



Special Report from the CDC

A cost–benefit analysis of three older adult fall prevention interventions[☆]



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ABSTRACT

Introduction: One out of three persons aged 65 and older falls annually and 20% to 30% of falls result in injury. The purpose of this cost–benefit analysis was to identify community-based fall interventions that were feasible, effective, and provided a positive return on investment (ROI). **Methods:** A third-party payer perspective was used to determine the costs and benefits of three effective fall interventions. Intervention effectiveness was based on randomized controlled trial results. National data were used to estimate the average annual benefits from averting the direct medical costs of a fall. The net benefit and ROI were estimated for each of the interventions. **Results:** For the *Otago Exercise Program* delivered to persons aged 65 and older, the net benefit was \$121.85 per participant and the ROI was 36% for each dollar invested. For *Otago* delivered to persons aged 80 and older, the net benefit was \$429.18 and the ROI was 127%. *Tai chi: Moving for Better Balance* had a net benefit of \$529.86 and an ROI of 509% and *Stepping On* had a net benefit of \$134.37 and an ROI of 64%. **Conclusions:** All three fall interventions provided positive net benefits. The ROIs showed that the benefits not only covered the implementation costs but also exceeded the expected direct program delivery costs. These results can help health care funders and other community organizations select appropriate and effective fall interventions that also can provide positive returns on investment.

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1. Introduction

Approximately one third of persons aged 65 and older fall annually (Tromp et al., 2001) and 20% to 30% of falls result in injury (Sterling, O'Connor, & Bonadies, 2001). Adjusted for inflation, the direct medical costs of fatal and nonfatal falls among people aged 65 and older exceeds \$30 billion (Stevens, Corso, Finkelstein, & Miller, 2006). In 2005, Roudsari et al. estimated that the direct medical costs of an acute fall injury averaged \$17,483 (Roudsari, Ebel, Corso, Molinari, & Koepsell, 2005).

The purpose of this cost–benefit analysis was to identify fall interventions that were feasible, effective, and provided a good return on investment (ROI). Such financial information can help organizations determine whether investing in specific interventions will translate into positive net financial benefits—that is, the benefits from averted direct medical costs outweigh the costs of implementing the intervention—and provide positive ROIs. This information also can help implementers identify the most appropriate interventions for their participants, thereby avoiding unnecessary costs without compromising effectiveness.

2. Method

This cost–benefit analysis used a third-party payer perspective to estimate the average costs and benefits of three effective community-based fall interventions. This perspective is relevant for any health care funder that bears the costs of treating fall injuries and may be considering providing a

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fall prevention program to enrollees as a preventive health service. This perspective was chosen because third-party funders have a strong financial incentive to prevent falls by their beneficiaries and these programs utilize staff that may be readily available to health care funders such as Medicare Advantage plans. However, these are not the only organizations that may have an incentive to fund fall prevention programs.

The methodology used here followed published guidelines for economic evaluation of fall prevention programs. (Davis, Robertson, Comans, & Scuffham, 2011). The costs of fatal and nonfatal injuries, derived from national vital statistics and claims data, were used to estimate the average annual benefits from averting the direct medical costs of a fall (Finkelstein, Corso, & Miller, 2006). The incidence of falls was estimated using data from the 2000 National Vital Statistics System, 2001 National Electronic Injury Surveillance System—All Injury Program, 2000 Health Care Utilization Program National Inpatient Sample and 1999 Medical Expenditure Panel Survey (Stevens et al., 2006). The average annual cost of a fall injury was estimated by dividing the total costs of fatal and non-fatal fall injuries by the number of injuries in 2000. All costs were adjusted for inflation to the year 2012 price level using the medical consumer price index (medical CPI). The timeframe for these cost estimates quantified costs for twelve months post injury.

2.1. Fall interventions

Fall interventions were selected based on the following criteria: a high level of effectiveness shown in the randomized controlled trial (RCT); feasibility because the intervention had been translated into a program and implemented in community settings; and appropriate for older adults with differing levels of fall risk. Three effective community-based fall interventions (Stevens, 2010) were selected for this analysis:

1. The *Otago Exercise Program* (Campbell, Robertson, Gardner, Norton, & Buchner, 1999)
2. *Tai Chi: Moving for Better Balance* (Li et al., 2005)
3. *Stepping On* (Clemson et al., 2004)

2.2. The Otago Exercise Program

The *Otago Exercise Program* was first implemented in Dunedin, New Zealand. The program consisted of individually tailored muscle-strengthening and balance-retraining exercises of increasing difficulty combined with a walking program. A physical therapist or specially trained nurse made a one-hour visit and three half-hour visits over the first two months. The participant was prescribed a set of in-home exercises selected for appropriate and increasing levels of difficulty as well as a walking plan. The exercises took about 30 min. Participants were encouraged to complete the exercises three times a week and to walk outside the home at least twice a week.

A fall in this study was defined as, “unintentionally coming to rest on the ground, floor, or other lower level” (Campbell et al., 1999). When compared with controls, the fall rate among the *Otago Exercise Program* participants was reduced by 35% (incidence rate ratio [IRR] = 0.65, 95% confidence interval [CI] 0.57–0.75) (Robertson, Campbell, Gardner, & Devlin, 2002). When participation was restricted to adults aged 80 and older who had previously fallen, the intervention effectiveness was 40% (IRR = 0.60, 95% CI .45–0.81) (Robertson et al., 2002).

2.3. Tai Chi: Moving for Better Balance

Tai Chi: Moving for Better Balance consisted of one-hour sessions of Tai Chi movements that included a warm-up and cool down period. The program consisted of 24 Tai Chi forms that emphasized weight shifting, postural alignment, and coordinated movements. Classes were held three times a week for 26 weeks. The program was delivered by experienced Tai Chi instructors who followed the classical Yang style. The program was designed to be implemented in senior centers, adult activity centers, and community centers.

A fall in this study was defined as, “landing on the floor or the ground, or falling and hitting objects such as stairs or pieces of furniture, by accident” (Li et al., 2005). When compared with controls, the risk of falling among the *Tai Chi: Moving for Better Balance* participants was reduced 55% (risk ratio = 0.45, 95% CI 0.30–0.70) (Li et al., 2005).

2.4. Stepping On

Stepping On was developed in Australia. It consisted of seven weekly three-hour group sessions conducted in a community setting with follow-up home visits. The program was led by an occupational therapist (OT) who introduced the exercises and led or facilitated sessions about topics related to falls. Most sessions were attended by a volunteer subject matter expert who discussed topics such as managing medications, home and community safety, behavioral methods for sleeping better, and using hip protectors. This intervention has been translated by researchers at the University of Wisconsin at Madison in collaboration with the original researchers for implementation in the United States.

A fall in this study was defined as, “an event that results in a person unintentionally coming to rest on the ground, floor, or other lower level” (Clemson et al., 2004). Compared to controls, the fall rate among *Stepping On* participants was reduced by 31% (relative risk = 0.69, 95% CI 0.50–0.96) (Clemson et al., 2004).

2.5. Time frames

The time frame—the length of the intervention—differed for each intervention. The *Otago Exercise Program* lasted six months, the Tai Chi intervention lasted 26 weeks, and the *Stepping On* program lasted seven weeks. The time horizon—the length of time measured from the beginning of the intervention to the outcome assessment—also differed for each intervention. The effectiveness of the *Otago Exercise Program* and the Tai Chi program were measured at one year and the effectiveness of *Stepping On* was measured at 14 months.

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