Rehabilitation of Older Adult Amputees: Pre-Post Prosthetic Care

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***NOTE***
Attendee version: Videos, some pictures, and content slides removed due to size limitations. Full lecture will be presented at CSM (~100 slides).

Disclosures

• The presenter has no conflicts of interest to disclose.

About me:

• Graduated from SUNY Stony Brook in 2009
• Geriatric Specialist Certification in 2013
• Have worked with individuals having limb-loss in three major settings
  • Sub-acute
  • Acute rehabilitation
  • Outpatient
• Currently full-time faculty at the University of Hartford
  • Rehabilitation Sciences
  • DPT
  • MSPO

Learning Objectives:

By the end of this session, you should be able to...

• 1) Understand the unique characteristics and presentation of older adults with limb loss.
• 2) Construct a learning environment conducive to older adult learning.
• 3) Evaluate an older adult both pre-prosthetically and prosthetically.
• 4) Create educational materials specifically to enhance the self-management process of your patient.
• 5) Identify red-flags and pitfalls to making a recovery and how address these issues.

Research:

• Decision Trees
**Research**

- Mobile app

**Themes**

- Terminology
- Statistics
- Specific considerations for older adults with limb loss
- Creating a conducive learning environment
- Phases
  - Pre-prosthetic
  - Post prosthetic
- Personalized educational interventions
- Summary: Bringing it all together

**Key Terms**

- Person with Limb Loss (replaces amputee)
- Dysvascular: patients with peripheral vascular disease, diabetes, or a combination of both (Kulkarni et al. 2006)
- TT: trans-tibial (replaces below knee)
- TF: trans-femoral (replaces above knee)
- Prosthesis user: signifies an individual at the prosthetic utilization stage of rehabilitation

**Quick look at K-levels**

- What they are used for:
- What each level looks like
- Function
- Equipment
- How they are determined
- PLOF: Perceived future level of function
- How to make it objective:
  - AMPPro
  - AMPnoPro

**Medicare K-Level Guidelines**

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>AMPPro</th>
<th>AMPnoPro</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Prosthesis will not enhance QoL or mobility potential.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>Transfers.</td>
<td>Single axis</td>
<td>SACH</td>
</tr>
<tr>
<td>2</td>
<td>Traverse low-level barriers: curbs, stairs, uneven surfaces.</td>
<td>Poly-centric</td>
<td>Throttle-level foot Multi-axial ankle</td>
</tr>
<tr>
<td>3</td>
<td>Unlimited community ambulator.</td>
<td>Hydraulics/pneumatic Microprocessor</td>
<td>Energy-storing foot Multi-axial ankle</td>
</tr>
<tr>
<td>4</td>
<td>Exceeds basic ambulation skills.</td>
<td>Any system</td>
<td>Any system &quot;blades&quot;</td>
</tr>
</tbody>
</table>

**AMPpro/AMPnoPro**

- Outcome measure designed by Robert Gailey
- Used to assign a K-level
- One of very few validated outcome measures for lower limb loss.
- Easy to perform
- Can be done with and without a prosthetic device (noPRO)
All ages (US)\(^1,2\)

- 1.2m 1995
- 1.6-2m 2005
- 185K new major amputations/yr
- 1 in 190 people have limb loss
- 3.6m 2050
- Despite amputation rates decreasing
- 63% white.
- 55% amputated for dysvascular etiologies
- 45% Trauma/other
- In 2009, costs with amputations 8.3B!

Older Adults

- Age
  - Average 72.2 yrs old
- Males vs females
  - 53.2% M vs 46.8% F
- TF vs TT
  - 44% TF/56% TT Etiology
- Dysvascular: PAD, PVD, with/without diabetes complications.

Older adult

- 75% of all non-traumatic lower limb amputations occur in older adults (>65 yo).\(^3\)
- 90% of all those amputations are due to vascular etiologies.\(^3\)
- The oldest old (85+) are projected to demonstrate an increase in amputations from 20% to 35% by the year 2050.\(^2\)
- Prosthetic fitting as low as 27% in older adults.\(^3\)
  - Especially low in those with cognitive impairment
  - Only 7% in the oldest old (4.5x less likely than those younger than 76)

To summarize...

- While overall trends in amputations are decreasing, rates of amputations in older adults remain the greatest.

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Specific Considerations

- Comorbidities
  - Diabetes
  - Neurological (non-cognitive)
  - Cardiopulmonary
  - Arthritis

- Not uncommon to see the following as a result:
  - Vision
  - Sensation
  - Dexterity
  - Coordination
  - Deformity

Specific Considerations

- Cognitive issues
  - Older adults in general have more cognitive impairment
    - When coupled with dysvascular disease, impairment increases.
    - Cognitive issues can impair the problem solving process
    - Sequencing deficits are correlated with a higher need of physical support

- Cognition shown to be predictive of:
  - Ultimate prosthetic prescription
  - Functional mobility
  - Disability
  - Memory and executive function
  - Predictive of functional loss over time

Specific Considerations

- Prior level of function
  - Part of the K-level calculation
  - Time from onset of injury → amputation
    - Unlike traumatic, many may have been on conservative care prior
    - Can influence their perceived level of function...

Specific Considerations

- Higher risk of developing secondary complications
  - Contractures
  - More time spent sitting
  - Wounds
    - Bottoming out
  - Functional loss
    - Non-use of prosthetic limb
  - Musculoskeletal complications
    - Low back pain
    - Contralateral osteoarthritis

Specific Considerations

- Ageism
  - If this bias influences the prescription of the prosthetic limb it can spell out disaster
    - A single axis knee for someone with community potential
    - Archaic suspension types difficult to don because they are commonly prescribed to older adults

Themes

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Learning Strategies

- Teaching an old dog new tricks
- Repetition, repetition, repetition
  - That’s without cog deficits
- Goal oriented
  - Elevator analogy
- Quiet environment
- Written materials with pictures
  - Can pass around the book I made

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What we know so far

- Terminology
- Statistics
- Specific considerations for older adults with limb loss
- Creating a conducive learning environment
- Questions?

Themes

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Outline

- Time frame
- Examination/Interventions
- Education
- Goals

Time frame

- Acute care= 1-2 wks
- Acute rehabilitation Vs sub-acute
  - Acute rehab= 2 wks
  - Sub-acute= 20 days to 3 months
- *Actually becomes prosthetic training
- Generally pt is ready for a prosthesis after 6 weeks(+/- 2 wks)
  - Wound has healed and sutures are removed
  - Wound closure
  - *Can cast
Timeframe
• General timeframe for uncomplicated amputation to heal
  • Sutures/staples removed = 4-6 wks

Examination/Interventions
• Major elements
  • Skin
  • Strength
  • ROM
  • Sensation
  • Shape
  • Balance
  • Function
• Minor elements
  • Osteoarity
  • Hand strength
  • Visual acuity

Strength
• If you had pick only a few osteokinematic motions...
  • TT
    • Knee extension, hip ABD, hip ext
  • TF
    • Hip add, hip ext, “core”
  • All
    • Elbow extension, shoulder adduction

ROM
• Min needed for TT vs TF?

Limb shaping
• Shrinker
• Ace Wrap

Balance
• Seated
• Standing
  • With and without an AD
  • reaching
Function

• Transfers
• Ambulation
• Stairs

Work on that control...

• Push up blocks in seated for HEP
• Biofeedback hopping control progression
  • Use a scale or EMG on the quads/triceps
  • Pbars→assisted device

Discharge Equipment

• Milk crate, step stool
• Two chairs without arm rest if primarily walker dependent
  • Two walkers: one for upstairs and one for downstairs
• Two wheelchairs with removable armrests if wheelchair dependent
• Ramp
• Chair lift
• Restrictions.

Education

• At the very least
  • Limb inspection
  • Contralateral foot inspection
  • Ace wrapping/bandage changing (even with home care!)
  • Conservative mobility
  • Consistency of home program
  • Timeline
  • Right to choose their prosthetist

Goals:

• Should consider if patient will:
  • Be a prosthetic candidate
  • Will have help at home
  • Has steps

Sample Goals:

• For a patient who has no/little help and is discharging home pre-prosthetically:
  • Pt will be modified independent with the least restrictive assisted device ambulating on level surfaces, over thresholds, and through restricted environments distances of 20’ in 2 weeks.
  • Pt will be able to negotiate 12-8” steps using a seated technique modified independently in 2 weeks.
  • Pt will be able to transfer from chair/stairs, stairs/chair, and chair/walker modified independently in 2 weeks.
  • Pt will be able to propel wheelchair modified independently through thresholds, up inclines, down declines, and over uneven surfaces 200’.
  • shaping
Sample Goals

• For a patient who has help and is discharging home pre-prosthetically:
  • Pt will be contact guard with the least restrictive assisted device ambulating on level surfaces, over thresholds, and through restricted environments distances of 10' in 2 weeks.
  • Pt will be able to negotiate 12-6” steps using a seated technique with minimum assistance in 2 weeks.
  • Pt will be able to transfer from chair/stairs, stairs/chair, and chair/walker minimum assistance in 2 weeks.
  • Pt will require minimum assistance to propel wheelchair up an inclined surfaces or down a declined surface.
  • shaping

Themes

• Phases
  • Pre-prosthetic
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Outline

• Time frame
• Suspension types
• Examination/Interventions
• Education
• Goals

Time frame: prosthetic phase

• Diagnostic/check/temp socket measured as soon as wound is closed and sutures are removed (~4-6 wks s/p)
  • Wound/MD dependent
• ~1-2 wk wait
  • Insurance/clinician dependent
• Temporary prosthesis @ ~6-wks
  • This is where you will come in...
• Permanent prosthesis anywhere from 3 months-1 year
  • Usually D/c’d from PT.

Common suspension types

• TT
  • Suction using a sleeve
  • Pin lock
  • Vacuum
• TF
  • Suction using a liner
  • Lanyard
  • Pin or lanyard with an elastic belt

Examination/Interventions

• Major elements
  • Skin
  • Strength
  • ROM
  • Shape
  • Device
  • Problem solving
  • Function
• Minor elements
  • Dexterity
  • Hand strength
  • Visual acuity
Skin

- Pressure tolerance
- Wearing schedule

Strength

- Same as for pre-prosthetic but...
  - Add core stabilization as they should be at least a 4/5 MMT from the pre-prosthetic therapy…right?

ROM

- There should be minimal, if any, contractures present.
  - If so, this should be the priority of the individuals exercise routine

Goals:

- Should consider:
  - K level
  - Able to don/doff independently
  - Problem solve donning issues
  - Desired functional level

Shape

- Should be wearing the shrinker any time they are
  - Not in the prosthesis
  - Not in water
Device

- Knee
  - Stance control?
  - Lock out mode?
  - How do you sit with it?
  - Programmable?
- Ankle
  - Stiff?
  - Hypermobile?
  - How much ROM?
  - Can it accommodate?

Problem Solving

- Can they don/doff independently?
- Can they manage their comfort?
  - If they need help:
    - What phase?
    - Is it from physical deficits (hand strength) or is it from cognitive deficits
- This informs your education plan

Function

- Transfers
- Gait
- Stairs

Stair negotiation prosthetic

- If weight is not brought anteriorly during descent, the weight-activated safety feature will not activate.
- The result will be either collapse if weight shift happens late, or posterior loss of balance if not at all
  - Watch your back!

Goals:

For a patient who has no/little help and is discharging home prosthetically from inpatient:

- Pt will be modified independent with the least restrictive assisted device ambulating on level surfaces, over thresholds, and through restricted environments distances of 200’ in 2 weeks.
- Pt will be able to negotiate 12-6” steps with one handrail and the least restrictive assisted device in 2 weeks modified independently.
- Pt will be able to don/doff the prosthetic limb independently.
- Pt will demonstrate the ability to modify the socket fit based on the presentation of the residual limb independently.

Goals

For a patient who has help and is discharging home prosthetically from inpatient:

- Pt will be modified contact guard with the least restrictive assisted device ambulating on level surfaces, over thresholds, and through restricted environments distances of 20’ in 2 weeks.
- Pt will be able to negotiate 12-6” steps with one handrail and the least restrictive assisted device in 2 weeks with minimum assist.
- Pt will be able to don/doff the prosthetic limb with moderate assist.
- Pt will demonstrate the ability to modify the socket fit based on the presentation of the residual limb with moderate assistance.
Themes

- Phases
  - Post prosthetic
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Creating education materials specifically for your patients

- Make a decision tree for the issues that they have the most issues with... K.I.S.S.
- Make a photo book (actual pictures) with step by step directions for common issues
  - Donning
  - Adding socks
  - Putting lanyard through opening
- Make sure caretaker is trained in donning/doffing and socket comfort adjustment
  - #1 complaint → non-use post discharge.

Themes

- Personalized educational interventions
- Summary-Bringing it all together

Summary

- Statistically the most vulnerable limb loss population
  - Growing due to demographic shifts
- Create an atmosphere that puts mutually acceptable goals at the forefront and use that as the “carrot”
- Pre-prosthetically you have one job...
- Empower your patients to self-manage comfort issues through individualized educational materials.
- Find a GOOD prosthetist!

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