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| **CRITICALLY APPRAISED TOPIC** |

**FOCUSED CLINICAL QUESTION**

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| In older adults residing in long-term care facilities (P), does balance training (I) increase performance measures of falls risk (O) more than strength training (C)? |

**AUTHOR**

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**CLINICAL SCENARIO**

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| Working with older adults in the outpatient physical therapy clinic at a long-term care facility resulted in multiple injuries due to falls and interventions to decrease falls risk within the home and community. Both balance-focused and strength-focused intervention approaches were utilized, often in combination, but time constraints were often a point of contention between the patient and therapist. If older adults in long-term care facilities have a limited amount of time to dedicate to therapy- I would like to know whether it more beneficial to focus on balance or strengthening exercises to increase performance measures associated with falls risk. |

**SUMMARY OF SEARCH**

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| Eight studies met the inclusion and exclusion criteria including three systematic reviews, three randomized controlled trials, one meta-analysis, and one pre-test post-test quasi-experimental with a control group.   * Exercises for muscle strengthening- particularly elbow and knee flexor and extensors and functional lower extremity exercises- in combination with balance training may be the most effective means of decreasing falls risk in older adults residing in long-term care facilities.1,2,8 * The combination of progressive resistance training and group balance exercise classes demonstrate a decreased rate of falls and increased physical performance measures in older adults in long-term care facilities.7 * Successful balance interventions include tandem stance, tandem walking, toe walking, heel walking, backward walking, lateral walking, turning, stepping over objects, stair climbing, sit to stands, and squatting for decreased falls risk.1 * Balance is a multifactorial quality that can be improved through single, multiple, and multifactorial non-pharmacological approaches to improve performance measures and decrease falls risk in older adults with interventions utilizing or combined with exercise prescription resulting in the most successful decrease in falls risk.1, 5 * Although exercise prescription does have a direct preventative effect on the risk of falls- when combined with gait or balance training, a stronger effect of reduction in falls is seen.6 |

**CLINICAL BOTTOM LINE**

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| Older adults residing in long-term care facilities see the greatest improvement in fall risk reduction performance measures when full body strengthening exercises are prescribed in combination with balance training. |

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| ***This critically appraised topic has been individually prepared as part of a course requirement and has been peer-reviewed by one other independent course instructor*** |

**SEARCH STRATEGY**

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| **Terms used to guide the search strategy** | | | |
| **P**atient/Client Group | **I**ntervention (or Assessment) | **C**omparison | **O**utcome(s) |
| Older adults  Long term care facility  SNF  Assisted Living  Older adults AND (long term care facility OR skilled nursing facility OR assisted living facility) | Balance training  Balance exercis\*  Balance | Strength training  Musculoskeletal training  Strength  Muscle Strength | Decreased Falls Risk  Performance based measurement  (Berg Balance Scale OR Tinetti OR TUG OR 5XSTS)  Falls Risk  Fall\* |

**Final search strategy (history):**

Search history:

Older adults AND balance training AND strength training AND decreased falls risk

Older adults AND (long term care facility OR skilled nursing facility OR assisted living facility) AND balance training AND strength training AND decreased falls risk

Older adults AND (long term care facility OR skilled nursing facility OR assisted living facility) AND balance AND strength AND fall\*

Older adults AND (long term care facility OR skilled nursing facility OR assisted living facility) AND balance OR strength AND fall\*

Older adults AND (long term care facility OR skilled nursing facility OR assisted living facility) AND (balance OR coordination) AND (strength OR resistance) AND fall\*

older adults AND (long term care facility OR skilled nursing facility OR assisted living facility) AND (balanc\* or coordinat\*) AND (strength\* OR resistance\*) AND Berg

Older adults AND (long term care facility OR skilled nursing facility OR assisted living facility) AND balanc\* AND (strength OR resistance) AND fall\*

Older adults AND (long term care facility OR skilled nursing facility OR assisted living facility) AND balanc\* AND (strength OR resistance) AND fall\*

older adults AND (long term care facility OR skilled nursing facility OR assisted living facility) AND (balanc\* or coordinat\*) AND (strength\* OR resistance\*) AND (Berg Balance OR Tinetti OR 5xSTS)

Final strategy: older adults AND (long term care facility OR skilled nursing facility OR assisted living facility) AND (balanc\* or coordinat\*) AND (strength\* OR resistance) AND fall risk NOT nutrition\* NOT vibrat\* NOT drug

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| **Databases and Sites Searched** | **Number of results** | **Limits applied, revised number of results (if applicable)** |
| **PubMed**  **CINAHL**  **EMBASE** | **16**  **9**  **26** | **Since 2002**  **Sine 2002**  **Since 2002** |

## INCLUSION and EXCLUSION CRITERIA

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| **Inclusion Criteria** |
| Published in English, outcome measure is a performance measure, published in the last 20 years, participants currently reside in a LTCF, adults 65 or older, peer reviewed OR cross sectional OR cohort study OR RTC OR meta-analysis, pre-experimental research design OR true experimental research design OR quasi-experimental research design |
| **Exclusion Criteria** |
| Participants with a degenerative disease/mental illness/unmanaged acute or chronic condition that would affect falls risk, study lasting less than 4 weeks, published over 20 years ago, self-assessment of falls risk utilized as outcome measure |

**RESULTS OF SEARCH**

**Summary of articles retrieved that met inclusion and exclusion criteria**

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| **Author (Year)** | **Risk of bias (quality score)\*** | **Level of Evidence\*\*** | **Relevance** | **Study design** |
| **Rimland et al.1, 2016** | **JBI Critical Appraisal Checklist for Systematic Reviews; 10/11** | **Level 1** | **high** | **Systematic Overview** |
| **Naczk et al.2, 2020** | **JBI Critical Appraisal Checklist for Randomized Control Trials; 10/13** | **Level 2** | **moderate** | **Randomized Control Trial** |
| **Motalebi et al.3, 2018** | **JBI Critical Appraisal Checklist for Quasi-Experimental Studies; 9/9** | **Level 1** | **high** | **Pre-test Post-Test Quasi-Experimental with Control Group** |
| **Sadeghi et al.4, 2021** | **JBI Critical Appraisal Checklist for Randomized Control Trials; 10/13** | **Level 2** | **high** | **Randomized Control Trial** |
| **Thomas E et al.5, 2019** | **JBI Critical Appraisal Checklist for Systematic Reviews; 10/11** | **Level 1** | **high** | **Systematic Review** |
| **Lee et al.6, 2017** | **JBI Critical Appraisal Checklist for Systematic Reviews; 11/11** | **Level 1** | **high** | **Meta-Analysis** |
| **Hewitt et al.7, 2018** | **JBI Critical Appraisal Checklist for Randomized Control Trials; 10/13** | **Level 2** | **moderate** | **Randomized Control Trial** |
| **Rao et al.8, 2005** | **JBI Critical Appraisal Checklist for Systematic Reviews; 2/11** | **Level 4; downgraded due to lack of information regarding search strategy, appraisal, and specificity regarding the research question.** | **low** | **Systematic Review** |

\*Indicate tool name and score

\*\*Use Portney Table 36-1: Summary of Levels of Evidence (2020). If downgraded, indicate reason why.

**BEST EVIDENCE**

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| * **Lee et al.6, 2017** was chosen due to its high methodological quality core as a meta-analysis, high level of evidence, and high level of relevance to my PICO question. This study collected data on multiple intervention strategies, including both balance and strength training, for older adults residing in long term care facilities and their impact on falls risk and prevention. * **Rimland et al.1, 2016** was chosen due to its high methodological quality score as a systematic overview, high level of evidence, and high level of relevance to my PICO question. This study looked at non-pharmaceutical intervention strategies, including both balance and strength training, and its impact on falls risk and prevention in older adults residing in long term care facilities. * The combination of high-quality data and specific relevance to my clinical question make these two studies the best suited for selection for critical appraisal. These studies were chosen over other high quality, relevant studies due to their focus on both strength and balance training, not one or the other, and the quantity of reliable/valid material available for synthesis of my clinical question. |

**SUMMARY OF BEST EVIDENCE**

**(1) Description and appraisal of (study title) by (authors, Year)**

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| **Aim/Objective of the Study/Systematic Review:** |
| The aim of the study by Lee et al. were to evaluate the effectiveness of exercise interventions on the rate of falls and number of fallers in long-term care facilities. |
| **Study Design** |
| The study by Lee et al. is a meta-analysis consisting of twenty-one studies that included 5,540 participants. The articles selected were located on Ovid-Medline, Embase, CINHAL, Cochrane Library and Korean databases (KoreaMed, KMbase, KISS, RISS, and KisTi) with the keywords “aged,” “care facility,” “old people,” “falls,” “intervention,” and “exercise.” Two reviewers independently excluded irrelevant studies and completed full-text reviews for relevant articles with any disagreement being resolved through discussion. The inclusion criteria for the chosen studies were: randomized trials including quasi-randomized trials; participants were older adults over 65 years living in care facilities; types of interventions were any exercise interventions designed to reduce falls compared with any other intervention, usual care, or placebo; types of outcome measures were rate or number of falls, or number of participants sustaining at least one fall during follow-up (fallers); types of setting were care facilities (assisted living, nursing home, skilled nursing facility, long-term facility). The exclusion criteria include studies that were not original articles; were preclinical studies; were not written in English or Korean; lacked a placebo or control group; and had recruited participants from the community, hospital, home, or clinic.  After modification to avoid potential misunderstanding through pilot form testing using a sample from each included study, the reviewers rereviewed the articles to ensure the author, year of publication, country where research was performed, study design, population sex and age, and sample size fit the inclusion criteria. From there, exercise types (strength, balance, endurance, walking), intervention time or duration, and combined interventions (medication, education, home visit, staff training, environment modification) were extracted from the appropriate studies. The outcomes included the rates of falls, the total number of falls per unit of person time that falls were monitored, and number of individuals who experienced falls at a 95% confidence interval (CI). Odds or risk ratios with CIs were collected if the numbers of participants and events were unavailable.  Cochrane risk of bias for randomized controlled trials was completed to assess the quality of studies included, and any disagreements or discrepancies were resolved through discussion with a third reviewer. Five studies were determined to have risk of bias, only nine studies reported allocation concealment, and only five studies reported blindness.  Two-tailed tests of significance (p <.05) were utilized for data analyses. Dichotomous variables were pooled using risk ratio, while continuous variables were pooled using mean difference. Both risk ratios and mean differences were calculated and reported with a 95% CI. Statistical heterogeneity was evaluated through Cochrane *Q* and *I2* statistics; the studies which resulted in low or moderate heterogeneity used a fixed model, and the studies that demonstrated high heterogeneity utilized a random effects model. Analysis of dichotomous studies utilized the Mantel-Haenszel method; and continuous variables were analyzed utilizing the inverse variance method. Sensitivity analyses was then utilized to determine the effect of exercise intervention on the population of recurrent fallers. |
| **Setting** |
| Studies included in the meta-analysis assessed older adults residing in long-term care facilities including nursing homes, skilled nursing facilities, and assisted living facilities. |
| **Participants** |
| In the twenty-one studies included, the mean age of participants was 82.6 years and 81.2% were female. Most participants were frail and required assistance with at least one activity of daily living or had functional limitations. 2,860 participants were included in the exercise groups and 2,860 participants were included in the control groups. |
| **Intervention Investigated** |
| *Control* |
| The control groups included in the meta-analyses participated in no activity, usual care, occupational therapy, or usual, small bouts of exercise throughout the intervention period. |
| *Experimental* |
| The most common exercise interventions prescribed to the participants were balance and strength training lasting 4-48 weeks. All but one of the studies, which met one-time weekly, involved participation in the exercise program 2-3 times per week, and these sessions lasted 30-90 minutes each. Given the population participating in these studies, treatment was provided through the long-term care facilitiy that the participants resided in.  Fifteen of the studies looked at exercise as a single intervention with two including gait, balance, and functional training with mechanical devices; seven involving both balance and strength training; one involving balance and single-leg functional training; and three assessing balance, strength, and walking interventions. The other six studies included exercise combined with fall interventions such as staff education, medication review, and environmental modification. |
| **Outcome Measures** |
| The outcome measures collected for the meta-analyses were the rate of falls and number of participants sustaining at least one fall at follow up. Rate of falls is defined as the total number of falls per unit of person that falls were monitored within each study. For each study included, the rate of falls and the number of fallers were analyzed for significant differences between the experimental and control groups. |
| **Main Findings** |
| When looking at the overall effect of exercise on fall prevention, significant differences among rate of falls (RR 0.81, 95% CI 0.68–0.97; 18 studies, 5,047 participants) were found. However, no significant difference was noted among number of fallers for all exercise interventions and control groups (RR 0.93, 95% CI 0.86–1.01; 14 studies, 4,100 participants). Despite no significant differences noted among rate of falls (RR 0.91, 95% CI 0.75–1.10) and number of fallers (RR 1.04, 95% CI 0.92–1.18) in single exercise interventions and control groups- there was significant differences noted among rate of falls (RR 0.61, 95% CI 0.52–0.72) and number of fallers (RR 0.85, 95% CI 0.77–0.95) in the combined exercise intervention and control groups.  A post-hoc subgroup analyses by type of exercise was also completed to determine the effect of exercise type on fall prevention. This showed that exercise prescription involving gait, balance, and functional training with mechanical devices (RR 0.45, 95% CI 0.24–0.85; *I*2 = 0%, 2 studies, 111 participants), and balance and strength exercises (RR 0.84, 95% CI 0.72–0.96; *I*2 = 0%, 6 studies, 1,166 participants) reduced the rate of falls in this population. Balance and single-leg functional training (RR 0.82, 95% CI 0.65–1.04; 1 study, 553 participants) and Tai Chi (RR 0.75, 95% CI 0.52–1.08; 1 study, 286 participants) did not significantly differ but did reduce the rate of falls. Balance, strength, and walking interventions (RR 1.48, 95% CI 1.10–2.00; *I*2 = 55%, 3 studies, 448 participants) and goal setting physical activity (RR 1.11, 95% CI 0.84–1.45; 1 study, 682 participants) led to an increased rate of falls. Overall, there are no significant differences among the number of individuals experiencing falls among different types of exercise intervention.  Sensitivity analysis of recurrent fallers was also performed and there were significant differences between all exercise intervention and control groups on number of recurrent fallers (RR 0.71, 95% CI 0.53–0.97; *I*2 = 49%, 6 studies, 1,877 participants). |
| **Original Authors’ Conclusions** |
| Lee et al. conclude that strengthening exercises alone, or when combined with other fall interventions, result in reduction in falls in older adults, especially those who are frail and residing in long term care facilities; with the best results yielded from exercise programs that combine two or more fall prevention interventions such as medication, environmental modification, staff education, mobility aids and post fall consultation to manage risk factors. Given the multifactorial nature of balance, Lee et al. support a multifactorial approach to treatment to mitigate risk factors, decrease falls risk, and provide support for the development of a falls risk prevention protocol to be utilized by clinicians treating older adults in long-term care facilities.  Of exercises prescribed, those focused on gait, balance, functional training with mechanical devices, and full body strengthening are supported as most successful when reducing rates of falls in this population. Single-leg functional training and Tai Chi are also supported as successful intervention approaches for reducing the rate of falls. Lee et al. support a combination of balance training, muscle strength, and gait ability to promote compensatory strategies to reduce falls risk. Balance training alone is not supported as a sole intervention approach to reduce risk of falls in older adults residing in long term care facilities at this time.  In the subpopulation of recurrent fallers, Lee et al. demonstrate the benefit of exercise intervention on the decreased number of fallers- indicating the increased benefit of exercise prescription for individuals with a higher risk for falls. |
| **Critical Appraisal** |
| **Validity** |
| The meta-analysis, level 1 study by Lee et al. has a high relevance to the clinical question and a high methodological quality score lending its low risk of bias based on the JBI Critical Appraisal Checklist for Systematic Reviews. One major strength of this study is its breadth of evidence and the analysis of 5,540 patients of the same population as the clinical question. The study gathered and analyzed data from twenty-one studies all looking at exercise intervention either alone or in combination with balance training; and not only determined if exercise was beneficial for decreased falls risk alone or in combination, but also which specific exercise interventions yielded the best results. This gives readers the framework required to put these findings into evidence-based practice. A weakness of the study is the inability to include heterogeneousness in terms of the amount and intensity of exercise prescribed, sample size, gender, participant condition, and level of care facility due to it being a meta-analysis. Another weakness was the inability to estimate impact on the individual level, and therefore results were characterized on trial-level characteristics. Lastly, only including studies published in English or Korean limit the number of studies that can be included in the meta-analysis. Therefore, despite the significance of this study, results should be interpreted with caution. |
| **Interpretation of Results** |
| The strongest evidence from the Lee et al. meta-analyses is the support of multifactorial exercise prescription for decreased falls risk in older adults residing in long-term care facilities. The combination of an exercise program with fall prevention training is proposed as a significant intervention that results in decreased falls risk for older adults. Considering this study looks at participants on a trial-level, it is imperative that we treat the individual in front of us first; but this review gives us a guideline of where to start and what specific exercises to try within the clinic. Utilizing performance measures in the clinic, we can use the evidence presented to us by Lee et al. to track decreased falls risk in our individual patients as we intervene with both exercise and fall prevention tactics. |
| **Applicability of Study Results** |
| The study is highly applicable to the stated clinical scenario as the population consists of older adults who are both at risk for falls due to decreased independence and function, and who reside in long-term care facilities. The analyses also look at different combinations of exercise and balance training to provide evidence on whether exercise prescription or balance training is enough alone to yield significant results. The aim of the study relates to the clinical scenario, and the results support a specific direction of treatment that can be utilized in the clinic. The study supports a combination of exercise intervention and fall prevention as the best approach for decreasing falls in older adults with those focused on gait, balance, functional training with mechanical devices, full body strengthening, single-leg functional training, and Tai Chi showing the most success with decreasing falls risk. |

**(2) Description and appraisal of (study title) by (authors, Year)**

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| **Aim/Objective of the Study/Systematic Review:** |
| The aim of the study by Rimland et al. were to collect and summarize information regarding fall intervention in different healthcare settings to provide a succinct guide for clinicians and healthcare workers to utilize in practice. This systematic overview is a part of the Optimal Evidence-Based Non-drug Therapies in Older People (ONTOP) project which aims to provide recommendations to healthcare providers regarding the best available evidence-based intervention and treatment for common geriatric conditions. |
| **Study Design** |
| The study by Rimland et al. is a systematic overview consisting of 31 systematic reviews that reported results as narrative summaries and 28 systematic reviews that performed meta-analyses for a total of 59 included studies. Those included were drawn from the Cochrane Database of Systematic Reviews, PubMed, PsycINFO, EMBASE, CINHAL, and PEDRO from 2009-2015. Inclusion criteria consisted of the use of at least one medical literature database, the inclusion of at least one primary randomized controlled trial, the use of at least one non-pharmacological intervention for prevention of falls for individuals over the age of 60, and studies written in either the English, Spanish, or Italian language. The data extracted from each systematic review included: publication year, databases searched, study population, non-pharmacological intervention, the number of randomized controlled trials included, outcome measures, and the A Measurement Tool to Assess Reviews (AMSTAR) score. Independent pairs of reviewers screened the titles, abstracts, and full texts with a kappa statistic of 0.85, indicating very good agreement; however, any disagreement was resolved through discussion. Assessment of methodological quality of included systematic reviews was completed by two independent reviewers utilizing AMSTAR. The kappa statistic between the these two reviewers was 0.94, indicating nearly perfect agreement; however, disagreements were resolved through consensus. The systematic overview was then prepared by researchers according to the PRISMA statement.  The studies included by Rimland et al. are identified in accordance with the Prevention of Falls Network Europe (ProFaNE) taxonomy where clinically important measures extracted from the studies performed as single, multiple, and multifactorial interventions are summarized and organized. |
| **Setting** |
| Rimland et al. include systematic reviews assessing fall intervention in communities, care facilities (long-term, residential, and nursing home) and hospitals (acute and sub-acute). |
| **Participants** |
| Adults over the age of 60 years old residing in either the community, care facilities, or hospitals were included in the systematic overview. Given the nature of a systematic overview and its summary of a prodigious amount of data, there were, at minimum, 100,000 individual participants included in this study. |
| **Intervention Investigated** |
| *Control* |
| Of the studies included by Rimland et al. the significant control groups consisted of older adults residing in the community, care facility, or hospital that did not undergo single, combined, or multifactorial exercise intervention as compared to the experimental group during the time of intervention. |
| *Experimental* |
| Of the systematic reviews included in the study, the interventions were classified according to the ProFaNE taxonomy as follows: exercise (gait, balance, functional training, strength/resistance training, flexibility, Tai Chi, general physical activity, endurance or other kinds of exercises not falling within the previous categories), surgery (including cataract surgery and pacemaker implantation), management of urinary incontinence, fluid or nutrition therapy, psychological, environment/assistive technology (environmental modifications to increase safety and mobility, low beds, walking aids, hip protectors, identification bracelets, vision assessment/correction, bed alarms and footwear), social environment (staff education), knowledge (patient education), and other (physical therapy, treatment of postural hypotension). These interventions were provided as single interventions, multiple interventions provided to all subjects, or multifactorial interventions provided to subjects based on evaluation and individual risk factors.  Exercise was the most prescribed intervention as a single intervention (n=50) or when combined with other types of intervention (n=18) followed by environmental modification, (n=28), assistive and protective aids (n=24), patient education (n=23), and staff education (n=15). |
| **Outcome Measures** |
| Of the outcome measures included in the systematic overview, a list of clinically relevant outcomes for fall prevention was determined by a panel of international experts who rated each outcome measure to determine those that were critical, important, and not important. Two rounds of rating concluded the most critical, clinically relevant outcome measures were fall rate and number of fallers. Fall rate was defined as the total number of falls divided by the quantity “person time” during the intervention period. From there, fall rate was reported as a rate ratio (RaR) which is defined as the fall rate of the intervention group divided by the fall rate of the control group. The second outcome measure, number of fallers, were reported as risk ratios (RR). |
| **Main Findings** |
| In community-dwelling older adults, a decrease in falls was seen with multi-element exercise combined with Tai Chi (fall rate, RaR 0.71, 95% CI 0.63–0.82; 16 trials, 3,622 participants; number of fallers, RR 0.85, 95% CI 0.76–0.96; 22 trials, 5,333 participants). Additionally, exercise alone demonstrated a greater avoidance of falls as compared to exercise in combination with environmental modification, medication review, and physical therapy (RR 0.45, 95% CI 0.29–0.71; Cochran Q test 18.5 (p<0.001); 5 trials). A decline in fall rate was seen with strength and balance exercises completed in the home (incidence rate ratio 0.68, 95% CI 0.56–0.79; I2 = 0%, P = 0.71). Additionally, home assessment and modification was effective at reducing both fall rate (RaR 0.81, 95% CI 0.68–0.97; I2 = 64%, p = 0.02; 6 trials, 4,208 participants) and number of fallers (RR 0.88, 95% CI 0.80–0.96; I2 = 0%, p = 0.73; 7 trials, 4,051 participants) in this population. When assessment and individual risk factors were considered, multifactorial intervention was associated with a decrease in fall rate (RaR 0.76, 95% CI 0.67–0.86; I² = 85%, p < 0.00001; 19 trials, 9503 participants) within this population and setting. In older adults with dementia residing in the community, exercise alone was shown to reduce the number of falls (Mean difference -1.06, 95% CI -1.67 –-0.46; I2 = 0%, P = 0.95) and the number of fallers ((RR 0.68, 95% CI 0.55–0.85; I2 = 0%, P = 0.99).  In long-term care facilities and hospitals, physical therapy was associated with a decreased number of fallers (RR 0.36, 95% CI 0.14–0.93; I2 = 0%, P = 0.46; 2 trials, 83 participants), but not a significant decrease in rate of falls of participants (RaR 0.54, 95% CI 0.16–1.81;1 trial, 54 participants). Additionally, older adults in geriatric care facilities saw a decrease in falls (RR 0.51, 95% CI 0.29–0.88; I2 = 0%, P = 0.55; 894 participants) with multifactorial intervention including care activities to avoid deterioration of ADLs, mobility, continence, nutrition, skin integrity, mood, sleep, and cognition, repeated medical review, early rehabilitation, early discharge planning and environmental modifications.  In both community-dwelling and long-term care facilities, exercise intervention alone was shown to significantly decrease the fall rate of participants (RaR 0.84, 95% CI 0.77–0.91). Neither increased patient nor caregiver education resulted in a reduction of falls in either population. Additionally, exercise in combination with vitamin D, calcium, management of urinary incontinence, fluid or nutritional therapy, psychological measures, environment/assistive aids, knowledge, and vision improvement resulted in both a decreased fall rate ratio (RaR 0.80, 95% CI 0.73–0.88; I2 = 19%, P = 0.23; 11 trials) and number of fallers (RR 0.85, 95% CI 0.80–0.91; I2 = 0%, P = 0.80; 12 trials). |
| **Original Authors’ Conclusions** |
| Rimland et al. concluded that the effectiveness of different interventions for decreased rate of falls and number of fallers residing in the community, long-term care facilities and hospitals varied. Multifactorial interventions that utilized individual assessment and prescribed intervention based on individual risk factors was the most consistently effective approach among all settings. In community-dwelling older adults, a combination of balance and strength training was consistent at reducing falls. Overall, exercise was the most successful intervention across subgroups and settings, leading to decreased rate of falls and number of fallers. Of the systematic reviews included, patient education and educational intervention were seen as ineffective for reducing falls in this population. |
| **Critical Appraisal** |
| **Validity** |
| The systemic overview, level 1 study by Rimland et al. has a high relevance to the clinical question and a high methodological quality score lending its low risk of bias based on the JBI Critical Appraisal Checklist for Systematic Reviews. Of the systematic reviews included, the methodological quality was assessed using AMSTAR by two, independent reviewers resulting in 11 high quality, 37 medium quality and 11 low quality systematic reviews. The 11 low quality systematic reviews were then removed from the systematic overview.  A major strength of this study was the amount of data provided by researchers with over 100,000 individual participants studied. Information regarding different exercise interventions, both alone and in combination with multifactorial interventions for fall prevention, were analyzed and organized giving readers a vast amount of statistically significant information to apply to future studies or clinical practice. A weakness of this study was, due to the shear amount of data analyzed and summarized in a systematic overview, details on the individual level including amount and intensity of exercise prescribed, sample size, gender, participant condition, were omitted and conclusions were drawn from trial-level characteristics. Another weakness was the 6-year timeline of included studies, and the potential of valid studies not being included in this systematic review. Lastly, only including studies published in the English, Italian, and Spanish languages put a limit on which studies could be included in this study. Therefore, results should be interpreted with caution and require individual assessment before application to the clinical setting. |
| **Interpretation of Results** |
| Rimland et al. provide a clinically significant summary of exercise interventions both as a single intervention and in combination with other fall prevention intervention tactics that can be utilized in the clinic with this population. The strongest evidence from the study includes the effectiveness of individualized exercise prescription resulting in both decreased rate of falls and number of fallers. Although there were limitations to this study, researchers were able to extract data that cover a variety of different settings and intervention approaches and offer valuable information to clinicians in all settings. Upon review, this systematic overview provides an effective summary of fall prevention intervention that can be utilized as a guide for healthcare workers due to its large sample and effect size. |
| **Applicability of Study Results** |
| Rimland et al. provide data that is highly relevant and applicable to the clinical question. Although different settings were considered throughout the study, significant data was extracted that directly correlate to the specific clinical question and population. The findings of this systematic overview support physical therapy as a successful intervention for decreasing number of fallers in long term care facilities, especially when combined with individual assessment considering patient risk factors, care activities to avoid deterioration of ADLs, mobility, continence, nutrition, skin integrity, mood, sleep, and cognition, repeated medical review, early rehabilitation, early discharge planning and environmental modifications. This gives specific and significant intervention techniques that can be utilized in the stated clinical scenario to decrease falls risk in older adults. |

**SYNTHESIS AND CLINICAL IMPLICATIONS**

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| Both studies included in this CAT support an individualized and multifactorial approach for the treatment of adults in pursuit of decreased falls risk. The first study conducted by Lee et al. is highly relevant to the clinical question given its population of older adults residing in long-term care facilities and application of exercise alone and in combination with balance intervention. This meta-analysis concludes that the combination of the two are most successful in decreasing falls risk. Rimland et al. is also highly relevant considering its direct correlation to the proposed setting and population stated in the clinical question. This systematic overview provides a vast amount of data which support physical therapy intervention and exercise prescription as the most successful approaches to reducing falls in older adults residing in long term care facilities.  Both studies offer specific intervention techniques that can be extracted and utilized in the clinic, making them a valuable and practical guide for clinicians and healthcare providers. Lee et al. note successful intervention when exercise is combined with gait, balance, functional training on mechanical devices, full body strengthening, single-leg functional training, and Tai Chi. Rimland et al. support exercise in combination with care activities to avoid deterioration of ADLs, mobility, continence, nutrition, skin integrity, mood, sleep, and cognition, repeated medical review, early rehabilitation, early discharge planning and environmental modifications. Both studies found significant value in individualized treatment that included assessment of the patient and acknowledgement of their specific risk factors prior to treatment for fall prevention. Future meta-analyses and systematic overviews that analyze the specifics of exercise prescription including frequency, duration, and intensity in combination with balance training would be helpful to bolster a guide for clinicians and healthcare providers to follow when treating this patient population for decreased falls. Additionally, the inclusion of performance-based falls risk assessments as opposed to fall rate and number of falls would be more applicable to a clinical setting.  Based on the two studies included in this CAT, I conclude that a multifactorial approach including individualized assessment, exercise prescription and balance intervention is the most successful when increasing performance-based measures of fall risk in older adults residing in long-term care facilities. Given the multifactorial nature of balance, it is apparent that strength training or balance training alone are not enough to combat falls risk and must be utilized in combination for the best, clinical results. Therefore, although the combination of intervention techniques may require more time in the clinic for the patient and more planning on the part of the clinician, I would recommend a combination of strengthening and balance intervention to increase performance measures of falls risk in older adults residing in long-term care facilities. |

**REFERENCES**

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