Finding Evidence for Effective Fall Prevention Interventions
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Introduction of practitioner-focused sites
- www.aota.org Evidence-Based Practice Resources
- www.otseeker.com Set up like traditional database
- www.OTCATS.com Critically Appraised Topics

Introduction to FREE Sites:
- OT CATS - Critically Appraised Topics in OT: http://www.otcats.com
- OTSeeker: http://www.otseeker.com/
- Ageline through AARP: http://www.aarp.org/research/ageline/
- Psychbite - a free evidence database for cognitive and behavioral interventions in cases of acquired brain injury: http://www.psycbite.com/
- Google Scholar: http://scholar.google.com/

A Note about Databases – Where to Spend Your Time Searching:

Courtesy CSU Spring 2007 Research Group
Hand-Written Notes: Slides 1 – 13:
Slide 14: Strategies Shown in Randomized Clinical Trials to Be Effective in Reducing the Occurrence of Falls among Elderly Persons Living in the Community (Tinetti. n engl j med 348;1 www.nejm.org january 2, 2003)

<table>
<thead>
<tr>
<th>Programs</th>
</tr>
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<tbody>
<tr>
<td><strong>Strategy</strong></td>
</tr>
<tr>
<td>Balance and gait training and strengthening exercise</td>
</tr>
<tr>
<td>Reduction in home hazards after hospitalization</td>
</tr>
<tr>
<td>Discontinuation of psychotropic medication</td>
</tr>
<tr>
<td>Multifactorial risk assessment with targeted management</td>
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<tr>
<td>Specific balance or strength exercise</td>
</tr>
</tbody>
</table>

Slide 18: Intervention studies which have used exercise to modify intrinsic risk factors for falls (Sports Med 2001; 31 (6): 427-438)

<table>
<thead>
<tr>
<th>Risk factor for falling</th>
<th>Average improvement (%) [range between studies]</th>
</tr>
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<tbody>
<tr>
<td>Muscle strength</td>
<td>6-174</td>
</tr>
<tr>
<td>Range of motion</td>
<td>0.5-18</td>
</tr>
<tr>
<td>Balance</td>
<td>-7-53</td>
</tr>
<tr>
<td>Gait</td>
<td>12-48</td>
</tr>
<tr>
<td>Reaction time</td>
<td>0-4</td>
</tr>
<tr>
<td>Items Compared</td>
<td>Our Client</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Age group</td>
<td></td>
</tr>
<tr>
<td>Condition/Dx</td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td></td>
</tr>
<tr>
<td>Type of intervention</td>
<td></td>
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<tr>
<td>desired/studied</td>
<td></td>
</tr>
<tr>
<td>Time after Dx initiated</td>
<td></td>
</tr>
<tr>
<td>Length of intervention</td>
<td></td>
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<tr>
<td>Administered by</td>
<td></td>
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<tr>
<td>Outcomes</td>
<td></td>
</tr>
<tr>
<td>desired/measured in study</td>
<td></td>
</tr>
<tr>
<td>Level of evidence or type of</td>
<td>RCT* (Int v Con)</td>
</tr>
<tr>
<td>design (circle one)</td>
<td>Existing Gps &amp; Pre/post</td>
</tr>
<tr>
<td>Identify items of evidence in</td>
<td>Case Study</td>
</tr>
<tr>
<td>these studies useful to the</td>
<td></td>
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<tr>
<td>client</td>
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</table>

*RCT=randomized control trial: a study in which participants are randomly assigned to intervention versus control groups; this is highest quality of research and can be most trusted.

&Existing groups study also known as quasi experimental runs the intervention on one group that already exists, for example, a number of people living in a specific setting or comprised of people with a history of falling versus no history. This is good quality, and more common, but not as trustworthy as RCT.

#Pre/post studies one group – they are measured (pretest=count number of falls in past year), undergo the fall-prevention intervention, and then are measured again (post test=number of falls in the group after intervention). This is good quality, and more common, but not as trustworthy as RCT.

@Case study is weak research – it simply describes an intervention and how well it worked on one person. We should use this information ONLY if it is all we have. Case studies that are supported by practitioners’ clinical observations of clients in their own practices carry more weight.

Hand-Written Notes on Small Group Activity:
Out of 13 intervention studies, the following reported success in preventing falls:

- N = 131; Intervention (n = 92), an exercise class including Tai Chi once weekly plus walking with sticks, and home exercises each at least 3× weekly for 6 months; Control (n = 39) usual activities
- Relative hazard for falls for the exercise group in 10mo = 0.60 [95% CI for (Intervention) compared with (Control) 0.43, 0.84]

Campbell et al., 1997 (Sports Med 2001; 31 (6): 427-438)
- N = 232; Control [n = 84]; Intervention [n = 116], individually tailored program of exercise. Physiotherapist visited 4× in first 2mo. Exercises 3× per wk, 30 min each, lower limb strength and balance plus encouraged walking outside 3× per wk
- Total falls: (Intervention) = 88, (Control) = 152; Rate of falls per year: (Intervention) = 0.87 [SD 1.29] (Control) = 1.34 [SD 1.93], difference 0.47 (p < 0.05)

Campbell et al., 1999 (Sports Med 2001; 31 (6): 427-438)
- N = 152, 2y follow-up of the above 12mo study. Intervention (n = 71), individually tailored program of exercise. Physiotherapist visited 4× in first 2mo of the original study. Exercises 3× per wk, 30 min each, lower limb strength and balance plus encouraged walking outside 3× per wk; Control (n = 81), equal care and frequent social visits
- Total falls over 2y: Intervention = 138, Control = 220. Rate of falls per person year: Intervention = 0.83 [SD 1.29], Control = 1.19 [SD 1.93]. Relative hazard for falls for the exercise group at 2y = 0.69 [95% CI for Intervention group compared with Control = 0.49, 0.97].
- Relative hazard for a fall resulting in moderate or severe injury = 0.63 (95% CI, 0.42, 0.95)

- All individuals had at least mild deficits in strength or balance. Intervention in 3 groups: (S) strength and flexibility [n = 25]; (E) endurance and flexibility [n = 25]; (SE) strength and endurance (n = 25). Strength training: upper and lower limb; 3 sessions per wk for 60 min. Endurance training: stationary cycle 75% max. heart rate.
- 3 intervention groups analyzed as 1 group and compared to control group [n=25]: Falls in the first year: (In) = 42%, (Ct) = 60%; Relative risk in the intervention group 0.53 (p < 0.05)

- Intervention: 2 groups: Tai Chi (TC) [n = 72] 15 min twice daily at home for 4mo; computerized balance training (BT) [n = 64]; Control [n = 64] education sessions once per wk.
- 47.5% reduction in fall incidence (p<0.01) comparing Tai Chi group to control group; no sig. difference considering balance group
Type of Exercise: Number of Effective & Ineffective

Duration of Exercise Found Effective & Ineffective

Frequency (times /week) of Exercise Found Effective and Ineffective
Slides 35-49: **Cochrane Review Summary (Interventions in Preventing Falls in the Elderly)**

*(Cochrane Review by Gillespie, Gillespie, Robertson, Lamb, Cumming & Rowe):*

- 62 trials 21,668 people included in the review
- Studies judged according to whether they were “likely to be beneficial” or “of unknown effectiveness” or “unlikely to be effective”

**Risk Ratios (RR) of Beneficial Interventions**

Studies of **Unknown Effectiveness:**
- Group-Delivered Exercise
- Individual LE Strengthening
- Home Hazard Mod. w/ Medication Suggestions
- Home Hazard Mod. w/ education packet on exercise and reducing falls
- Cognitive/Behavioral Approach Alone
- Hm. Haz. Mod. when no Hx of falling

**Ineffective:** Brisk walking in older women with UE Fx.

**Results from Meta Analyses:**

A meta-analysis of fall prevention programs for the elderly: how effective are they? *(Hill-Westmoreland EE; Nursing Research, 2002 Jan-Feb; 51 (1): 1-8)*

- RESULTS: The overall mean weighted effect size for the 12 studies included in the meta-analysis was .0779 (Z = 5.03, p < .001).
- Exercise alone had a mean weighted effect size of .0220 (Z = .5303, p > .5)
- Exercise and risk modification had a mean weighted effect size of .0687 (Z = 3.41, p < .001)
- Comprehensive risk assessment intervention studies had an effect size of .1231 (Z = 3.97, p < .001)
- Mean weighted effect size for community-based studies was .0972 (Z = 5.37, p < .001) and for institution-based studies was .0237 (Z = .7822, p = .22).
- CONCLUSIONS: There was a 4% decrease in the rate of falls for individuals who were in the treatment groups receiving various fall prevention interventions.
What is Effect Size??

- In a way – a “magic number”: it is an index of what can be seen/observed clinically as an improvement – removed from numbers or “statistical findings”
- There are many effect size measures; the most common are $r$ and Cohen’s $d$ effect sizes
- Cohen compared various statistical findings to clinical observations in the behavioral sciences and came up with a chart of equivalences. In general, a positive ES indicate the intervention group improved visibly/functionally; ES = 0 indicates no effect of therapy or “the intervention”; a negative ES indicates the intervention was harmful or had a negative effect on the group (and should not be repeated!)
- A Cohen’s $d$ of .5 and an $r$ of .3 is considered a “medium effect”; $d = .8$ or $r = .5$ considered “large or larger than typical effect”

More Results from Meta Analyses:

Exercise in the prevention of falls in older people: a systematic literature review examining the rationale and the evidence (Carter ND; Sports Medicine, 2001; 31 (6): 427-38)

- RESULTS: On the basis of 9 randomized controlled studies conducted since 1996, exercise appears to be a useful tool in fall prevention in older adults, significantly reducing the incidence of falls compared with control groups. However, current limitations such as inconsistencies in the measurement of key dependent and independent variables do not, at present, permit a meta-analysis of intervention trials.

Do hospital fall prevention programs work? A systematic review (Oliver D; Journal of the American Geriatrics Society, 2000 Dec; 48 (12): 1679-89)

- RESULTS: Individual components of interventions showed no significant benefit. The pooled effect of about 25% reduction in the fall rate may be a result of intervention but may also be biased. Studies did not analyze compliance with the intervention or opportunity costs resulting from the intervention. Research and clinical programs in hospital fall prevention should pay more attention to study design and the nature of interventions.
Hand-Written Notes: Slides 50 – 56:
Evidence-Based Practice Structured Abstracts Results:

- Participants in the treatment group that received physical and occupational therapy showed significant improvement.
- There was significantly more improvement in function in daily living tasks in treatment group.
- Participants who received treatment also showed significant improvement over the control group in their ability to walk 10 meters quickly (p < .05).
- The treatment group had improved motor coordination after 4 months of therapy.


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Results of Individual Article Reviews:


- Intervention group showed 31% reduction in falls; this was a significant difference compared to control group, p = .025.
- Intervention gp sig. > in mobility efficacy and number of protective behaviors adopted.
- 70% participants followed 50% of recommendations.
- “Stepping on” program in Appendix and a reference to its full description.

A little Background:

What does “significantly different” mean???

- We are all different on just about anything you measure about us – height, weight, how far we throw a ball, etc.
- Randomly select 2 groups from this room and get average weight of each group. The two averages will be slightly different – based on CHANCE of a few more people with more weight being in one group compared to the other.
- Now I want to try an intervention – a diet for one gp, and the other is the control – " eat as usual" gp. - and we do this experiment for 2 months.
- How much different do the average weights of the twogps need to be to feel confident the diet worked? – as they were different to begin with!
- Statistical tests give us an answer – the averages must be different enough that the chances of finding a difference that great would be rare (a low probability) in any two groups selected and weighed WITHOUT either getting the diet.

What is “p”???

- p tells us how low the probability is
- Magic value for p (which stands for “probability of finding a difference this large between groups”) is .05.
- Example: An intervention to prevent falls showed a significant difference between fall-prevention gp. and usual treatment gp, p = .05.
• $p = .05$ means the chances of having a difference in number of falls this great \textit{WITHOUT} the fall-prevention intervention is only 5 times in 100.
• So, a $p$ of < .001 means the amount of difference was so great, it would happen only 1 time in 1000 of making two gps, having no intervention, and counting the number of falls in each group

More Individual Article Reviews:

\textbf{Impact of a Multifactorial Fall Prevention Program Upon Falls of Frail Adults Attending an Adult Health Day Care Center Diener & Mitchell (Topics in Geriatric Rehab, 21 (3): 247-252, 2005)}
• Significantly greater % fallers in control gp compared to fall prevention gp, $p<.001$
• Significantly fewer environmental hazards and behavioral hazards in fall prevention gp, $p<.001$
• Strength NOT significantly different, $p>.05$, between two groups @ 6 months

\textbf{Fall Prevention in Long-Term Care: An In-House Interdisciplinary Team Approach (Eakman et al. Topics in Geriatric Rehabilitation, 17 (3): 29-39, 2002)}
• Pretest/Posttest design – found significantly fewer falls (3.2 falls) after the fall prevention program compared to before (5.52 falls; $p<.001$)
• Also significantly fewer injuries from falls
• Study outlines the 20 most frequently given recommendations; 274 interventions given overall with range of 5 to 17 per resident

Hand-Written Notes on Ineffective Interventions:
CDC Resources on Fall Prevention:

- Publications help older adults prevent falls
- CDC, in partnership with the CDC Foundation and MetLife Foundation, has produced four posters and redesigned two of its popular brochures to help older adults—and those who care for them—prevent falls and the injuries and deaths that result. These materials are important resources to protect the health and independence of older adults. *What YOU Can Do to Prevent Falls* outlines four key fall prevention strategies. Strategies include exercising regularly, having medicines reviewed to reduce side effects and interactions, having yearly eye exams, and reducing fall hazards in the home.
- *Check for Safety: A Home Fall Prevention Checklist for Older Adults* guides readers in a room-by-room check of their home to find and fix hazards that can increase the risk of falling.
- Four posters, designed for use in health care facilities, senior centers, and other community organizations, highlight the messages in the brochures.
- In 2003, more than 13,700 people 65 and older died from falls; 1.8 million older adults were treated in emergency departments for nonfatal injuries from falls, and more than 460,000 of these patients were hospitalized. Free Resources:
  - [www.cdc.gov/ncipc/duip/fallsmaterial.htm](http://www.cdc.gov/ncipc/duip/fallsmaterial.htm).
  - [www.cdc.gov/ncipc/duip/preventadultfalls.htm](http://www.cdc.gov/ncipc/duip/preventadultfalls.htm).
As part of participating in the search for what works in preventing falls (that is, participating in Evidence-Based Practice):

Development of a Common Outcome Data Set for Fall Injury Prevention Trials: The Prevention of Falls Network Europe Consensus

Lamb et al. on behalf of the Prevention of Falls Network Europe and Outcomes Consensus Group. JAGS 53:1618–1622, 2005 © 2005 by the American Geriatrics Society

Recommendation 2: Falls
1. A fall should be defined as “an unexpected event in which the participants come to rest on the ground, floor, or lower level.”

2. Ascertaining must consider the lay perspective of falls. Participants should be asked, “In the past month, have you had any fall including a slip or trip in which you lost your balance and landed on the floor or ground or lower level?”

3. Falls should be recorded using prospective daily recording and a notification system with a minimum of monthly reporting. Telephone or face-to-face interview should be used to rectify missing data and to ascertain further details of falls and injuries.

4. Fall data should be summarized as number of falls, number of fallers/ non fallers/ frequent fallers, fall rate per person year, and time to first fall (as a safety measure).

5. Primary analysis of fall data should not be adjusted for physical activity, and reporting should include the absolute risk difference between groups.

Recommendation 4: Psychological Consequences of Falling
1. Psychological consequences of falls should be conceptualized in terms of fall-related self-efficacy, defined as “the degree of confidence a person has in performing common activities of daily living without falling” and measured using the modified Falls Efficacy Scale (mFES).18

2. The measure should be scored per published guidance.18

Recommendation 5: Measure Health Related Quality of Life
1. The recommended measures of quality of life are the Short Form 12 (SF12) version 2 and European Quality of Life Instrument (EuroQol EQ-5D).