Applications of the preventative health care model to wound care

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Causes of Diabetic Ulceration

- Ischemia
- Mechanical Stresses
- Neuropathy
Decreased tissue flexibility
Decreased muscle strength
Decreased joint range of motion
Decreased ability to walk long distances or safely over rough terrain
Cannot walk to mailbox or climb stairs to bedroom
Cannot work family farm
Mobility Limitations in Adults > 40 Years of Age

- Lower extremity disease:
  - peripheral arterial disease (PAD)
  - peripheral neuropathy (PN)
- Diabetes
- Combination of LED & Diabetes (↑risk)

*Mobility Limitation Among Persons Aged 40 Years With and Without Diagnosed Diabetes and Lower Extremity Disease—United States, 1999-2002*  
Peripheral Arterial Disease

- 8-10 million Americans affected
- Expected increase in prevalence to 12 million by 2020
- Marker for serious cardiovascular disease
- Claudication pain affects 2% of patients over 65 years
- 20-25% of older men & women seen in primary care have low ABIs
Relationship Between ABI & Leg Function

Cross-sectional study
3 Chicago Area Medical Centers
740 men and women (460 with PVA)
Clinical measures: Accelerometer-measured physical activity over 7 days, 6-minute walk, 4-m walking velocity, standing balance, and ABI
ABI and Walking

- Stronger association between ABI and function than leg symptoms and function
- < 40% of participants with ABI of 0.4 walked continuously for 6 minutes
- > 95% of participants with ABI of 1-1.5 walked continuously for 6 minutes
- With an ABI < 0.5
  - shorter distance walked in 6 minutes
  - less physical activity
  - slower 4-m walking velocity
  - decreased tandem stance (< 10 s)
Review of the Literature


Study Methodology

• Medline and Nonmedline-based specialty searches
• 10 Randomized Clinical Trials
• 5 studies had a untreated control group
• 9/10 groups had a walking exercise group
• exercise programs varied in intensity, duration and content
• Outcome measures were max pain-free walking distance or time on a treadmill
Effect of exercise on walking distance or time in patients with intermittent claudication

Percentage improvement with exercise

Percentage improvement with control
9 Study Groups

• Improved walking distance (28-210%)
• Smallest improvements seen with short duration or low intensity exercise
Effects of Exercise on PAD

Examined 16 stage II PVD patients (8 received placebo therapy and 8 received exercise therapy)

• Increased the walking capacity
• Increased pain-free walking time
• Increased maximum walking time

Polestriding exercise for PAD

- 52 participants randomized into 4 test groups
- Test groups:
  - PoleStriding with vitamin E (N = 13)
  - PoleStriding with placebo (N= 14)
  - vitamin E without exercise (N= 13)
  - placebo without exercise (N = 12)
- Polestriding significantly improved exercise tolerance and perceived quality of life

Home versus Center-Based Exercise Training

- Center-based programs superior to Home
- Greater improvement with distance walked and time to claudication pain (up to 6 mo)
- Home-based study demonstrated a greater rate of adherence (68% compared to 38% to center-based at 2 years post)
Conclusion

• 10 studies unequivocally demonstrated that a standardized exercise program improved pain-free walking distance or increased time to claudication pain in patients with PAD
References


Diabetes and Physical Limitations

- 37% Higher proportion of physical limitations
- Decreased mobility
- Decreased lower extremity function
- Decreased ability to perform ADL’s
- Females with diabetes greater disability than males

Orr et al., Diabetes Care. 2006 29:2120-2122
Bruce et al., Diabetes Care. 2005 28:2441-247
Volpato et al., Diabetes Care. 2003 26:70-75.
Peripheral Neuropathy & Physical Limitations

Level of peripheral neuropathy correlates with:

- impaired balance
- decrements in both usual and fast-paced walking speeds
- ability to walk long distances (quarter mile)
- climb steps without resting (10 steps)

Preventing Progression from Impairment to Disability

- Slower muscle contraction velocity associated with gait and balance impairments (Orr et al., 2006)
- Suggested Intervention: resistance (power) training progressing to plyometric type exercises

FEIGENBAUM, MATTHEW S.; POLLOCK, MICHAEL L.
Women: Falls & Diabetes

• Diabetes increases the risk for fractures
• Aging women with diabetes are at higher risk for falling
• Women with diabetes are more likely to have multiple risk factors for falls
• Women with non-insulin-treated diabetes have a greater risk of falls
Fall Risk


Causes of Diabetes-Related Falls

- Poor balance with increased body sway
- Higher prevalence of documented risk factors:
  - poor balance
  - decreased muscle strength
  - decreased flexibility/increased tissue stiffness
  - arthritis
  - cardiovascular disease
  - depression
  - poor vision
  - medications for insomnia & anxiety
Fall Prevention Strategies

• Education and skill building to increase knowledge about fall risk factors
• Exercise to improve strength and balance
• Home modifications to reduce fall hazards
• Medication assessment to minimize side effects
• Shoe wear that promotes stability
• Hip protectors to prevent fracture
Literature Supporting Exercise Intervention to Prevent Falls

• De Vos et al., Optimal loading for increasing muscle power during explosive resistance training in older adults. J Geront. 60:638-647, 2005

• Brandon et al., Effects of long-term resistive training on mobility and strength in older adults with diabetes. J Geront. 58:M740-745, 2003


Taijiquan - As a Rehabilitation Technique

- 34 Studies (Mixed Clinical, NRCT, RCT)
- 11 RCT’s
- 5 RCTs demonstrating positive effects on:
  - Balance
  - Cardiopulmonary endurance
  - Skin microcirculation
  - ROM
  - Immune function
  - Bone synthesis
Summary

- Individuals with Diabetes have a higher incidence of physical disabilities than their age-matched peers.
- Ischemia and Peripheral Neuropathy are contributing factors to the development of these physical disabilities.
- Exercise is an effective treatment and should be part of the wound providers' comprehensive treatment plan.