

Prosthetic Devices: Component Considerations

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Outline

- ▶ Principles of Prosthetic Design
 - ▶ Socket Fit and Comfort
 - ▶ Alignment Optimization
- ▶ Functional Level Assessment
- ▶ Clinical Presentation
- ▶ Suspension Systems
- ▶ Component Selection
- ▶ Insurance Justifications



Functional Level Assessment: K Level Descriptors

▶ Level 0

Does not have the ability or potential to ambulate or transfer safely with or without assistance and a prosthesis does not enhance their quality of life or mobility.

▶ Level 1

Has the ability or potential to use a prosthesis for transfers or ambulation on level surfaces at fixed cadence. Typical of the limited and unlimited household ambulator.

▶ Level 2

Has the ability or potential for ambulation with the ability to traverse low level environmental barriers such as curbs, stairs or uneven surfaces. Typical of the limited community ambulator.

▶ Level 3

Has the ability or potential for ambulation with variable cadence. Typical of the community ambulator who has the ability to traverse most environmental barriers and may have vocational, therapeutic, or exercise activity that demands prosthetic utilization beyond simple locomotion.

▶ Level 4

Has the ability or potential for prosthetic ambulation that exceeds basic ambulation skills, exhibiting high impact, stress, or energy levels. Typical of the prosthetic demands of the child, active adult, or athlete.

Functional Level Assessment: Outcome Measures

- ▶ AmpPro/NoPro
- ▶ Activity Balance Confidence (ABC)
- ▶ PLUS-M
- ▶ Houghton
- ▶ PROMIS-29
- ▶ Community Integration Questionnaire
- ▶ Coping Self-Efficacy Scale



Functional Level Assessment: AmpPro/NoPro

AMPUTEE MOBILITY PREDICTOR ASSESSMENT TOOL

Initial instructions: Client is seated in a hard chair with arms. The following measurements are tested with or without the use of the prosthesis. Advise the person of each task or group of tasks prior to performance. Please avoid unnecessary chatter throughout the test. Safety First, no task should be performed if either the tester or client is uncertain of a safe outcome.

The Right Limb is: PF TT KD TF HD intact
 The Left Limb is: PF TT KD TF HD intact

1. Sitting Balance: Sit forward in a chair with arms folded across chest for 60s.	Cannot sit upright independently for 60s Can sit upright independently for 60s	=0 =1		
2. Sitting reach: Reach forwards and grasp the ruler. (Tester holds ruler 12in beyond extended arms midline to the sternum)	Does not attempt Cannot grasp or requires arm support Reaches forward and successfully grasps item.	=0 =1 =2		
3. Chair to chair transfer: 2 chairs at 90°. Pt. may choose direction and use their upper limb(s).	Cannot do or requires physical assistance Performs independently, but appears unsteady Performs independently, appears to be steady and safe	=0 =1 =2		
4. Arises from a chair: Ask pt. to fold arms across chest and stand. If unable, use arms or assistive device.	Unable without help (physical assistance) Able, uses arms assist device to help Able, without using arms	=0 =1 =2		
5. Attempts to arise from a chair: (stopwatch ready) If attempt in no. 4 was without arms then remove and allow another attempt without prosth.	Unable without help (physical assistance) Able requires >1 attempt Able to rise one attempt	=0 =1 =2		
6. Immediate Standing Balance: (first 5s) Begin timer immediately.	Unsteady (stagger, moves foot, steps) Steady using walking aid or other support Steady without walker or other support	=0 =1 =2		
7. Standing Balance (30s): (stopwatch ready) For item no. 7 & 8, first attempt is without assistive device. If support is required allow after first attempt.	Unsteady Steady but uses walking aid or other support Steady without support	=0 =1 =2		
8. Single limb standing balance: (stopwatch ready) Time the duration of single limb standing on both the sound and prosthetic limb up to 30s. Grade the quality, not the time. *Eliminate item 8 for AMPPro® Sound side seconds Prosthetic side seconds	Non-prosthetic side Unsteady Steady but uses walking aid or other support for 30s Single limb standing without support for 30s Prosthetic Side Unsteady Steady but uses walking aid or other support for 30s Single limb standing without support for 30s	=0 =1 =2 =0 =1 =2		
9. Stepping reach: Reach forward and grasp the ruler. (Tester holds ruler 12in beyond extended arm(s) midline to the sternum)	Does not attempt Cannot grasp or requires arm support on assistive device Reaches forward and successfully grasps item no support	=0 =1 =2		
10. Heel-toe test: With feet as close together as possible, examine position lightly on pt.'s sternum with palm of hand 3 times (feet should rise)	Begins to fall Stagger, grabs, catches self or uses assistive device Steady	=0 =1 =2		
11. Eyes Closed: (at maximum position #7) If support is required grade as unsteady.	Unsteady or grips assistive device Steady without any use of assistive device	=0 =1		

12. Pick up objects off the floor: Pick up a pencil off the floor placed midline 12in in front of feet	Unable to pick up object and return to standing Performs with some help (table, chair, walker aid etc) Performs independently (without help)	=0 =1 =2		
13. Lifting items: Ask pt. to fold arms across chest and sit. If unable, use arm or assistive device.	Unsafe (misjudged distance, falls into chair) Uses arms, assistive device or not a smooth motion Safe, smooth motion	=0 =1 =2		
14. Initiation of gait: (Immediately after told to "go")	Any hesitancy or multiple attempts to start No hesitancy	=0 =1		
15. Step length and height: Walk a measured distance of 12ft twice (up and back). Four scores are required or two scores (a, & b) for each leg. "Marked deviation" is defined as extreme substitute movements to avoid clearing the floor.	a. Swing Foot Does not advance a minimum of 12in (up and back). Advances a minimum of 12in b. Foot Clearance Foot does not completely clear floor without deviation Foot completely clears floor without marked deviation	=0 =1 =0 =1	Prosthesis	Sound
16. Step Continuity:	Stopping or discontinuity between steps (stop & go gait) Steps appear continuous	=0 =1		
17. Turning: 180 degree turn when returning to chair.	Unable to turn, requires intervention to prevent falling Greater than three steps but completes task without intervention No more than three continuous steps with or without assistive aid	=0 =1 =2		
18. Variable cadence: Walk a distance of 12ft as fast as possible slowly 4 times. (Speeds may vary from slow to fast and fast to slow varying cadence)	Unable to vary cadence in a controlled manner Asymmetrical increase in cadence controlled manner Symmetrical increase in speed in a controlled manner	=0 =1 =2		
19. Stepping over an obstacle: Place a movable box of 4in in height in the walking path.	Cannot step over the box Catches foot, interrupts stride Steps over without interrupting stride	=0 =1 =2		
20. Stairs (must have at least 2 steps): Try to go up and down these stairs without holding on to the railing. Don't hesitate to permit pt. to hold on to rail. Safety First, if examiner feels that any risk is involved omit and score as 0.	Ascending Unsteady, cannot do One step at a time, or must hold on to railing or device Step over step, does not hold onto the railing or device Descending Unsteady, cannot do One step at a time, or must hold on to railing or device Step over step, does not hold onto the railing or device	=0 =1 =2 =0 =1 =2		
21. Assistive device selection: Add points for the use of an assistive device if used for two or more items. If testing without prosthesis use of appropriate assistive device is mandatory.	Bed board Wheelchair / Parallel Bars Walker Crutches (axillary or forearm) Cane (straight or quad) None	=0 =1 =2 =3 =4 =5		
Total Score	AMPPro _____/43 AMPPEO _____/47			

Abbreviation: PF = partial foot, TT = transfemoral, KD = knee disarticulation, TF = transfemoral, HD = hip disarticulation

Test: no prosthesis with prosthesis Observer: _____ Date: _____

K LEVEL (converted from AMP score)

AMPPro K0 (0-8) K1 (9-20) K2 (21-28) K3 (29-36) K4 (37-43)

AMPPEO K1 (15-26) K2 (27-38) K3 (37-42) K4 (43-47)

ABC-16 Scale

For each of the following, please indicate your level of confidence in doing the activity without losing your balance or becoming unsteady from choosing one of the percentage points on the scale from 0% to 100%. If you do not currently do the activity in question, try and imagine how confident you would be if you had to do the activity. If you normally use a walking aid to do the activity or hold onto someone, rate your confidence as if you were using these supports.

For each of the following activities, please indicate your level of self-confidence by choosing a corresponding number from the following rating scale:

0% 10 20 30 40 50 60 70 80 90 100%
no confidence completely confident

How confident are you that you will not lose your balance or become unsteady when you...

1. ...walk around the house? ____%
2. ...walk up or down stairs? ____%
3. ...bend over and pick up a slipper from the front of a closet floor ____%
4. ...reach for a small can off a shelf at eye level? ____%
5. ...stand on your tiptoes and reach for something above your head? ____%
6. ...stand on a chair and reach for something? ____%
7. ...sweep the floor? ____%
8. ...walk outside the house to a car parked in the driveway? ____%
9. ...get into or out of a car? ____%
10. ...walk across a parking lot to the mall? ____%
11. ...walk up or down a ramp? ____%
12. ...walk in a crowded mall where people rapidly walk past you? ____%
13. ...are bumped into by people as you walk through the mall? ____%
14. ...step onto or off an escalator while you are holding onto a railing? ____%
15. ...step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing? ____%
16. ...walk outside on icy sidewalks? ____%

Activity Balance Confidence (ABC)



Name: _____ Date: _____

Instructions: Please respond to all questions as if you were wearing the prosthetic leg(s) you use most days. If you would normally use a cane, crutch, or walker to perform the task, please answer the questions as if you were using that device.

Please choose "unable to do" if you:

- Would need help from another person to complete the task,
- Would need a wheelchair or scooter to complete the task, or
- Feel the task may be unsafe for you

Please mark one box per row.

Question	Without any difficulty	With a little difficulty	With some difficulty	With much difficulty	Unable to do
1. Are you able to walk a short distance in your home?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
2. Are you able to step up and down curbs?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
3. Are you able to walk across a parking lot?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
4. Are you able to walk over gravel surfaces?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
5. Are you able to move a chair from one room to another?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
6. Are you able to walk while carrying a shopping basket in one hand?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
7. Are you able to keep walking when people bump into you?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
8. Are you able to walk on an unlit street or sidewalk?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
9. Are you able to keep up with others when walking?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
10. Are you able to walk across a slippery floor?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
11. Are you able to walk down a steep gravel driveway?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)
12. Are you able to hike about 2 miles on uneven surfaces, including hills?	<input type="checkbox"/> (5)	<input type="checkbox"/> (4)	<input type="checkbox"/> (3)	<input type="checkbox"/> (2)	<input type="checkbox"/> (1)

PLUS-M

Houghton Scale of Prosthetic Use	
1. Do you wear your prosthesis?	0 < than 25% of waking hours (1-3 hours) 1 25-50% of waking hours (4-8 hours) 2 > than 50% of waking hours (> 8 hours) 3 All waking hours (12-16 hours)
2. Do you use your prosthesis to walk:	0 Just when visiting the doctor or limb-fitting center 1 At home but not to go outside 2 Outside the home on occasion 3 Inside & outside all the time
3. When going outside wearing your prosthesis, do you:	0 Use a wheelchair 1 Use 2 crutches, 2 canes, or a walker 2 Use one cane 3 Use nothing
4. When walking with your prosthesis outside, do you feel unstable when:	
4a: Walking on a flat surface?	0 Yes 1 No
4b: Walking on slopes?	0 Yes 1 No
4c: Walking on rough ground?	0 Yes 1 No
TOTAL:	/12 points

Houghton

PROMIS-29

PROMIS-29 Profile v2.0

Please respond to each question or statement by marking one box per row.

Physical Function		Without any difficulty	With a little difficulty	With some difficulty	With much difficulty	Unable to do
PF01	Are you able to do chores such as vacuuming or yard work? _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PF02	Are you able to go up and down stairs at a normal pace? _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PF03	Are you able to go for a walk of at least 15 minutes? _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PF04	Are you able to run errands and shop? _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anxiety		Never	Rarely	Sometimes	Often	Always
AN01	I felt fearful _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AN02	I found it hard to focus on anything other than my anxiety _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AN03	My worries overwhelmed me _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AN04	I felt uneasy _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Depression		Never	Rarely	Sometimes	Often	Always
DE01	I felt worthless _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DE02	I felt helpless _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DE03	I felt depressed _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DE04	I felt hopeless _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fatigue		Not at all	A little bit	Somewhat	Quite a bit	Very much
FAT	I feel fatigued _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FAT	I have trouble starting things because I am tired _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Fatigue		Not at all	A little bit	Somewhat	Quite a bit	Very much							
FAT01	In the past 7 days... How run-down did you feel on average? ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
FAT02	How fatigued were you on average? _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
Sleep Disturbance		Very poor	Poor	Fair	Good	Very good							
SD01	In the past 7 days... My sleep quality was _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
SD02	In the past 7 days... My sleep was refreshing _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
SD03	I had a problem with my sleep _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
SD04	I had difficulty falling asleep _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
Ability to Participate in Social Roles and Activities		Never	Rarely	Sometimes	Usually	Always							
AS01	I have trouble doing all of my regular leisure activities with others _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
AS02	I have trouble doing all of the family activities that I want to do _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
AS03	I have trouble doing all of my usual work (include work at home) _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
AS04	I have trouble doing all of the activities with friends that I want to do _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
Pain Interference		Not at all	A little bit	Somewhat	Quite a bit	Very much							
PI01	In the past 7 days... How much did pain interfere with your day to day activities? _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
PI02	How much did pain interfere with work around the home? _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
PI03	How much did pain interfere with your ability to participate in social activities? _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
PI04	How much did pain interfere with your household chores? _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
Pain Intensity													
PI05	In the past 7 days... How would you rate your pain on average? _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		0	1	2	3	4	5	6	7	8	9	10	
		No pain											Worst pain imaginable

Community Integration Questionnaire

Community Integration Questionnaire

Name: _____ Date: _____

Home Integration	Answer (circle one)	Score
1. Who usually does shopping for groceries or other necessities in your household?	Yourself alone (2) Yourself and someone else (1) Someone else (0)	
2. Who usually prepares meals in your household?	Yourself alone (2) Yourself and someone else (1) Someone else (0)	
3. In your home who usually does normal everyday housework?	Yourself alone (2) Yourself and someone else (1) Someone else (0)	
4. Who usually cares for the children in your home?	Yourself alone (2) Yourself and someone else (1) Someone else (0) Not applicable (score is the average of 1,2,3 and 5)	
5. Who usually plans social arrangements such as get-togethers with family and friends?	Yourself alone (2) Yourself and someone else (1) Someone else (0)	
Home Integration Total Score	Add the above scores together	
Social Integration		
6. Who usually looks after your personal finances such as banking or paying bills?	Yourself alone (2) Yourself and someone else (1) Someone else (0)	
<i>Can you tell me approximately how many times a month you now usually participate in the following activities outside your home?</i>		
7. Shopping	5 or more (2) 1 – 4 times (1) Never (0)	
8. Leisure activities such as movies, sports, restaurants	5 or more (2) 1 – 4 times (1) Never (0)	
9. Visiting friends or relatives	5 or more (2) 1 – 4 times (1) Never (0)	

10. When you participate in leisure activities do you usually do this alone or with other?	mostly alone (0) mostly with friends who have head injuries (1) mostly with family members (1) mostly with friends who do not have head injuries (2) with a combination of family and friends (2)	
11. Do you have a best friend with whom you confide?	Yes (2) No (0)	
Social Integration Total Score	Add the above scores together	
Integration into Productive Activities		
12. How often do you travel outside the home?	almost every day (2) almost every week (1) seldom/never (less than once per week) (0)	
13. Please choose the answer below that best corresponds to your current (during the past month) work situation: <i>Please see scoring for this item on next page</i>	Full-time employment (>20 hours/week) Part Time Employment (≤ 20 hours/week) Not working, but actively looking for work Not working, not looking for work Not applicable, retired due to age Volunteer job in the community	
14. Please choose the answer below that best corresponds to your current (during the past month) school or training program situation <i>Please see scoring for this item on next page</i>	Full-time Part-time Not attending school or training program	
15. In the past month, how often did you engage in volunteer activities? <i>Please see scoring for this item on next page</i>	5 or more 1 – 4 times Never	
Total Score		

Scoring for items 13 to 15 - JobSchool

The patient receives a 0, if answers for the following questions are:
 Item 13) not working, not looking for work
 Item 14) not going to school
 Item 15) no volunteer activities

The patient receives a 1, if answers for the following questions are:
 Item 13) not working, not looking for work
 Item 14) not going to school
 Item 15) volunteers 1 to 4 times

The patient receives a 2, if answers for the following questions are:
 Item 13) actively looking for work
 AND/OR
 Item 15) volunteers 5 or more times per month

The patient receives a 3, if answers for the following questions are:
 Item 13) working part-time
 OR
 Item 14) attends school part-time

The patient receives a 4, if answers for the following questions are:
 Item 13) working full-time
 OR
 Item 14) attends school full-time

The patient receives a 5, if answers for the following questions are:
 Item 13) working full-time AND Item 14) attends school part-time
 OR
 Item 13) works part-time AND Item 14) attends school full-time

If the patient is retired due to age, use item 15 to score the JOBSCHOOL variable

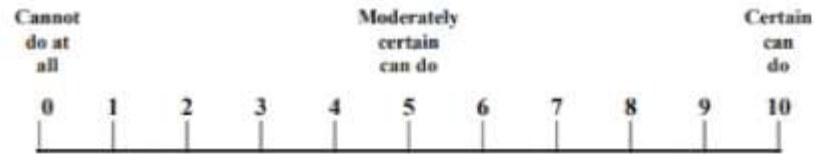
5 or more receives 4 points
 1 – 4 times receives 2 points
 Never receives 0 points

Summing Scores:

The productivity score = item 12 score + Jobschool variable

The total CIQ score = Home integration score + social integration score + productivity score

When things aren't going well for you, or when you're having problems, how confident or certain are you that you can do the following:



For each of the following items, write a number from 0 - 10, using the scale above.

When things aren't going well for you, how confident are you that you can:

1. Keep from getting down in the dumps. _____ 99
2. Talk positively to yourself. _____ 99
3. Sort out what can be changed, and what can not be changed. _____ 99
4. Get emotional support from friends and family. _____ 99
5. Find solutions to your most difficult problems. _____ 99

6. Break an upsetting problem down into smaller parts. _____ 99
7. Leave options open when things get stressful. _____ 99
8. Make a plan of action and follow it when confronted with a problem. _____ 99
9. Develop new hobbies or recreations. _____ 99
10. Take your mind off unpleasant thoughts. _____ 99

11. Look for something good in a negative situation. _____ 99
12. Keep from feeling sad. _____ 99
13. See things from the other person's point of view during a heated argument. _____ 99
14. Try other solutions to your problems if your first solutions don't work. _____ 99
15. Stop yourself from being upset by unpleasant thoughts. _____ 99

Coping Self-Efficacy Scale

16. Make new friends. _____ 99
17. Get friends to help you with the things you need. _____ 99
18. Do something positive for yourself when you are feeling discouraged. _____ 99
19. Make unpleasant thoughts go away. _____ 99
20. Think about one part of the problem at a time. _____ 99

21. Visualize a pleasant activity or place. _____ 99
22. Keep yourself from feeling lonely. _____ 99
23. Pray or meditate. _____ 99
24. Get emotional support from community organizations or resources. _____ 99
25. Stand your ground and fight for what you want. _____ 99
26. Resist the impulse to act hastily when under pressure. _____ 99

Self- reported and performance-based outcome measures for 3 Houghton Scale ability categories

Outcome Measures	Independent Community	Limited Community Household	Limited Household
Houghton Scale			
TUG Test (s)			
2MWT (m)			
Walking speed (m/s)*			
Walking speed range (m/s)			<0.5

NOTE: Values are mean SD or as otherwise indicated. All ability categories were significantly different from each other for all outcome measures.

Abbreviations: PEQ-MA= Prosthetic Evaluation Questionnaire mobility subscale
 3-BBS= total sum score of 3 BBS items

*Calculated from the 2MWT distance

Functional Level Assessment: Socket Comfort Score

- ▶ Ask patient to rate the comfort of their socket on a 0 - 10 scale where 0 and 10 represented the most uncomfortable and the most comfortable socket imaginable.



Clinical Presentation

- ▶ Prosthetic History
- ▶ Limb Length
- ▶ Limb Condition
- ▶ ROM/MMT
- ▶ Cognitive ability to manage new technology



Clinical Presentation: Prosthetic History

- ▶ Cause of amputation
- ▶ How long since amputation
- ▶ What suspension system has the patient used
- ▶ What type of components has the patient used
- ▶ Has patient attended PT



Clinical Presentation: Limb Length

- ▶ Component and suspension/selection based on limb length

Limb Length	Benefits	Limitations
Short	No limit on build heights of components	Decreased muscles strength, Decreased lever arm Increased energy expenditure required
Long	Less energy expenditure, more control, and leverage	Limitations due to build heights of components

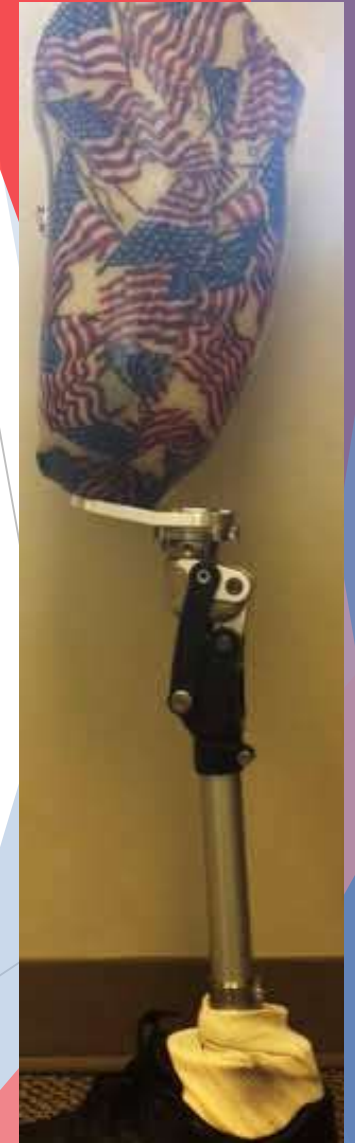
Clinical Presentation: Limb Condition

- ▶ Skin Grafts
- ▶ Nueromas
- ▶ Pain
- ▶ Distal padding
- ▶ Soft tissue
- ▶ Shape - bulbous, cylindrical, conical
- ▶ Adhesion



Clinical Presentation: ROM/MMT

- ▶ Contractures
 - ▶ Transfemoral - Hip Flexion, Hip Abduction
 - ▶ Transtibial - Knee flexion
- ▶ Strength
 - ▶ Include upper extremity/dexterity



Clinical Presentation: Cognition

- ▶ Ability to understand suspension systems
- ▶ Ability to manage new technology
 - ▶ Charging and battery, etc.
- ▶ “Gadget Tolerance”



Suspension Systems

- ▶ Suction
 - ▶ Skin fit
 - ▶ Sleeve
 - ▶ Seal-in Liner
- ▶ Pelvic Band/Hip Joint
- ▶ Pin Lock
- ▶ KISS/Strap
- ▶ BOA
- ▶ Magnet
- ▶ Elevated Vacuum
 - ▶ Manual/Electric



Suspension Systems: Suction

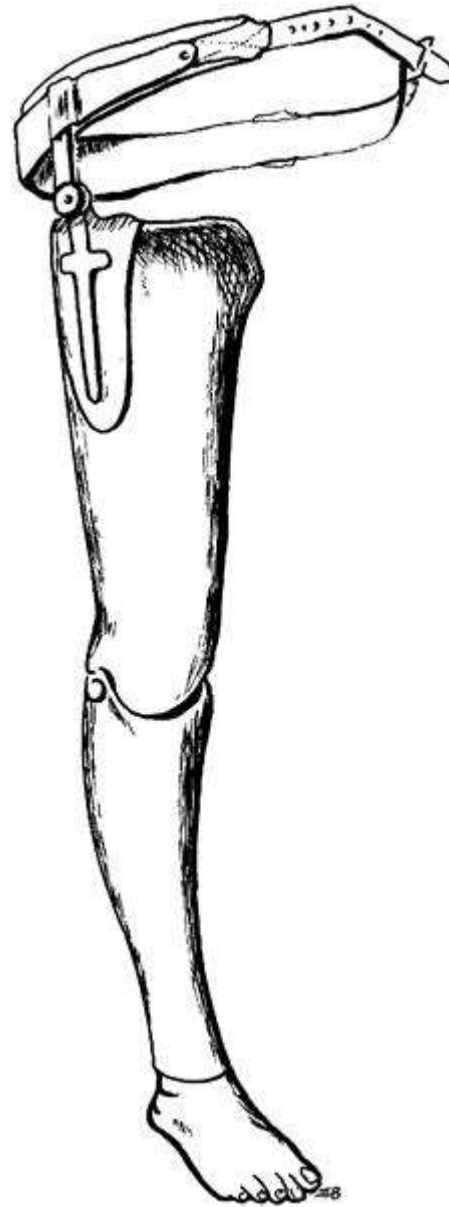
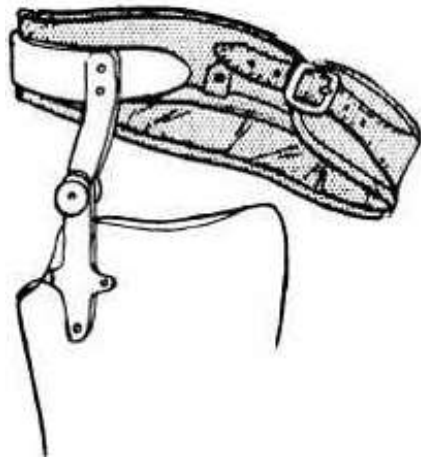


- ▶ Skin Fit - mature limb, stable volume, sound skin integrity, patient didn't tolerate liner
- ▶ Sleeve - One way expulsion valve, mature limb, sound hand dexterity, mostly BKA
- ▶ Seal-in liner - Liner serves as seal, mature limb, stable volume, more room for components



Suspension Systems: Pelvic Band/Hip joint

- ▶ Short limb
- ▶ Proximal instability/weakness
- ▶ Difficulty with donning



Suspension Systems: Pin Lock

- ▶ Distal suspension
- ▶ Poor hand dexterity
- ▶ Sound skin integrity/distal soft tissue
- ▶ Easy to don with practice - must align pin



Suspension Systems: KISS/Strap

- ▶ Distal suspension
- ▶ Easy to don but requires hand dexterity
- ▶ Can don sitting down and then stand to adjust



Suspension Systems: BOA

- ▶ Fluctuating volume throughout the day
- ▶ Gadget friendly user
- ▶ Reduces need for socks



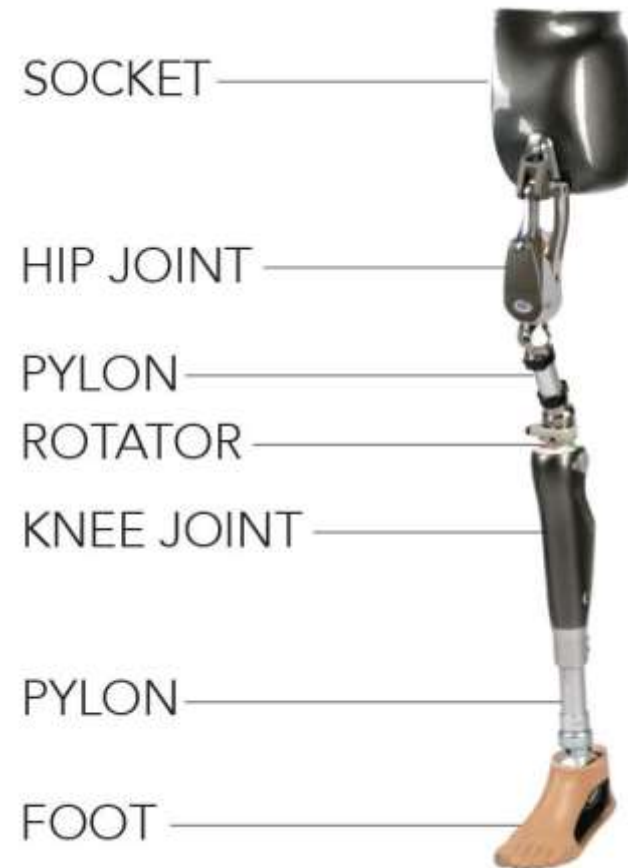
Suspension Systems: Elevated Vacuum

- ▶ Controls volume and reduces fluctuations, enhances suspension, promotes skin and limb health
- ▶ Electronic pump or manual pump (vacuum pulled from heel compression)



Component Selection

- ▶ Transtibial
 - ▶ Foot selection
- ▶ Transfemoral
 - ▶ Knee selection
- ▶ Activity Specific



Components: Foot Selection

- ▶ K1 - SACH
- ▶ K2 - Non Carbon Fiber/Dynamic Response, Flexible Keel
- ▶ K3 - Dynamic Response, Shock Absorber, Torque Adaptor
- ▶ K4 - Dynamic Response, Shock Absorber, Torque Adaptor

- ▶ Non K-Level specific (K2-K4)- Adjustable heel height, hydraulic ankle, multiaxial feature

Components: K1 Foot

- ▶ SACH - Solid Ankle Cushioned Heel
- ▶ Stable
- ▶ Only allows DF/PF
- ▶ Durable



Components: K2 Foot

- ▶ Flexible Keel
- ▶ Multi or Single Axis
- ▶ NO carbon fiber!



Components: K3/K4 Feet

- ▶ ESAR - Energy Storing and Return
- ▶ Can have torsion/shock adaptors
- ▶ Typically carbon fiber



Components: Activity Specific Feet, other features



Components: Knee Selection

- ▶ Terminology
 - ▶ Axis - Single Axis, Multi Axis, Polycentric (4 bar, 7 bar linkages)
 - ▶ Control - Constant friction, Hydraulic, Pneumatic, Microprocessor
 - ▶ Other Features:
 - ▶ Stance Flexion, Extension Assist, Manual Lock



Components: Knee Selection

- ▶ K1 - Single/Multi Axis, Constant Friction
 - ▶ Common to have manual lock feature
- ▶ K2 - Single/Multi Axis, Constant Friction
 - ▶ Extension Assist/Stance Flexion
- ▶ K3 & K4 - Single/Multi Axis, Hydraulic, Pneumatic, Microprocessor



Components: K1 Knee

- K1 - Single/Multi Axis, Constant Friction
 - Common to have manual lock feature
 - Used for transfers/short distance ambulating within the house



Components: K2 Knee

- ▶ K2 - Single/Multi Axis, Constant Friction
 - ▶ Extension Assist/Stance Flexion
 - ▶ No hydraulics or microprocessor control



Components: K3/K4 Knees

- ▶ K3/K4 - Single/Multi Axis, Hydraulic, Pneumatic, Microprocessor
- ▶ K4 - high activity frames are covered
 - ▶ Water resistant vs submersible



Components: Other

- ▶ Transfemoral
 - ▶ Rotation Adaptor - Assist in ADLs (dressing), getting into and out of car
 - ▶ Requires a shorter limb length for space



Insurance Justifications for Componentry

- ▶ K3/K4 level feet and knees
- ▶ Activity specific components
- ▶ “Medical Necessity”



Prosthetic Assessment Form

PROSTHETIC ASSESSMENT FORM			
Patient Name:		DOB:	Age:
Site of Amputation: <input type="checkbox"/> left <input type="checkbox"/> right	Level of Amputation: <input type="checkbox"/> no disartic <input type="checkbox"/> below knee <input type="checkbox"/> knee disartic <input type="checkbox"/> above knee <input type="checkbox"/> Syme <input type="checkbox"/> partial foot	K-level: <input type="checkbox"/> K1 <input type="checkbox"/> K2 <input type="checkbox"/> K3 <input type="checkbox"/> K4	
Contralateral Limb Amputation: <input type="checkbox"/> no <input type="checkbox"/> yes specify: _____	Patient's Desire to Ambulate: <input type="checkbox"/> good <input type="checkbox"/> fair <input type="checkbox"/> poor	Engition: <input type="checkbox"/> intact <input type="checkbox"/> not intact	ADL's Requiring Prosthetic Use: <input type="checkbox"/> concourse walking <input type="checkbox"/> home environment <input type="checkbox"/> community responsibilities
The following criteria MUST be met for rationale of Preparatory/Definitive Prosthesis and all prosthetic users: <input type="checkbox"/> Patient is motivated to use a prosthesis (e.g. follows post op instructions, attends medical appointments, social participation) <input type="checkbox"/> Patient has a functional residual limb for prosthetic socket fit (e.g. incision healed, no drainage, stable volume) <input type="checkbox"/> Patient has the ability to reach a functional level to safely use a prosthesis Notes: _____			
RX DEVICES REQUESTED:			
New Prosthesis: <input type="checkbox"/> preparatory prosthesis <input type="checkbox"/> definitive prosthesis <input type="checkbox"/> activity specific prosthesis	Replacement of Components: <input type="checkbox"/> socket <input type="checkbox"/> knee <input type="checkbox"/> foot <input type="checkbox"/> other: _____	Repair of Components: <input type="checkbox"/> socket <input type="checkbox"/> knee <input type="checkbox"/> foot <input type="checkbox"/> other: _____	
New Consumables Due to Wear & Tear: <input type="checkbox"/> liners <input type="checkbox"/> socks <input type="checkbox"/> sleeves <input type="checkbox"/> other: _____	Additional Components: <input type="checkbox"/> lock <input type="checkbox"/> tube clamp <input type="checkbox"/> flexion plate <input type="checkbox"/> other: _____	<input type="checkbox"/> rotation adaptor <input type="checkbox"/> protective inside cover <input type="checkbox"/> protective outside cover	
RX RATIONALE FOR DEVICES REQUESTED:			
Change in Physiological Condition: <input type="checkbox"/> compromised skin integrity <input type="checkbox"/> weight gain/loss <input type="checkbox"/> limb volume changes <input type="checkbox"/> revision surgery <input type="checkbox"/> new amputation	<input type="checkbox"/> blisters <input type="checkbox"/> discoloration <input type="checkbox"/> ulcers <input type="checkbox"/> dermatitis <input type="checkbox"/> weight loss > 20lbs <input type="checkbox"/> weight gain > 20lbs <input type="checkbox"/> ill-fitting socket <input type="checkbox"/> decreased wear tolerance (due to pain/Rx) date of revision: _____		
Change in Function Resulting in Change of K-level: <input type="checkbox"/> decrease in K-level: <input type="checkbox"/> increase in K-level:	Irreparable Items: <input type="checkbox"/> lost or stolen <input type="checkbox"/> damaged <input type="checkbox"/> normal wear & tear <input type="checkbox"/> broken beyond repair		
New Comorbidity: <input type="checkbox"/> stroke <input type="checkbox"/> contralateral limb amputation <input type="checkbox"/> contralateral limb OA <input type="checkbox"/> cardiopulmonary status <input type="checkbox"/> neuropathy <input type="checkbox"/> osteoporosis <input type="checkbox"/> joint contracture requiring alignment change (>7 degrees) <input type="checkbox"/> other: _____	Environmental Considerations: <input type="checkbox"/> assist AGS <input type="checkbox"/> extend device life <input type="checkbox"/> work environment <input type="checkbox"/> inclement		
Descriptions of K-levels (lower limb prosthesis functional levels):			
K1: Has the ability or potential to use a prosthesis for transfers or ambulation on level surfaces at a fixed velocity. Typical of the limited and unoriented household ambulator. K2: Has the ability or potential for ambulation with the ability to traverse low level environmental barriers such as curbs, stairs, or uneven surfaces. Typical of the limited community ambulator. K3: Has the ability or potential for ambulation with variable balance. Typical of the community ambulator who has the ability to traverse most environmental barriers and may have the cognitive, therapeutic, or exercise activity that demands prosthetic utilization beyond simple locomotion. K4: Has the ability or potential for prosthetic ambulation that exceeds basic ambulation skills, exhibiting high impact, stress, or energy levels. Typical of the prosthesis demands of the child, active adult, or athlete.			

Questions?

► Image references

- ▶ https://www.ottobock.com.au/clinicalservices-contentupdate/your-individual-fitting/fitting_with_a_leg_prosthesis-contentupdate.html
- ▶ http://www.ottobock.co.uk/prosthetics/lower_limb_prosthetics/prosthetic-product-systems/genium_x3-prosthetic-leg/
- ▶ Oandp.com
- ▶ <https://www.clickmedical.co/store/revofit/revo/>
- ▶ <https://twitter.com/RegalProsthesis>
- ▶ <http://www.spsco.com/product-type/prosthetics/knee/locking-1/ofm2hd-knee-11-ofm2.html>
- ▶ <https://www.college-park.com/lower-limb/prosthetic-feet>
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- ▶ <https://www.ossur.co.uk/prosthetic-solutions/products/dynamic-solutions/proprio-foot>
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- ▶ <https://www.ossur.com/prosthetic-solutions/products/balance-solutions/balance-knee>