Modifying homes to prevent falls is very cost-effective: New NZ study

12 June 2016

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A just published modelling study by the BODE^3 Team has reported that “home safety assessment and modification” (e.g., adding hand rails and removing tripping hazards in homes) appears to be a very cost-effective health sector intervention. But even more cost-effective was targeting this intervention to older people with previous injurious falls. In this blog we take a closer look at this intervention and consider what policy-makers, NGOs and citizens might wish to consider doing in response to the evidence.

The NZ Burden of Disease Study (NZBDS) reported that falls cause 10% of all the injury-related health loss in this country – in third place behind transport and self-inflicted injuries. For adults aged 65 years or over, falls are the most common cause of injury-related health loss, and responsible for three-quarters of the health loss from femoral fractures (1,2).

What is this home modification intervention?

Home safety assessment and modification (HSAM) is a well-established intervention to reduce injurious falls among community-dwelling older people (3). It usually involves a two-stage intervention consisting of a personalised assessment of injury hazards in the home (e.g., by an occupational therapist), followed by hazard removal (4). This usually includes reducing tripping hazards (loose mats), adding grab bars inside and outside the tub or shower and next to the toilet, adding hand rails on both sides of stairways, and improving home lighting (4). A recent Cochrane systematic review of HSAM interventions concluded that they reduced the rate of falls by 19% (5). Given this evidence base, HSAM is recommended by the World Health Organization for preventing injurious falls (6).

What the new BODE^3 Study found

The study used a Markov macro-simulation model that estimated quality-adjusted life-years (QALYs) gained in the 65+ age-group (7). It used a health system perspective and a discount rate of 3% (for both health gain and costs). Intervention effectiveness estimates came from the Cochrane systematic review and NZ-specific intervention costs (8).

The study estimated that in the 65+ age-group, a nationwide HSAM programme would generate 34,000 QALYs over the life-time of the modelled population (95% uncertainty interval [UI]: 5,000 to 65,000). The total cost to implement the programme was estimated to be NZ$145 million (95%UI: $96 to $206 m). The net health system costs (intervention costs plus health sector costs throughout the remaining lives of the modelled cohort) was estimated to be NZ$110 m (95%UI: cost saving to NZ$196 million).

The incremental cost-effectiveness ratio (ICER) was NZ$9,000 per QALY gained (95%UI: cost saving to $20,000). This suggests that such a HSAM programme would be highly cost-effective and very good value-for-money (i.e., way below the GDP per capita level of NZ$45,000 that we typically use as a rough threshold in our modelling work, and recommended by WHO as a rough guide). But targeting HSAM only to people aged 65+ with previous injurious falls was estimated to be even more cost-effective at only NZ$2000 per QALY gained – which is exceptionally good value-for-money. Such targeting would also lower upfront implementation costs for government or DHBs. (Conversely, this means that providing HSAM to 65+ year olds with *no* previous injurious falls will be less cost-effective than the NZ$9000 per QALY 'average', namely about NZ$19,400 per QALY gained.)

Also cost-effective, but somewhat less so than the baseline intervention, was targeting the HSAM programme to just older people aged 75+ years at $17,000 per QALY gained (or $8,300 for those with a previous fall history). Such targeted programmes would also have the advantage of lowering upfront costs to funders – which might improve acceptability for the fiscally-constrained health sector. This modelling study also explored equity issues and found that there was no significant difference in cost-effectiveness by sex or by indigeneity (Māori vs non-Māori).

What might policy-makers wish to consider?

Given these results, other NZ work (8), and also the results of international studies suggesting that HSAM is generally effective and cost-effective, policy-makers can have reasonable confidence that this is a good value-for-money intervention. Some of the options they could consider include:

- Adopting a national programme, which would achieve economies-of-scale and probably also better quality control of provision. It could be prudent to start with just homes in which a 65+ year-old resident has already had an injurious fall (given the results mentioned above).
- Leave it to DHB-level policy-makers, but perhaps with start-up support from Central Government for the first DHB to act, given the potential for nationwide learnings about the best approach.
- Wait until there are more head-to-head comparisons with alternative interventions such as group exercise programmes for older people. Indeed, NZ is a world leader in such programmes (e.g., the Otago Exercise Programme (9-12)). Additional, but yet to be published work by the BODE^3 Team suggests that these programmes are also cost-effective – though probably not as good as HSAM. Nevertheless, group exercise programmes have other advantages that have not yet been quantified for NZ: the social benefits and the heart disease prevention benefits. Technological innovation may also be relevant here with the use of robots in Japan to run exercise programmes for older people (13-15). But maybe use of robots in this way would have low acceptability in the NZ setting.

We suspect that HSAM is more cost-effective than the average health sector intervention – including average new drugs funded by Pharmac (though NZ still lacks good league tables to facilitate comparisons). This might suggest that Central Government or DHBs could logically disinvest in certain other health sector interventions to fund HSAM (e.g., divest in very expensive pharmaceuticals used in those with very limited life expectancy).

Other alternatives for a government that did not wish to mobilise substantive resources for a nationwide HSAM programme intervention could be:

- Regulations that require all newly built homes to have state-of-the-art falls prevention features.
- Regulations that require all rental properties to have home modifications for falls prevention. This approach could particularly benefit lower-income older people who disproportionately use rental accommodation.

What might citizens not waiting for government consider?

Citizens and NGOs might not wish to wait, since governments are not always fast to act – even when health sector interventions have strong evidence for effectiveness and cost-effectiveness. So citizens and NGOs could consider the following:

- NGOs representing older people and other NGOs could consider funding their own local-level HSAM Programmes e.g., an Iwi Authority which had the available resource could invest in HSAM for low-income older Māori in their community. At an average cost of $250 per home (based on NZ data (8)), it is likely that some reasonable provision could be achieved by such organisations.
- Individuals could include falls prevention features in the homes of older relatives or in their own homes. New Zealanders of all ages have falls in homes (8,16), and especially those with episodes of heavy alcohol use – as per NZ studies (17,18) and internationally (19).

All the above options would help reduce falls. But rather than ad hoc approaches by individuals, NGOs and DHBs, there is potentially a strong case for a Central Government led national programme that achieved the efficiencies of economies-of-scale and widespread

quality control of provision.

References

1. Ministry of Health. Health loss in New Zealand: A report from the New Zealand Burden of Diseases, Injuries and Risk Factors Study 2006–2016. Wellington, Ministry of Health, 2013.
2. New Zealand Ministry of Health, Accident Compensation Corporation (ACC). Injury-related Health Loss: A report from the New Zealand Burden of Diseases, Injuries and Risk Factors Study 2006–2016. In. Wellington, New Zealand; 2013.
3. Cumming RG, Thomas M, Szonyi G, et al. Home visits by an occupational therapist for assessment and modification of environmental hazards: a randomized trial of falls prevention. Journal of the American Geriatrics Society. 1999;47(12):1397-1402.
4. Pynoos J, Steinman BA, Nguyen AQ. Environmental assessment and modification as fall-prevention strategies for older adults. Clin Geriatr Med. 2010;26(4):633-644.
5. Gillespie LD, Robertson MC, Gillespie WJ, et al. Interventions for preventing falls in older people living in the community. Cochrane Database of Systematic Reviews (Online). 2012;9:CD007146.
6. World Health Organization. Falls: fact sheet No. 344 http://www.who.int/mediacentre/factsheets/fs344/en/2012.
7. Pega F, Kvizhinadze G, Blakely T, Atkinson J, Wilson N. Home safety assessment and modification to reduce injurious falls in community-dwelling older adults: cost-utility and equity analysis. Injury Prevention 2016 (E-publication 24 May).
8. Keall MD, Pierse N, Howden-Chapman P, et al. Home modifications to reduce injuries from falls in the Home Injury Prevention Intervention (HIPI) study: a cluster-randomised controlled trial. Lancet. 2015;385:231-8.
9. Thomas S, Mackintosh S, Halbert J. Does the 'Otago exercise programme'reduce mortality and falls in older adults?: a systematic review and meta-analysis. Age and Ageing. 2010;39:681-687.
10. Robertson MC, Devlin N, Scuffham P, et al. Economic evaluation of a community based exercise programme to prevent falls. Journal of Epidemiology & Community Health. 2001;55(8):600-606.
11. Robertson MC, Devlin N, Gardner MM, Campbell AJ. Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls. 1: Randomised controlled trial. BMJ. 2001;322(7288):697-701.
12. Robertson MC, Gardner MM, Devlin N, et al. Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls. 2: Controlled trial in multiple centres. BMJ. 2001;322(7288):701-704.
13. Hirano M, Hanajima N, Urita K, et al. Development of an Exercise Support System for the Elderly Which Uses a Small Humanoid Robot. Journal of Robotics and Mechatronics. 2013;25(6):939-948.
14. Stafford RQ, MacDonald BA, Jayawardena C, et al. Does the Robot Have a Mind? Mind Perception and Attitudes Towards Robots Predict Use of an Eldercare Robot. International Journal of Social Robotics. 2013;6(1):17-32.
15. Matsusaka Y, Fujii H, Okano T, Hara I: Health exercise demonstration robot TAIZO and effects of using voice command in robot-human collaborative demonstration. In: RO-MAN 2009 – The 18th IEEE International Symposium on Robot and Human Interactive Communication: Sept. 27 to Oct. 2 2009;472-477.
16. Gulliver P, Dow N, Simpson J. The epidemiology of home injuries to children under five years in New Zealand. Aust N Z J Public Health. 2005;29(1):29-34.

17. Kool B, Ameratunga S, Robinson E, Crengle S, Jackson R. The contribution of alcohol to falls at home among working-aged adults. Alcohol. 2008;42(5):383-388.
18. Thornley S, Kool B, Marshall RJ, Ameratunga S. Alcohol intake, marijuana use, and sleep deprivation on the risk of falls occurring at home among young and middle-aged adults: a case-crossover study. N Z Med J. 2014;127(1406):32-38.
19. Kool B, Ameratunga S, Jackson R. The role of alcohol in unintentional falls among young and middle-aged adults: a systematic review of epidemiological studies. Inj Prev. 2009;15(5):341-347.

Public Health Expert Briefing (ISSN 2816-1203)
