Anjali Paintal
1/20/2020

Evidence Table
Falls Assessment, Outcome Measures, and Interventions

1. Gillespie LD. Interventions for preventing falls in older people living in the community. *Cochrane database of systematic reviews*. 09/2012(9):CD007146. doi: 10.1002/14651858.CD007146.pub3.
   - Sample: Systematic review of 159 randomize control trials (RCTs) with 79,193 older adult participants
   - Interventions: The majority of studies compared a falls prevention intervention with a no intervention or an intervention that was not expected to impact falls risk. The RCTs included interventions such as exercise, group exercise, Tai Chi, vitamin D (with vs without calcium), medication provision, medication withdrawal, surgery, fluid therapy, nutrition therapy, psychological interventions, environment/assistive technology interventions, home safety interventions, education interventions, and multifactorial interventions.
   - Outcome measure(s): Rate of falls and risk of falling were the primary outcome measures used. Rate of falls was defined as "the total number of falls per unit of person time that falls were monitored." Risk of falling was defined as number of fallers.
   - Findings:

Interventions that reduced falls	Interventions that did not reduce falls
- Exercise classes containing multiple components led to a significant decrease in rate of falls (pooled rate ratio (RaR) 0.71, 95% confidence interval 0.63 to 0.82; 3622 participants, 16 trails) and risk of falling (pooled risk ratio (RR) 0.85, 95% confidence interval 0.76 to 0.96; 5333 participants, 22 trials). - Individual multi component exercise at home led to significantly decreased rate of falls (RaR 0.68, 95% CI 0.58 to 0.80; 951 participants, 7 trials) and risk of falling (RR 0.78, 95% CI 0.64 to 0.94;714 participants). - Tai Chi resulted in significant reductions in falls risk (RR 0.71, 95% CI 0.57 to 0.87; 1625 participants, 6 trials).	- Resistance training alone failed to significantly reduce rate of falls or number of people falling. - There was no reduction in risk of falling or number of falls with general physical activity (walking). - No statistically significant reduction in rate of falls or risk of falling was seen with vitamin D supplementation (with or without calcium). - Hormone replacement therapy alone did not reduce the rate of falls or risk of falling. - Medication review and modification did not reduce risk or rate of falling. - Fluid or nutrition therapy did not impact risk of falling. - Cognitive behavioral intervention did not reduce rate or risk of falling.

- Overall exercise interventions led to significant decreases in risk of fracture (RR 0.34, 95% CI 0.18 to 0.63; 810 participants, 6 trials).
- Supplementation of calcitrol led to a statistically significant reduction in rate of falls (RaR 0.64, 95% CI 0.49 to 0.82; 213 participants) and risk of falling (RR 0.54, 95% CI 0.31 to 0.93; 213 participants).
- Progressive withdrawal of psychotropic medication led to statistically significant reductions in rate of falls (RaR 0.34, 95% CI 0.16 to 0.73; 93 participants) but not risk of fallin g(RR 0.61, 95% CI 0.32 to 1.17; 93 participants).
- Home safety assessment and modification interventions effectively reduced the rate of falls (RaR 0.81, 95% CI 0.68 to 0.97; 4208 participants, 6 trials) and risk of falling (RR 0.88, 95% CI 0.80 to 0.96; 4051 participants, 7 trials).
- One study with 616 participants demonstrated that an intervention that included eye vision assessment and examination, new spectacles (if appropriate), referral for expedited ophthalmology treatment, mobility training, and canes resulted in statistically significant decrease in rate of falls (RaR 1.57, 95% CI 1.19 to 2.06) and risk of falls (RR 1.54, 95% CI 1.24 to 1.91).
- Non slip shoe devices on outdoor shoes resulted in a significant decrease in rate of outdoor falls (RaR 0.42, 95% CI 0.22 to 0.78).
- A combination of exercise, education, and home safety reduced rate of falls (RaR 0.69, 95% CI 0.5 to 0.96; 285 participants).
- Centre based rehabilitation program including exercise and education significantly reduced falls (Ra R 0.46,

- Balance enhancing insoles did not reduce risk of falling compared to normal insoles.
- Falls education interventions did not reduce the rate or risk of falling.

95% CI 0.22 to 0.97) and risk of falling (RR 0.57, 95% CI 0.35 to 0.93) compared to home-based program. • Multifactorial interventions significantly reduced the rate of falls (RaR (random-effects) 0.76, 95% CI 0.67 to 0.86; 9503 participants, 19 trials).	

- Applicability: These findings suggest that there are multiple potential interventions that can decrease falls risk. Group exercise programs, home-based exercise interventions, and home safety interventions are effective in reducing rate and risk of falls. Multifactorial interventions proved to be effective at reducing rate of falls, but not risk of falling. Nutritional interventions were largely ineffective at reducing falls risk, but reducing psychotropic medications was effective at decreasing rate of falls. When thinking about a falls risk assessment and intervention program, it is important to think of multiple components that may be contributing to falls.
- Comments on evidence level/study quality: This study is level 1a evidence, as it is a systematic review of randomized control trials. Limitations of this systematic review include substantial heterogeneity between RCTs, falling was not defined in all studies included, and some studies retrospectively collected data regarding number of falls.

2. Hasegawa J. Urinary incontinence and behavioral symptoms are independent risk factors for recurrent and injurious falls, respectively, among residents in long-term care facilities. *Archives of gerontology and geriatrics*. 01/2010;50(1):77-81. doi: 10.1016/j.archger.2009.02.001.
    - Sample: 13 randomly selected long-term care facilities in Japan. 1082 disabled older adults of mean age 82.5 82.5 ± 8.5 (mean ± SD).
    - Interventions/groups: non fallers, falls with or without serious injury, single fall or multiple falls
    - Outcome measures: at least one fall vs. no falls, injurious falls vs. non injurious falls among fallers or no falls, and recurrent falls vs. one fall/no falls.
    - Findings:
        - Compared to non-fallers, fallers had an increased rate of incontinence experiences, behavioral symptoms, moderate physical function, and higher number of medications.
        - Urinary incontinence and behavioral symptoms were independent risk factors for falls.
        - Urinary incontinence was a risk factor for recurrent falls (log rank test, p=0.036), not injurious falls (p=0.101).
        - Behavioral symptoms were a risk factor for injurious falls (log rank test, p<0.001), but not recurrent falls (p=0.929)

- The association between behavioral symptoms and injurious falls continued to exist after adjusting for antipsychotic use.
  - Applicability: The results of this study indicate that urinary incontinence and behavioral symptoms (wandering, agitation, verbally or physically abusive behavior, and resistance to care) should be addressed in order to prevent falls in long-term care facilities. Long term care facilities would benefit from evidence-based interventions to address these potentially modifiable risk factors contributing to falls.
  - Comments on evidence level/study quality This study was level 2b evidence as it was a cohort study. Other than randomly selection of long-term care facilities, no other randomization was mentioned. No blinding was used in the study, further increasing risk of bias. Investigators did not control for exogenous factors that could have affected study results such as use of physical restraints, visual and balance impairments, dizziness, changes in medication during follow up, and orthostatic hypotension. Besides number of falls and presence of injurious falls, no other information regarding the circumstances of the fall were collected. Overall, this study is of low to moderate methodological quality.

3. Kovács E. Effects of a multimodal exercise program on balance, functional mobility and fall risk in older adults with cognitive impairment: A randomized controlled single-blind study. *European journal of physical and rehabilitation medicine*. 10/2013;49(5):639-648.
   - Sample: 86 older adults with cognitive impairments that resided in a long term-care facility in Budapest, Hungary
   - Groups/Interventions: Multimodal exercise group vs. control roup (usual care). The multimodal exercise group was led by two physical therapists and consisted of strength, balance exercises and walking training for cognitively impaired adults. Participants engaged in the walking program once a week. The strength training was individualized and focused on major lower extremity muscles. The multimodal exercise program also included progressive dynamic and static balance activities.
   - Outcome measures: Static and dynamic balance were measured using the Performance Oriented Mobility Assessment (POMA) balance (-B) and gait (-G) scales, functional mobility was assessed using the Timed Up and go (TUG) test, functional independence was measured using the Katz Index, and incidence of falling was recorded.
   - Findings:
     - The exercise group demonstrated statistically significant improvements on the POMA-B scale across all three time points (P<0.0001). Significant improvements were seen after 6 months (p<0.0001) and even more after 12 months (p=0.002)
     - The control groups did not show significant improvements on the POMA-B scale (P=0.640)
     - The exercise group demonstrated statistically significant improvements on the POMA-G score during the second 6 month period (p=0.001)
     - The control group did not show significant improvements on the POMA-G scale (p=0.530)

- The POMA-Total score also significantly increased at the first six-month mark (p<0.0001) and the second 6 month mark (p<0.0001), but not in the control group.
  - The exercise group demonstrated significant improvements in TUG time (p<0.0001), but not in the control group. The improvements found in the exercise group on the TUG did not reach clinical relevance (4.09 seconds).
  - No significant between group difference was found in the Katz index.
  - No significant difference between groups was found in number of fallers or falls incidence after the intervention.
- Applicability: The results of this study suggest that a 12-month multimodal exercise program can improve the balance of cognitively impaired older adults. This study is particularly important because it demonstrates that further improvements occur after the first 6 months of training, which supports the efficacy of longer interventions.
- Comments on evidence level/study quality: The study is level 1b evidence, as it is a randomized control trial. This this study did not differentiate between mildly cognitively impaired older adults and severely impaired. This study also included a relatively low sample size of 86 older adults. Additionally, only 78% of the exercise group and 73% of the control group completed the study at 12 months. Lastly, neither therapists nor participants were blinded to group allocation, which increases the potential for bias.

4. Summary of the Updated American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons. *Journal of the American Geriatrics Society (JAGS)*. 01/2011;59(1):148-157. doi: 10.1111/j.1532-5415.2010.03234.x.
   - Clinical Algorithm (retrieved directly from the article):
     - Screen for falls by asking the following questions: i) two or more falls in prior 12 months? ii) presents with acute fall? Iii) difficulty with walking or balance?
       a. If the patient reports a single fall, evaluate gait and balance, if gait abnormalities or unsteadiness is present
       b. If the patient has gait unsteadiness or answered yes to any of the three falls screening questions above:
         i. Obtain relevant medical history, physical examination, cognitive and functional assessment
         ii. Determine multifactorial fall risk:
           - History of falls
           - Medications
           - Gait, balance, and mobility
           - Visual acuity
           - Other neurological impairments
           - Muscle strength
           - Heart rate and rhythm

- Postural hypotension
- Feet and footwear
- Environmental hazards

   iii. If additional intervention is warranted:
- Minimize medications (especially psychoactive meds)
- Provide individually tailored exercise program
- Treat vision impairment (including cataract)
- Manage postural hypotension
- Manage heart rate rhythm abnormalities
- Supplement vitamin D
- Manage foot and footwear problems
- Modify the home environment
- Provide education and information

   iv. Reassess periodically

- <u>Highlights of Findings:</u>
  - The following cardiovascular disorders are most associated with falls: carotid sinus hypersensitivity, vasovagal syndrome, bradyarrhythmias, and tachyarrhythmias. Treatment and management of these disorders reduces falls risk.
  - Evidence supports the use of vitamin D in falls prevention, independent of its effect on bone health.
  - Combined calcium and vitamin D3 supplementation have been shown to reduce rates of fracture in older adults in long term care facilities.
  - Type and condition of footwear can contribute to increase falls risk. Anti-slip shoes have been found to be effective in decreasing outdoor falls.
  - Evidence supports the use of environmental assessment in intervention as part of a multicomponent falls prevention program.
  - Education and information are essential parts of all fall prevention programs.
- <u>Applicability:</u> This clinical practice guideline provides specific clinical recommendations informed by various randomized control trials and systematic reviews. The clinical algorithm offers a methodical approach to falls assessment.
- <u>Comments on evidence level/study quality:</u> Clinical practice guidelines (CPG) such as these are considered level 1 evidence as they are based on systematic reviews and randomized control trials. This CPG sites many contradictory studies and concludes that "evidence is mixed" regarding several of the recommendations that they propose; for example, the falls prevention algorithm suggests that clinicians provide education and information, but the authors also state that there is little evidence to determine if educational interventions are independently effective in preventing falls. This CPG was compiled by a panel of members (physical therapists, pharmacists, orthopedists, occupational therapists, nurses, geriatric specialists, etc.) with extensive knowledge and publications regarding

fall prevention in older adult populations. Overall, this is a very good resource, as it pulls findings from several systematic reviews and randomized control trials and offers clinical recommendations.

5. Nunan S. Fall risk assessment tools for use among older adults in long-term care settings: A systematic review of the literature. *Australasian journal on ageing*. 03/2018;37(1):23-33. doi: 10.1111/ajag.12476.
   - Sample: 15 studies analyzing 16 different falls risk assessment tools (FRATs) were included. The sample size of the studies ranged from 18 to 1946 participants. The mean age of the participants ranged from 74.5 to 87.3 years old. The majority of the studies included were of 6-month duration, but others ranged from 3-12 months.
   - Intervention/groups: Multifactorial assessment tools, functional mobility assessments, and algorithms
   - Outcome measures: Inter-rater reliability, cut-off score, sensitivity, specificity, positive predictive value, negative predictive value, positive likelihood ratio, negative likelihood ratio, Youden Index, ROC curve analysis, prognostic separation index
   - Findings:
     - *Algorithms*
       - Becker algorithm:
         a. Participants not able to transfer without assistance: moderate sensitivity of 60% and specificity of 82%
         b. Participants able to transfer without assistance and no past history of falls in last 12 months: sensitivity of 72% and specificity of 57%
         c. Participants able to transfer without assistance and past history of falls in last 12 months: sensitivity of 32% and specificity of 93%.
            i. Low overall feasibility of this tool
       - Fall Risk Screening Model for Residents who can stand unaided:
            i. 73% sensitivity and 55% specificity
       - Fall Risk Screening Model for Residents who cannot stand unaided:
         a. 87% sensitivity and 29% specificity
            i. Low overall feasibility of this tool
     - *Functional Mobility Assessments*
       - Inter rater reliability for functional mobility assessment ranged from 0.55 to 0.97.
         a. The Modified Get-up and Go test showed the lowest inter-rater reliability while the Performance Oriented Mobility assessment (POMA) showed the highest.
       - Sensitivity ranged from 43%-86% and specificity scores ranged from 56%-91%.
         a. The Mobility Interaction Fall Chart (MIFC) and the Five Repetition Sit to Stand tests (FRSTST) demonstrated

relatively high sensitivity (85%, 86%) and specificity (82%, 91%), but a later study on MIFC found lower values and the study on Five Repetition Sit to Stand Test had a high risk of bias.
- Different studies found varying values for the sensitivity and specificity of the POMA. One study found a sensitivity and specificity of 64% and 66% with a cut off score of 19 while another found a sensitivity and specificity of 85% and 56% with a cut off score of 21.
- *Multifactorial Assessment Tools*
  - There were 8 different falls risk assessment tools that fell under the multifactorial assessment tool.
  - There were only two studies that reported the length of time it took to administer assessment tool.
    a. The Modified Fall Assessment Tool (MFAT) takes less than 5 minutes.
    b. The Peninsula Health Falls Risk Assessment Tool (PHFRAT) takes 2-3 minutes.
  - The Melbourne Fall Risk Assessment Tool (MFRAT) and the Queensland Fall Risk Assessment Tool (QFRAT) had the lowest inter-rater reliability score (0.52) while the Modified Fall Assessment Tool (MFAT) had the highest (0.94).
  - Sensitivity and specificity scores ranged from 50-91% and 32-90%.
    a. The Easy-Care Risk of Falls (ECRF) had a sensitivity of 86% and specificity of 65% (study population was not representative of the general LTC population).
    b. The Modified Fall Assessment Tool (MFAT) demonstrated a sensitivity of 61% and specificity of 80%
    c. The Melbourne Fall Risk Assessment Tool had a sensitivity of 50% and specificity of 80%
    d. The Queensland Fall Risk Assessment Tool (QFRAT) had a sensitivity of 61% and specificity of 29%.
    e. The Falls Assessment Risk and Management Tool (FARAM) had a sensitivity of 80% and specificity of 32%.
- Highlights of Findings:
  - The Mobility Interaction Fall Chart (MIFC) and the Five Repetition Sit to Stand Test (FRSTST) were the only two tools in this systematic review that demonstrated a sensitivity and specificity of 70% or over.
  - Several multifactorial assessment tools (MATs) showed good predictive validity, particularly the Modified Fall Assessment Tool (MFAT) with moderate to good predictive validity, inter-rater reliability of 0.94, and <5-minute time to administer.
  - The Peninsula Health Falls Risk Assessment Tool (PHFRAT) showed promising psychometric properties with good sensitivity and specificity score, inter rater reliability, and feasibility.

- The PHFRAT was also effective for identifying risk factors for more targeted interventions.
  - Applicability: This systematic review offers a comprehensive analysis of the quality of various falls risk assessment tools for older adults in long term care facilities. The Modified Fall Assessment Tool and the Peninsula Health Falls Risk Assessment tool stand out, as they demonstrated moderate-to-good predictive validity and reliability as well as good feasibility.
  - Comments on evidence level/study quality: This study is level 1a evidence, as it is a systematic review. The review's main limitation was that it included studies that had different mixes and combinations of patients; for example, some studies excluded people with cognitive deficits, people who are unable to stand or mobilize independently, people who have moderate-to-severe dementia, etc. This type of exclusion of certain individuals leads to spectrum bias, as study samples were not representative of the larger long-term care population. Additionally, the review's search strategy was limited to studies published in English which may have excluded some relevant articles.

6. Lusardi MM. Determining risk of falls in community dwelling older adults: A systematic review and meta-analysis using posttest probability. *Journal of geriatric physical therapy (2001)*. 2017;40(1):1-36. doi: 10.1519/JPT.0000000000000099.
   - Sample: 59 articles were included, participants were all community-living older adults
   - Intervention/Groups: medical history questions, self-reported measures, and performance-based measures
   - Outcome Measures: sensitivity, specificity, likelihood ratios, and posttest probability
   - Findings:
     - *Posttest probability of Medical History Questions:*
       - The following medical history questions resulted in the largest increase in posttest probabilities: previous falls (PoTP=44%), use of psychoactive medications (PoTP=38%), requiring assistance for any ADL (PoTP = 38%), being fearful of falling (PoTP=38%), and use of an ambulatory assistive device (PoTP=36%).
       - Difficulty with transfers (PoTP=78%) or stairs (PoTP=69%) warrants further evaluation/intervention.
       - Self-reported difficulty with walking also may be predictive of further falls (PoTP=41%).
     - *Posttest Probability of Self-Report Measures:*
       - Measures regarding balance/falls that were found to significantly increase PoTP:
         a. Falls Risk Assessment Questionnaire (>8 of 16 points; PoTP=63%)
         b. Balance Self-Perception Test (<50 of 60 points; PoTP= 63%)
         c. Activities Specific Balance Confidence Test (<90 of 100%; PoTP = 59%)

d. The Falls Efficacy Scale International (≥24; PoTP=42%)
- Barthel index: the PoTP was 77% with a score of 19 points or less, and 20% with score of 20 points or more for multiple falls.
- Mini-Mental State Evaluation (MMSE): PoTP 38% if positive and 23% if negative.
- Geriatric Depression Scale-15 (GDS-15), the Center for Epidemiological Studies Depression (CES-D), and the GDS-4 were relatively effective at indicating falls risk
  a. GDS-15: score of less than 6 resulted in PoTP of 45%
  b. CES-D: score of 16 or more resulted in PoTP of 45%
  c. GDS-4: PoTP=36%
- Longitudinal Study of Gaining Physical Activity Questionnaire (LASA-PAQ): PoTP=46% if positive, PoTP=20% if negative
- Medical Outcome Short Form Health Survey (SF-36): PoTP=54% if positive, PoTP=20% if negative
- *Posttest probability of Performance-Based Measures*
  - Berg Balance Scale (BBS) demonstrated best predictive ability among the performance measures
  - Berg: A score of 50 or less (positive test) resulted in a PoTP of 59% and a score more than 50 (negative test) resulted in a PoTP of 23%.
  - Timed Up and Go (TUG): a time of 12 seconds or more (positive test) resulted in a PoTP of 47% and a time of less than 12 seconds (negative test) resulted in a PoTP of 25%
  - Single-limb stance (SLS): a time of 6.5 seconds or above (positive test) led to a PoTP of 45% and a time of 6.5 seconds or below (negative test) led to a PoTP of 28%
  - 5 times sit-to-stand (5TSTS): a time of 12 seconds or more (positive test) led to a PoTP of 41% and a time of less than 12 seconds (negative test) led to a PoTP of 20%.
  - The Performance-Oriented Mobility Assessment (POMA): a score of less than 25 points (positive test) led to a PoTP of 42% and a score of more than 25 points (negative test) led to a PoTP of 23%.
  - Self-selected walking speed: a velocity of less than 1.0 m/s (positive test) led to a PoTP of 30%, while a velocity of 1.0 m/s or more led to a PoTP of 20%.
  - Results for the dynamic gait index were mixed and problematic due to poor methodological quality of studies.
- Summary of Findings:
  - Performance-based measures were superior to medical history questions and self-reported measures in predicting future falls.
  - Medical history questions should include questions regarding fall history, ADL difficulty, use of assistive devices, concern about falls, and use of psychoactive medication.

- No self-reported measure was particularly effective at predicting falls, but the The Fall Efficacy Scale-1 (FES-1) and the GDS-15 fared slightly better.
- The Berg Balance scale has a greater impact on posttest probability than the POMA and is more useful in determining falls risk.
- <u>Applicability:</u> This study establishes that the BBS score of 50 points or less, TUG times 12 seconds or more, and 5TSTS times 12 seconds or more are the best evidence supported performance-based measures to determine falls risk. The GDS-15, FES-1, and 5 medical history questions are good additional items to include in a thorough falls risk assessment.
- <u>Comments on evidence level/study quality:</u> This study is level 1a evidence, as it is a systematic review. The studies included in the review vary in quality, analysis, and methods; thus, potentially decreasing the methodological quality of this review. Posttest probabilities were not calculated for 63 of the 119 tests due to insufficient data.

7. Clemson L. The effectiveness of a community-based program for reducing the incidence of falls in the elderly: A randomized trial. *Journal of the American Geriatrics Society (JAGS)*. 09/2004;52(9):1487-1494. doi: 10.1111/j.1532-5415.2004.52411.x.
   - <u>Sample:</u> 310 community dwelling older adults aged 70 years or older who had experienced a fall in the last 12 months or had concerns about falling
   - <u>Intervention/Groups:</u> The experimental group participated in "Stepping On" sessions and the control group received up to two social visits from an occupational therapy student who was instructed not to discuss any fall-related topics. The 12 month "Stepping On" experimental group was led by occupational therapists who directed 7 sessions, a follow-up home visit, and a three-month booster session. Sessions were dedicated to different falls related topics such as sharing falling experiences, discussing and practicing exercises that prevent falls, moving about safely, home hazards, community safety, footwear, vision, vitamin D, planning ahead, reflecting on accomplishments, etc.
   - <u>Outcome Measures:</u> The primary outcome measure was falls. Other outcome measures included the Get-up and Go test, Rhomberg test, 36-item short form (SF-36), Modified Falls-Efficacy Scale (MFES), Mobility Efficacy Scale (MES), Physical Activity Scale for the Elderly (PASE) and the Worry scale.
   - <u>Findings:</u>
     - 58% of control subjects and 52% of intervention subjects reported one or more falls.
     - 35% of control subjects and 26% of intervention subjects reported 2 or more falls.
     - The intervention group reduced falls by 31% (p=0.025)
     - Participants in the intervention group improved their confidence in their ability to avoid falls while the control group's confidence decreased (MES, P=.042).

- Intervention participants used more behavioral practices that protected them from falls compared to their control group counterparts (FaB, P=.024).
- Applicability: The results of this study provide evidence to support the use of cognitive-behavioral and educational approaches to reduce falls in community dwelling older adult populations. This was a heavily educational-based intervention that proved to be effective by reducing falls by 31%.
- Comments on evidence level/study quality: This study is level 1b evidence, as it was a randomized control trial. The study's relatively high sample size of 310 individuals adds to the power of its findings. This was a single blinded study with solely group allocation blinding. Only 8% of participants were lost to follow-up for the primary outcome measure of falls. Loss to follow-up was higher for secondary outcome measures – 15.5%. Overall, this study seemed to have good methodological quality.

8. Dadgari A, Aizan Hamid T, Hakim MN, et al. Randomized Control Trials on Otago Exercise Program (OEP) to Reduce Falls Among Elderly Community Dwellers in Shahroud, Iran. *Iran Red Crescent Med J*. 2016;18(5):e26340. Published 2016 Feb 14. doi:10.5812/ircmj.26340
    - Sample: 317 older adults from the Semnan province of Iran who had experienced a fall within the last 12 months.
    - Intervention/Groups: Exercise group vs. control group. The exercise group participated in the Otago Exercise Program (OEP) for 6 months while the control group received general health training.
    - Outcome Measures: functional capacity, physical performance, and incidence of falls. The Berg balance scale (BBS and timed up and go test (TUG) was used to measure functional capacity. The chair stand test (CST) and arm curl test (ACT) were used to measure physical performance.
    - Findings:
        - The OEP group demonstrated improved physical performance as evidenced by the BBS with $P> 0.025$, and TUG with $p>0.017$.
        - The OEP group also demonstrated improved functional capacity as evidenced by the Arm0Curl-Test with $P>0.000$ and Chair-Stand-Test with $P>0.01$.
        - The OEP group also significantly reduced the incidence of falls ($P<0.000$). The experimental group's fall incidence decreased from 1.58 to 1.26 while the control group's fall incidence increased from 2.58 to 1.64.
    - Applicability: This study provides further evidence to support the effectiveness of the Otago Exercise Program in reducing falls in community dwelling older adult populations. The Otago intervention successfully improved physical performance, functional capacity, and decreased incidence of falls.
    - Comments on evidence level/study quality: This study is level 1b evidence as it is a randomized control trial. This was a single blinded study – assessors were blinded to group allocation. All outcome measures were performed by two examiners with strong inter-rater reliability ($r=0.94$). The quality of the study is

threatened by a high dropout rate of 144 individuals. Additionally, the quality of the study was also limited by the use of patient self-reported falls information which has low validity.