above the knee (top right).
  - Because the knee is amputated, these prostheses generally require an articulated knee joint. Many designs exist.



## Effects of Aging

- **Aging Muscles**
  - Muscles shrink, lose mass
  - Respond slower
  - Stiffer tissues – less able to tolerate stress
  - Tire more quickly and take longer to recover
- **Aging Bones**
  - Lose important minerals and water
  - Become less dense and more fragile → osteoporosis
  - Cartilage deteriorates → arthritis
  - Flexibility is reduced
- **Aging Joints**
  - Motion restricted
  - Inflamed & arthritic joints → pain





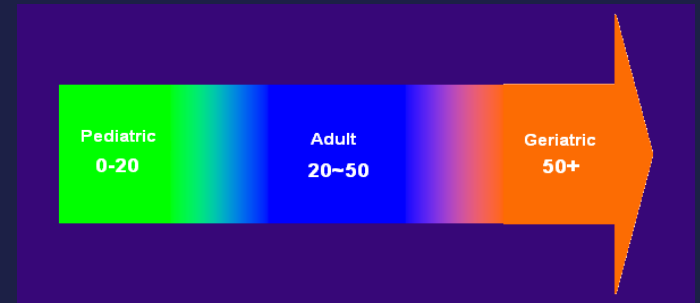
# Michael Brncick, M.Ed., CPO

Administrative Director of the Northwestern Center for Prosthetics and Orthotics, Associate Professor, Orthotics and Prosthetics Technology Program Coordinator, Joliet Junior College



# Obstacles

- Defining the age groups
  - Each age group can be very vague, so the range for ages had to be set
- Technical Vocabulary
  - Medical jargon may not be known by the audience for these educational modules
- Volume of Material
  - The topics researched can have overwhelming amounts of information. The most relevant information must be determined.
- Language Barrier
  - The modules must be translated into Spanish for use in Colombia

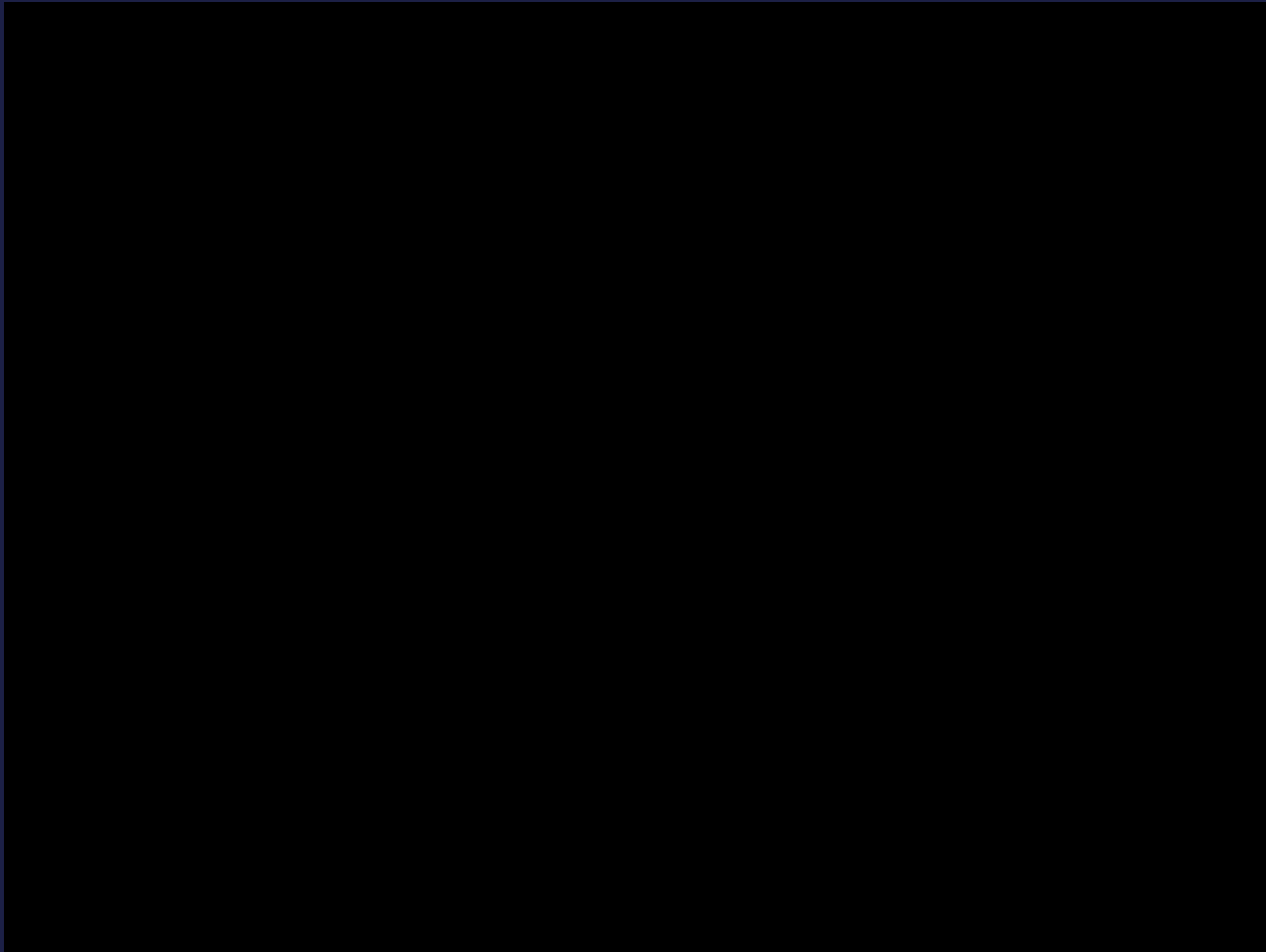


# Results



- Successfully completed 3 educational modules that have been translated to Spanish
- Created 3 brochures pertaining to the modules
- 3 of the students will attend the conference in Bogotá to present the material
- Wrote a code of ethics specific to the project
- Created a website for the project
- Members learned about the topic of orthotics and prosthetics

# Laboratorio Gilete – Bogotá, Colombia



# The Future of IPRO 309

- Conference in Bogotá for Orthotics and Prosthetics in May
- IPRO 309 will be working to address ISPO learning objectives concerning ethics, management, teamwork and communications



# Acknowledgements

- Bioconcepts, Inc.; Burr Ridge, IL
- Bryan Malas, MHPE, CO, CPed
- Centro Don Bosco; Bogotá, Colombia
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- Illinois Institute of Technology; Chicago, IL
- Joliet Junior College
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- Laboratorio Gilete, Bogotá; Colombia;
- Michael Brncick, M.Ed., CPO
- Northwestern University Prosthetics and Orthotics Center (NUPOC); Chicago, IL
- International Committee for the Red Cross (ICRC)
- Rotary International
- Universidad de los Andes; Bogotá Colombia





¿Preguntas?

# Code of Ethics



- Law
  - legalities
- Contracts
  - Agreement from all parties involved
- Professional Codes
  - ABC
  - ISPO
- Industry Standards
  - O&P Standards and medical community
- Community
  - Considerate of local communities affected by project
- Personal Relations
  - Respectful relations
- Moral Values
  - Honesty and integrity