




Continuing Education Series

**Outcome Measures in Lower Limb Prosthetics:  
Empowering through Mobility**



Continuing Education Series

---

---

---

---

---

---

---

---

**Disclosure Statements**

I have the following relevant relationships in the products or services described, reviewed, evaluated or compared in this presentation.


---

Hanger Clinic

- Our speaker is a paid employee Hanger Clinic and receives a salary.

Other Disclosures (if any)

- Financial
- Nonfinancial Relationships *(i.e. board member, association committees outside of Hanger Clinic)*



Continuing Education Series

---

---

---

---


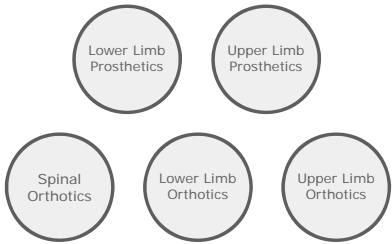
---

---

---

---

**Hanger Clinic  
Continuing Education Program**



Continuing Education Series

---

---

---

---

---

---

---

---

### Learning Outcomes

Upon completion of this presentation the participant will be able to:

- Identify trends in adult limb loss populations
- Demonstrate the value in a health care team approach to limb loss patient care
- Communicate the benefits of using outcome measures with lower limb prosthetic patients
- Discuss the Prosthetics Limb User Survey of Mobility (PLUS-M™) assessment
- Review sample patient case studies and best practice approach to rehabilitation and a successful care plan

Continuing Education Series



---

---

---

---

---

---

---

---

### Agenda

Patient Profiles: What we know and how to work together



Lower limb prosthetic outcomes and PLUS-M™ tool

Practice: Case studies and learn how a prosthetic company is translating data into clinical care

Discussion

Continuing Education Series



---

---

---

---

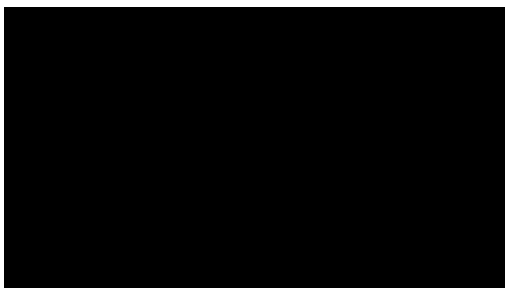
---

---

---

---

Helping patients reach their goals through mobility:  
**A patient's story**



Continuing Education Series



---

---

---

---

---

---

---

---

Continuing Education Series

### Patient Profiles: The Big Picture



Continuing Education Series

---

---

---

---

---

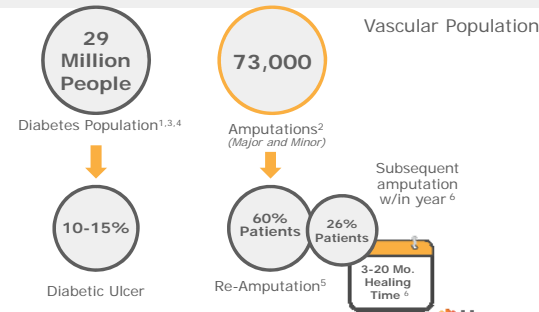
---

---

---

### Limb Loss Patient Population: 2 Million

Vascular Population



29 Million People  
Diabetes Population<sup>1,3,4</sup>

73,000  
Amputations<sup>2</sup>  
(Major and Minor)


10-15%  
Diabetic Ulcer

60% Patients  
Re-Amputation<sup>5</sup>

26% Patients  
Subsequent amputation w/in year<sup>6</sup>

3-20 Mo. Healing Time<sup>6</sup>

Ziegler-Graham, K. Archives of Physical Medicine and Rehabilitation (2008)  
Further Citations in Reference List (see subscript)  
Continuing Education Series



---

---

---

---

---

---

---


---

### Limb Loss Patient Population: 2 Million

Trauma Population

- More than 30,000 traumatic amputations yearly
- The 3 most common mechanisms of injury are crush, guillotine and avulsion
- Approximately 80% are male
- Majority are between the ages of 15-40
- Typically are in overall good health

Ziegler-Graham K. Archives of Physical Medicine and Rehabilitation (2008)  
McNutt, Amputee Coalition. (2010)  
Continuing Education Series



---

---

---

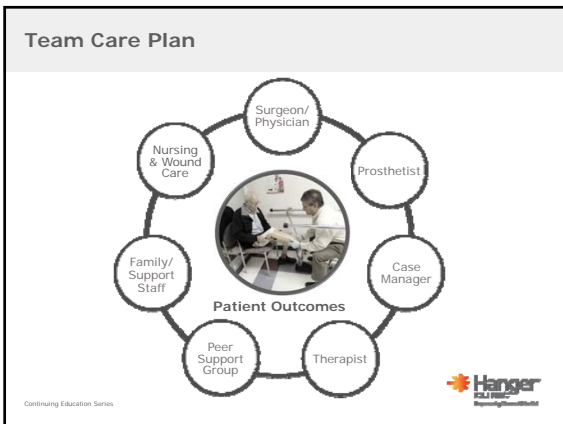
---

---

---

---

---



---

---

---

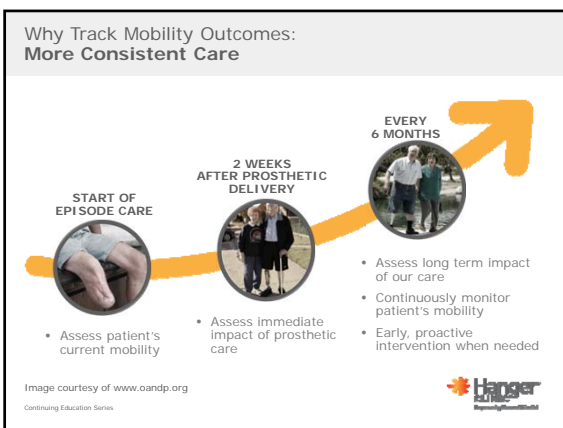
---

---

---

---

---



---

---

---

---

---

---

---

---

Outcome Measures:  
**PLUS-M™** and Prosthetic  
Evaluation Questionnaire

Continuing Education Series

---

---

---

---

---

---

---

---

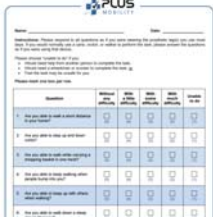
### Lower Limb Prosthetic Outcomes

**WHAT:**


- Prosthetics Limb Users Survey of Mobility (PLUS-M™)
- Self-reported instrument to measure mobility of adult with lower limb amputation
- Intended use: research and clinical care
- Uni/bi-lateral, various levels, current prosthesis users,  $\geq 18$

**WHO:**

- University of Washington Center on Outcomes Research in Rehabilitation
- National Institutes of Health
- Prosthetics Research Study



**Continuing Education Series**




---

---

---

---

---

---

---

---

---

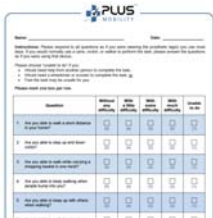
---

---


---

### PLUS-M™: Valid and Reliable

- Valid and Reliable: what and how
- Rigorously developed using modern psychometric methodology
- Numerous publications and abstracts



**Continuing Education Series**




---

---

---

---

---

---

---

---

---

---

---

---


### PLUS-M™: Validation Study

The PLUS-M™ was validated against established measures of physical function, mobility and balance and was correlated with:


- Amputee Mobility Predictor™ (AMP)
- Timed Up and Go (TUG)
- PEQ-MS
- ABC
- PROMIS-PF

The PLUS-M™

- Intra-class coefficient (ICC) greater than 0.9
- Indicating appropriate use for individual level monitoring of patients
- Better than many other patient-report instruments including the ABC, PROMIS and PEQ-MS



**Continuing Education Series**




---

---

---

---

---

---

---

---

---

---

---

---

### PLUS-M™: T-Score

- What is it?
- How it works
- What does the output look like?
- T-Score and Medical Records

Figure 2 - PLUS-M™ Measures of fit indicate that approximately 68% of people in the population have a score of 1 or less, and 95% are reflected in the standard form.

Continuing Education Series

---

---

---

---

---

---

---

---

---

---

---

---

### Prosthesis Evaluation Questionnaire – Well Being Subsection

- Development: Prosthetics Research Study
- Support for PEQ provided by US Department of Veterans Affairs
- Questionnaire divided into groups: Well-Being Subsection

**Satisfaction**

**7/10**

**Quality of Life**

**8/10**

Scoring is based on PRS coding and scale

Continuing Education Series

---

---

---

---

---

---

---

---

---

---

---

---

### Mobility Empowerment Score Card™

James Hanger DOB: 02/27/1942      Electronic Assessment Date: 08/02/2016

**Mobility (ALL Leg Prosthesis Users)**

Percentage: **67.0%**      Progress (Trend): **19.8%**

Trend: **0**

**PLUS-M™ T-Score: 54.4**

Mobility (SMALL Prostheses Users)

Amputation Level: Above Knee  
Etiology: Injury/Trauma  
Age Group: Greater than 65 years

Translating data to clinical care by a large prosthetic company

Continuing Education Series

---

---

---

---

---

---

---

---

---

---

---

---



**Case Studies:  
Transforming Patient Care**

Assessment Improves Care And Results In Higher Mobility

**Sample Case Study:**

- Age: 50 to 64
- Etiology: Trauma
- Clinician observes issue requiring referral to PMR for eval
- Patient returned 914 with Rx for replacement
- Post-delivery appointment

**Mobility Empowerment Score Card™**

Current Mobility (MUS, Leg Prosthesis) Score: 63.9%  
 Anticipation Level (Scale Free) Score: 46.4%

Satisfaction: Current 71% Previous 81% Trend: ↑  
 Quality of Life: Current 71% Previous 71% Trend: →

**Hanger**  
SOLUS  
Research & Innovation

Continuing Education Series

---

---

---

---

---

---

---

---

---

---

**Case Studies:  
Transforming Patient Care**

Ongoing Monitoring Enables Early Intervention

**Sample Case Study:**

- Age: 50 to 64
- Etiology: Vascular Disease/Diabetes
- What are the trends?
- Declines in high mobility patient following illness

**Mobility Empowerment Score Card™**

Current Mobility (MUS, Leg Prosthesis) Score: 70.2%  
 Anticipation Level (Scale Free) Score: 92.6%

Satisfaction: Current 71% Previous 70% Trend: →  
 Quality of Life: Current 71% Previous 81% Trend: →

**Hanger**  
SOLUS  
Research & Innovation

Continuing Education Series

---

---

---

---

---

---

---

---

---

---

**How outcomes data can help?**

- Assessment can help direct care to increase mobility
- Peer comparisons helps to manage patient expectations
- Ongoing monitoring enables early intervention
- Mobility tracking directs efficient care plan

Engaging the patient for:

Optimal Care      Better Outcomes

**Hanger**  
SOLUS  
Research & Innovation

Continuing Education Series

---

---

---

---

---

---

---

---

---

---





**Questions?**

**Provide your course evaluation, please visit:  
[hangerclinic.com/continuingeducation](http://hangerclinic.com/continuingeducation)**



Continuing Education Series

---

---

---

---

---

---

---

---

---


---

---

---

### References

1. Margolis DJ, Malay DS, Hoffstad OJ, Leonard CE, MacCurdy T, Lopez de Nava K, Tan Y, Molina T, Siegel KL. Prevalence of diabetes, diabetic foot ulcer, and lower extremity amputation among Medicare beneficiaries, 2006 to 2008: Data Points #1. Source: Data Points Publication Series [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US); 2011 Feb 17.
2. Centers for Disease Control and Prevention. National Diabetes Statistics Report: Estimates of Diabetes and Its Burden in the United States, 2014. Atlanta, GA: U.S. Department of Health and Human Services; 2014.
3. National Diabetes Data Group. Diabetes in America. Vol. 2. Bethesda, MD: National Institutes of Health; 1995. NIH Pub. No. 95-1468.
4. Reiber GE, Ledous WE. Epidemiology of diabetic foot ulcers and amputations: evidence for prevention. In: Williams R, Herman W, Kinmonth A-L, et al., eds. The evidence base for diabetes care. London: John Wiley & Sons; 2002. p. 641-665.
5. Murdoch DP, Armstrong DG, Dacus JB, Laughlin TJ, Morgan CB, Lavery LA. The natural history of great toe amputations. *Foot Ankle Surg* 1997; 36:204-9.
6. Dillingham TR, Pizzin LE, Shore AD. Reamputation, mortality, and health care costs among persons with dysvascular lower-limb amputations. *Arch Phys Med Rehabil* 2005; 86:480-6.
7. Thomas SR, Perkins JM, Magee TR, Galland RB. Transmetatarsal amputation: an 8-year experience. *Ann R Coll Surg Engl*. 2001 May; 83(3): 164-166.
8. Gershater MA, Londahl M, Nyberg P, Larsson J, Thorne J, Eneroth M, Apelqvist J. Complexity of factors related to outcome of neuropathic and neuroischaemic/ischaemic diabetic foot ulcers: a cohort study. *Diabetologia*. 2009 Mar; 52(3): 398-407.



Continuing Education Series

---

---

---

---

---

---

---

---

---

---

---

---

### References

9. Hafner BJ, Morgan SJ, Askew RL, Salem R. Psychometric properties of self-report outcome measures for prosthetic applications. American Academy of Orthotists & Prosthetists (AAOP) 42nd Annual Meeting and Scientific Symposium, Orlando, FL, March 9-12, 2016.
10. Amtmann D, Kim J, Chung H, Park R, Salem R, and Hafner BJ. Comparison of Computerized Adaptive Testing and Fixed-Length Short Forms of the Prosthetic Limb Users Survey of Mobility (PLUS-M™). International Society for Quality of Life Research (ISOQOL) 22nd Annual Conference. Vancouver, Canada, October 21-24, 2015.
11. Gaunard I, Galley R, Salem R, Hafner B. Construct validity of the Prosthetic Limb Users Survey of Mobility (PLUS-M). Proceedings of the 15th World Congress of the International Society of Prosthetics and Orthotics, Lyon, France, June 22-25, 2015.
12. Spaulding S, Gaunard I, Galley R, Morgan S, Amtmann D, Salem R, Hafner B. Prosthetists' confidence administering outcome measures. Proceedings of the 15th World Congress of the International Society of Prosthetics and Orthotics, Lyon, France, June 22-25, 2015.
13. Hafner B, Morgan S, Askew R. Reliability of self-reported outcome measures in people with lower limb loss: implications to clinical care and research. Proceedings of the 15th World Congress of the International Society of Prosthetics and Orthotics, Lyon, France, June 22-25, 2015.
14. Morgan S, Askew R, Hafner B. Equivalence of electronic and paper administration for four self-report instruments used in prosthetic clinical care. Proceedings of the 15th World Congress of the International Society of Prosthetics and Orthotics, Lyon, France, June 22-25, 2015.
15. Morgan SJ, Kelly VE, Salem R, Hafner BJ. Self-reported cognitive concerns in people with lower limb loss. Proceedings of the American Academy of Orthotists & Prosthetists (AAOP) 41th Annual Meeting and Scientific Symposium, New Orleans, LA, February 18-21, 2015.



Continuing Education Series

---

---

---

---

---

---

---

---

---

---

---

---

