

New fall-risk screening process more easily accessible to seniors

Trial being rolled out for assessment to be done by trained staff at active ageing centres

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Madam Tan Yok So, 78, has a history of falls and has developed a fear of falling, which has kept her from leaving home.

In 2016, the retiree slipped on a puddle of water at home and hit her head. About six years later, she fell backwards on a bus and again hit her head, causing her to stop riding buses altogether.

Help, however, is on the way for seniors like her.

Researchers from Duke-NUS Medical School and Swiss public university ETH Zurich have developed a fall-risk screening process that is more accessible for older adults because they can be assessed by trained staff at active ageing centres (AACs) in the community, without having to step into a clinic.

The research team has come up with a new algorithm which evaluates seniors' risk of falling by analysing physical mobility data from wearable sensors and psychosocial factors.

Seniors in the trial will undergo the new screening process to monitor changes in their gait patterns and overall fall risk.

The process can be conducted by trained staff and volunteers in the centres across Singapore, unlike other screening tools which require a clinician and can be costly.

Participants start by taking a five-minute walk test, where they wear six sensors – one on their waist, one on each arm and foot, and one on their forehead – developed by ETH Zurich, to collect data such as step length, stride length and gait.

"These data can show how steady someone's walking is and whether they put more weight on one leg, indicating potential weakness in the other leg," said Dr Navrag Singh, senior scientist and lead principal investigator of the programme.

The participants then complete a questionnaire, where they are asked their age, level of physical activity, history of falls and whether they have a fear of falling.

The data from the questionnaire and wearable sensors is then fed into an algorithm to calculate a fall risk score for each individual senior.

The new fall-risk screening process will be used to evaluate the progress of seniors who are taking part in the Safe-Tech (Steps to Avoid Falls in the Elderly – A Technology Enhanced Intervention) trial.

The trial began in March, and is being rolled out progressively to 10 AACs across the island as part of the Future Health Technologies programme at the Singapore-ETH Centre, supported by the National Research Foundation and ETH Zurich.

Some 400 seniors were selected from a study to take part in the trial. The 3½-year study, which started in July 2022, is conducted by the same research team and dubbed Target, short for Targeted Assessment and Recruitment of Geriatrics for Effective Fall Prevention Treatments.

It seeks to determine the factors that contribute to fall risk among Singaporeans aged 60 and above.

Falls are a major concern for the elderly in Singapore as they can lead to serious injuries such as



Mr Tan Kai Zhe, a PhD researcher with the Future Health Technologies programme, putting sensors on a study participant, Madam Chua Jway Khaiw, to capture the data needed for fall-risk analysis. PHOTO: LIANHE ZAOBAO

fractures and head trauma. According to a global study published in the *Journal of Orthopaedic Surgery and Research* in 2022, about one in four seniors aged 65 and above – excluding those living in nursing homes – will have at least one fall each year.

A local study published in the *Singapore Medical Journal* in 2020 found that 85 per cent of all geriatric trauma cases presented to emergency departments in hospitals here are due to injuries sustained from falls.

The NTUC Health Active Ageing Centre (Care) in Jurong Central Plaza, where Madam Tan attended sessions twice a week from April to July, is one of the 10 centres taking part in the trial.

Ms Vanessa Koh, a PhD candidate at Duke-NUS' Centre for Ageing Research and Education who is part of the research team, said that

currently, there is no standardised fall risk assessment for seniors across clinics in Singapore.

Doctors such as geriatricians as well as allied health professionals like physiotherapists and occupational therapists conduct common screening tests for seniors to evaluate their risk of falling through their speed of walking, their ability to stand up from a seated position and their balance when standing unsupported in various positions.

While the tests are conducted quickly, they collect only limited data, such as the time and speed taken to complete the tasks.

Geriatricians may also conduct screening tests and interviews to assess the seniors' ability to perform daily activities, in addition to gathering other information such as that on their current medication and existing mood disorders.

Such assessments are important

in identifying individuals with medical conditions, but can be subjective and time-consuming, not to mention expensive.

Ms Koh said that the new screening process can be conducted by any staff member who is trained, including volunteers. This means seniors do not need to pay high consultation fees to know their fall risk.

The entire process – from the walk test to the questionnaire – takes only about 20 minutes, added Ms Koh.

The seniors go through the process in the first, third and 12th month to measure their progress.

They are then divided into two groups.

Half will participate in a physiotherapist-led group programme conducted in AACs to improve their strength, balance, flexibility, coordination and endurance.

They will also learn to manage fall-risk factors through nutrition, medication, footwear, environmental hazards and pain management, among other things.

The other half will be placed in the control group and given the Health Promotion Board's fall prevention guidebook. They can choose to participate in any intervention programme outside the trial if they wish.

For the Target study, the researchers have, so far, recruited almost 2,300 seniors through home visits and are close to completing the baseline screening process for them.

Approximately 1,200 sets of data have been analysed, showing that about 40 per cent to 50 per cent of these seniors are at high risk of falls.

This study will conclude in February 2026.

The executive director of the Duke-NUS centre, Associate Professor Angelique Chan, who is leading the Target study, said the findings reveal a diverse array of risk factors impacting Singapore's elderly, highlighting the complexity of fall prevention.

"These risk factors include previous fall history, living environment, poor eyesight and multiple chronic conditions, including cognitive impairment. Preventing falls among the elderly therefore calls for a broad approach to address multiple factors, but also requires customisation for one's unique circumstances," Prof Chan added.

Duke-NUS aims to expand the Safe-Tech trial with its partnering AACs and day rehabilitation centres to help more seniors prevent falls. The research team is currently evaluating the programme's effectiveness and feasibility before finalising it after the trial ends in May 2026.

After going through a three-month pilot of the trial, Madam Tan has regained strength and overcome her fear of falling. She can now manage short flights of stairs independently and go for more family outings. She has even resumed taking the bus, accompanied by her children.

"My walking has become steadier and now I can visit the hair salon or see a doctor on my own," said Madam Tan.

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