A BALANCE CIRCUIT GROUP FOR AMPUTEES TO REDUCE RISK OF FALLS

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CONTENT

- Definition
- Prevalence, Risks, Consequences
- Strategies for preventing falls
- Falls Management - FRP
- Development of the Balance Circuit Group
- Outcome Measures
- Stats
DEFINITION

- An unintentional event which results in a person coming to rest on the ground, floor, or other lower level, other than as a consequence of loss of consciousness, overwhelming external force, sudden onset of paralysis, stroke or epileptic seizure. - BACPAR Falls Guidelines 2011
PREVALENCE, RISKS & CONSEQUENCES

- BACPAR Guidelines: 20 - 53% of amputees experience at least 1x fall /yr

- 52.4% of lower extremity amputees reported to have fallen in previous year (Miller et al 2001)

- At QMH 2013 - 163 primary pts d/c. Of those reviewed at 6/52 and 6/12 around 23% had reported a fall.

- TFA patients report two thirds fall annually = twice rate in able bodied adults over 65yo (Crenshaw et al 2010)

- Risk Factors
  - Causes of falls are
    - patient related,
    - environment related or
    - prosthetic related - or combination of all 3

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**Injuries**

(Pauley et al)

<table>
<thead>
<tr>
<th></th>
<th>78% bleeding / haemorrhage</th>
<th>15% lacerations</th>
<th>10% head injury</th>
<th>4% fractures</th>
</tr>
</thead>
</table>

**Consequences**

- ↓ Confidence / ↑ fear of falling
- Stump injury → revision / ↑ healing time
- Damage to prosthesis
- ↑ Length of stay
- # NOF Death
- ↓ mobility & social interaction
STRATEGIES IN PREVENTING FALLS

- Biomechanical forces involved in falls are similar in all populations regardless of age.
- What separates those who recover from slips / trips vs those who fall & break a hip
- Important thing is neuromuscular control - how quickly you can respond - and strength.
- 2 primary approaches to recovering from trips
  - Lowering strategy
  - Elevating strategy
- Recovery from slips = recovery requires complex neural mechanisms to detect the sliding motion and respond quickly
AMPUTEE STRATEGIES

- Amputees have developed at least one unique response to near falls (esp TFAs)

  - If prosthetic limb is obstructed - subject lowers it & steps over the obstacle with the sound limb

  - If non-prosthetic limb is obstructed & they don’t trust the prosthesis - they’ll transfer all their weight to the sound limb & hop several times

- Videos
  
  - [http://www.uic.edu/ahs/biomechanics/individual%20%20pages/Lab_frame10.htm](http://www.uic.edu/ahs/biomechanics/individual%20%20pages/Lab_frame10.htm)
FALLS MANAGEMENT

- MDT Management
  - FRP Ax
  - Education
  - Exercise
  - What to do if unable to get off the floor
  - Gait training and provision of walking aids
  - Outcome measures

Falls Prevention for Lower Limb Amputees using a Balance Circuit Group

Introduction

There are many reasons why people fall; later in life – medications, for example, may be a major factor. Falls can result in fractures, increased fear of falling, reduced mobility, decreased quality of life and increased mortality and even death. Therefore, Falls prevention targets should focus on individuals aged 65 years and older. For people over 65 years of age, a falls risk assessment is important in order to identify those at risk of falls.

What exercises?

- A co-ordinated approach is required in the treatment of falls. The most effective component of this intervention is therapeutic exercises, as balance improvement and muscle weakness caused by ageing and disease are the most prevalent, multifactorial risk factors for falls (Department of Health 2000). Research into effective exercise in preventing falls in older people has shown that programmes such as Chenge or FIT (Fall Risk Intervention Trial) can reduce the risk of falls by up to 50% (Cochrane review 2012).
- Falls prevention exercises need to be individually tailored: it should focus on lower limb strengthening, challenging balance and be progressive to be effective. Exercises need to be performed regularly (ideally 2-3 times per week) to maintain a level of strength and balance. It is also a weekly exercise class from additional precipitate exercises should be carried out through the week. A lower of 60 hours is thought to be required to reduce falls.

Statistics and Group Development...

For early adverse, TBLA is a structured way of falling, but there are no equivalent statements from outcome measures that can be used to predict an increase in the risk of falls. Therefore, we investigated falls and fear of falling.

There is no consensus on measures of falls prevention for LLA. Therefore, in the Department of Health, we decided to develop a circuit style exercise group targeting strength, balance, and balance. This approach is intended to be effective and to be effective, as balance and muscle weakness caused by ageing and disease are the most prevalent, multifactorial risk factors for falls.

Exercise and Falls Prevention:

- Gait training and provision of walking aids
- Outcome measures

So Far...

- The class has been running weekly since February 2013, for both men and women patients. Class numbers vary between 10-15 patients and have included volunteers and members of staff for every patient to supervise the off-floor training, the exercises to be performed on the parallel bars. Formally, it also includes the therapist and general programme. This class has for the majority of years a week and a half where it is become more focused on specific exercises for patients who have had a knee replacement. Feedback from the patients has been positive: “a good change in motivation, challenging for both psychiatric and non-physiatric patients, and enjoyable.”

References

**FALLS RISK PROFILE**

**Patient Name:** ________________________  
**DOB:** ______________  
**Gender:** M / F  
**NHS Number:** ________________________

### Increased Falls Risk Profile (Date & Initials once completed)

#### Description of fall(s):

<table>
<thead>
<tr>
<th>No of falls since amputation</th>
<th>FRAT vs FRP for amputees</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of falls in 12 months prior to amputation</td>
<td>Each patient now Ax &amp; patients discussed in MDT weekly meetings &amp; actioned</td>
</tr>
<tr>
<td>Advise patient of potential types of falls &amp; interventions to reduce risk Phantom sensation</td>
<td></td>
</tr>
</tbody>
</table>

#### No of fractures since 50

<table>
<thead>
<tr>
<th>Osteoporosis risk factors?</th>
<th>Y / N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoporosis Medication?</td>
<td>Y / N</td>
</tr>
<tr>
<td>Vitamin D risk?</td>
<td>Y / N</td>
</tr>
</tbody>
</table>

#### No of medications in total ease circle category of drugs taken =>

<table>
<thead>
<tr>
<th>More than 4 meds?</th>
<th>Y / N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lying:_____________</td>
<td></td>
</tr>
<tr>
<td>Sitting:___________</td>
<td></td>
</tr>
<tr>
<td>Walking:___________</td>
<td></td>
</tr>
<tr>
<td>Standing:___________</td>
<td></td>
</tr>
<tr>
<td>BP Lying:___________</td>
<td></td>
</tr>
<tr>
<td>BP Sitting:___________</td>
<td></td>
</tr>
<tr>
<td>BP Standing:___________</td>
<td></td>
</tr>
<tr>
<td>BP Lying to Standing</td>
<td></td>
</tr>
</tbody>
</table>

#### Concerned about falling? Y / N

<table>
<thead>
<tr>
<th>Ability to get off the floor?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent / Supervision / Assistance</td>
</tr>
<tr>
<td>Athletic mobility?</td>
</tr>
<tr>
<td>Wheelchair mobility?</td>
</tr>
<tr>
<td>Wheelchair transfers?</td>
</tr>
<tr>
<td>Mobility/Walking Aids with prosthesis?</td>
</tr>
<tr>
<td>Enter checklist to right</td>
</tr>
</tbody>
</table>

#### Other relevant factors:

| Dementia? | Y / N |
| Recent deterioration in vision? | Y / N |
| In hearing? | Y / N |
| Low Mood? | Y / N |
| Call bell within reach? | Y / N |
| Continence issues? | Y / N |
| Urinalysis completed? | Y / N |
| History of dizziness/blackouts? | Y / N |
| History of cardiac events? | Y / N |
| History of EtOH? | Y / N |
| Diabetic? | Y / N |
| BMI = | |

#### Foot Problems?

<table>
<thead>
<tr>
<th>Problems</th>
<th>Y / N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ails / Skin / Corn / Callus / Other details</td>
<td></td>
</tr>
</tbody>
</table>

#### Problematic Footwear? Y / N

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**Please do not leave any part of this form blank.**
“Programmes should include a combination of exercises to be effective in reducing falls.”

BACPAR FALLS GUIDELINES 2008
RECOMMENDATIONS - VANICEK 2009

- Level walking
  - Improve eccentric control of ankle PF of intact limb
  - Knee extensor strength
  - Hip flexor eccentric control on both limbs

- Stair descent
  - Knee extensor strength
  - Stretch hip flexors

- Postural control
  - Standing balance - simple to challenging, eyes closed, diff surfaces
  - ↓ Reliance on visual feedback - proprioception
  - Practice ability to move centre rapidly towards intact limb in dynamic conditions - pushed!

- Functional performance tests
  - TUAG, L-Test, 10m test - monitor progress
  - Falls Efficacy / Balance Confidence - MFES, Houghton
FALLS PREVENTION GROUP / CIRCUIT

- Aim to address BACPAR & Vanicek’s recommendations
- Exercises based on Otago but adapted to do with or without prosthesis

Circuit of ~ 10 exs of 2 mins each including on/off floor
“Programmes should include a combination of exercises to be effective in reducing falls”
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- Aerobic training
- Heel raises
- Gluteal squeeze
- Arm weights w/cushion
- Wall press ups
- Push up blocks
- Circuit style class
- 45 – 60 minute class
- Gym ball lateral

- Strength
- Transfer practice
- Step ups
- Transfer practice
- Sit to stands
- On & off the floor – Really??
- Backward chaining
- Transfer practice
- Multiple task practice
- Sit to stands

- Endurance
- Argue endurance but what about the heart rate or exertion?
- Transfers
- Parallel bars- heel toe
- Gait
- Getting around the circuit??
- Agility Training
- Throwing & Catching a ball
- Coordination
- Functional floor work

- Stretching
- NIL
- 10 minute cool down
- Tai Chi

- Heel raises
- Gym ball
- Step ups

- Wobble cushion weights

- Gluteal squeeze
- Wall press ups
- Push up blocks
- Arm weights w/cushion
- Wall press ups
- Push up blocks
- Arm weights w/cushion
ON / OFF FLOOR

What to do if unable to get up off the floor?

Backwards Chaining

Lower yourself from the plinth onto the mat on the floor, and then back up again.

Use either:
- Step - with or without prosthesis (1st photo)
- Straight into kneeling on mat - with or without prosthesis (2nd photo)
OUTCOME MEASURES

- General notes for group
- Patient questionnaire
- Discharge - 2MWT & TUAG
- 6/52 & 6/12 follow up also do Houghton, HAD, any falls & fear of falling

2min walking test & Timed up & go
TUAG & FALLS PREDICTION?! 

**TUG Normative Data for Community-Dwelling Adults:**

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-69</td>
<td>Male</td>
<td>15</td>
<td>8</td>
<td>2</td>
<td>7-9</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>22</td>
<td>8</td>
<td>2</td>
<td>7-9</td>
</tr>
<tr>
<td>70-79</td>
<td>Male</td>
<td>14</td>
<td>9</td>
<td>3</td>
<td>7-11</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>22</td>
<td>9</td>
<td>2</td>
<td>8-10</td>
</tr>
<tr>
<td>80-89</td>
<td>Male</td>
<td>8</td>
<td>10</td>
<td>1</td>
<td>9-11</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>15</td>
<td>11</td>
<td>3</td>
<td>9-12</td>
</tr>
</tbody>
</table>

**Cut-off scores indicating risk of falls by population**

<table>
<thead>
<tr>
<th>Population</th>
<th>Cut off score</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community dwelling adults</td>
<td>&gt; 13.5 s</td>
<td>Shumway-Cook et al 2000</td>
</tr>
<tr>
<td>Frail elderly</td>
<td>&gt; 32.6 s</td>
<td>Thomas et al 2005</td>
</tr>
<tr>
<td>LE single amputees</td>
<td>&gt; 19 s</td>
<td>Dite et al 2007</td>
</tr>
</tbody>
</table>
Last thoughts!

- Can we really reduce falls risk?!?
- Falls, obesity & inactivity are interlinked
- Not all centres have groups of patients in at the same time - how do you do this circuit then?
- Ongoing difficulty of measuring the circuit group against the rest of the week’s interventions.
- Ensuring the group caters for all our patients - young and old, prosthetic user or not - and is challenging in a ‘safe’ manner!
REFERENCES

- BACPAR - Guidelines for the prevention of falls in LLAs 2008
- Centers for disease control & prevention. www.cdc.gov/HomeandRecreationalSafety/adultfalls.html
REFERENCES - CONT:

- Department of Health, 2008 - Older Peoples NSF Standards
REFERENCES - CONT:

REFERENCES - CONT:


- Videos - http://www.uic.edu/ahs/biomechanics/individual%20%20pages/Lab_frame10.htm
"Don’t look dear, they’ll only do something silly"