

Multiple turns: Potential risk factor for falls on the way to the toilet

Dear Editor

Falls are the most frequent cause of unintentional injuries in older adults aged ≥ 65 years, accounting for 90% of hip fractures.¹ In a recent study of the circumstances of falls in older adults, 13% of all real-life falls captured on video occurred during "turning",² which is one of the fundamental components of mobility and accounts for as much as 45% of steps taken in a day.³ Of note, falls during turning have been shown to result in eightfold more femoral fractures than falls during linear gait.⁴ Despite the importance of turning, this has been rarely examined because of a lack of feasible methods for assessing during activities of daily living. Hence, with multidisciplinary examination, the present pilot study aimed to assess and characterize the movement, especially turning that leads to falls on a drawing of the home by architectural experts, as well as physical characteristics by medical and nursing experts.

From September 2016 to December 2018, 42 patients (aged 61–94 years, 33 women, mean age 81 ± 8 years, body mass index 20.6 ± 3.2 kg/m²) who were hospitalized as an emergency for falls-caused femoral fracture were enrolled. Patients with diagnosed dementia or communication difficulties (with fall recall uncertainty) were excluded. During the hospital stay, semistructured interviews were carried out within 10 days of the fall event, collecting information on the place, time and circumstances of the fall. Medical and physical information, such as comorbidity, medications and a 25-question Geriatric Locomotive Function Scale, were collected from the medical records and by questionnaire.⁵ To examine the barriers and layout of the living environment, and to validate the movement at the time of the falls, home-visit interviews were carried out 6–9 months after discharge, because most of the patients (76.2%, $n = 32$) were transferred to rehabilitation hospitals and stayed there for several months. Each participant gave written informed consent before enrollment in the present study that was approved by the ethics committee of the Graduate School of Medicine, the University of Tokyo.

The place of falls was grouped into three categories: home (38.1%, $n = 16$), public facility (35.7%, $n = 15$) and street

(26.2%, $n = 11$). Falls in the home occurred in the bedroom (37.5%, $n = 6$), corridor (25.0%, $n = 4$), living room (18.8%, $n = 3$), kitchen (12.5%, $n = 2$) and toilet (6.3%, $n = 1$). The main movement causing falls and subsequent femoral fracture in the home was walking between the bedroom and the toilet (62.5%, $n = 10$). Other movements included when putting on slippers (12.5%, $n = 2$), when doing something in the kitchen (12.5%, $n = 2$), tripping over an obstacle while walking in the living room (6.3%, $n = 1$) and when changing clothes (6.3%, $n = 1$). Compared with other fallers, the characteristics of fallers on the way to the toilet were: older age (85 ± 8 years vs 80 ± 8 years), a high score on the 25-question Geriatric Locomotive Function Scale (24.4 ± 15.2 points vs 19.0 ± 12.6 points), multimorbidity (≥ 2 chronic diseases; 80.0% vs 59.4%), polypharmacy (7.5 ± 2.7 drugs vs 6.2 ± 5.0 drugs) and high rate of long-term care insurance certification (1.6 ± 0.8 level vs 1.1 ± 0.9 level). However, statistical differences were not seen, because of the small sample sizes. The types of falls (i.e. stumble, slip, missing a step), blood pressure and fall history within 1 year were not different from those in other fallers. A total of 60% of falls on the way to the toilet occurred at night-time (between 18.00 hours and 06.00 hours). Regarding the environmental features, 40% of fallers were living alone, compared with 21.9% of other fallers. We carried out seven home-visit interviews among 10 cases of falls on the way to the toilet. Using a drawing, when examining the movement at the time of the fall, multiple turns with changes of direction were experienced before falls, whereas a step or obstacle leading to falls did not occur (Fig. 1).

In this pilot study, we investigated the movement leading to falls in older persons who had experienced femoral fracture on the way to the toilet. We found that their falls occurred after multiple turns with changes of direction in persons with frail physical condition. Regarding the effects of age on turning performance, older adults have been shown to often adopt a strategy consisting of simpler, smaller, slower, and more steps to turn to assist in balance control and prevent falling.⁶ Also, more variable turn execution is seen in older women, compared with young women. When considering

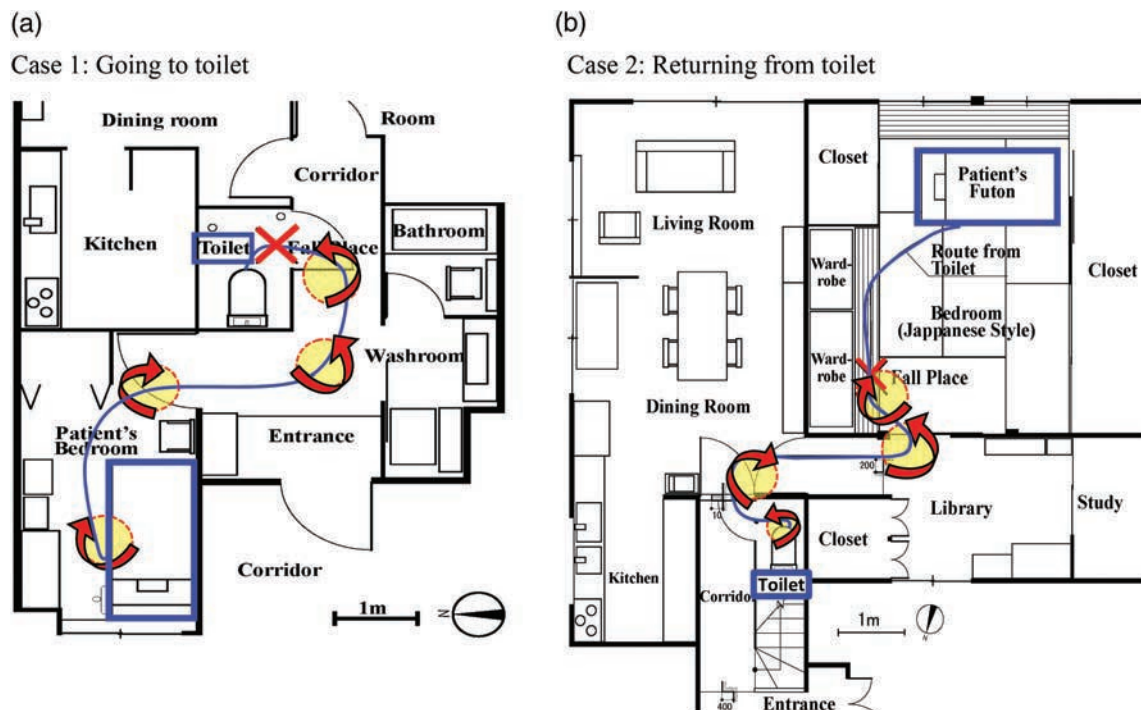




Figure 1 Predicted movements (a) on the way to and (b) returning from the toilet in a drawing of the home. Multiple turns and changes of direction were exhibited before falls. Blue line: predicted movement between the bedroom and the toilet.

these characteristics of turning in older adults, it is conceivable that multiple turns with varying angular ranges and changes of direction demand more complicated motion, which might cause loss of gait and turning ability on the way to the toilet.

Collectively, the present pilot examination shows that multiple turns are potential risk factors for falls/femoral fractures, and that tracking movement on a drawing of the home might be a feasible method to assess turning in the living environment. Further investigation is required on the quality (i.e. turn angle, duration and velocity) of turning that results in falls.⁸

Disclosure statement

The authors declare no conflict of interest.

Bo-Kyung Son,^{1,2,3}  Masahiro Akishita,²
Emiko Uchiyama,⁴ Shujirou Imaeda,⁵
Sakiko Taniguchi,⁶ Yuka Sumikawa,⁷
Suthutvoravut Unyaporn,² Takehiro Matsubara,⁸
Sakae Tanaka,⁹ Toshiaki Tanaka,¹ Toshio Otsuki,⁵
Junichiro Okata¹ and Katsuya Iijima¹ 

¹Institute of Gerontology, The University of Tokyo, Tokyo, Japan

²Department of Geriatric Medicine, The University of Tokyo, Tokyo, Japan

³Home Care Medicine, The University of Tokyo, Tokyo, Japan

⁴Department of Mechano-Informatics, Graduate School of Information Science and Technology, The University of Tokyo, Tokyo, Japan

⁵Department of Architecture, Graduate School of Engineering, The University of Tokyo, Tokyo, Japan

⁶Graduate School of Agricultural and Life Sciences, The University of Tokyo, Tokyo, Japan

⁷Division of Health Sciences and Nursing, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan

⁸Department of Emergency and Critical Care Medicine, Emergency and Critical Care Medicine, The University of Tokyo, Tokyo, Japan

⁹Department of Orthopedic Surgery, Orthopedic Surgery, The University of Tokyo, Tokyo, Japan

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