FACTORS ASSOCIATED WITH RISK FOR HIP IMPACT DURING REAL-LIFE FALLS CAPTURED ON VIDEOS AMONG OLDER ADULTS IN LONG-TERM CARE

Yijian Yang1, Rebecca Schonnop1, Fabio Feldman1,3, Stephen N. Robinovitch1,2
1Department of Biomedical Physiology and Kinesiology, 2School of Engineering Science, Simon Fraser University, Burnaby, BC, Canada, V5A 1S6, 3Fraser Health Authority

INTRODUCTION

Over 90% of hip fractures in older adults are caused by falls [1]. Risk for hip fracture increases 6-fold by falling sideways [2], and 30-fold by landing on the hip [3]. Yet there is lack of objective evidence on the factors separating falls that result in hip impact, from those that do not. This is a major barrier to prevention.

In the current study, we collected video footage of real-life falls in older adults, captured by networks of digital video cameras in two long-term care (LTC) facilities, and analyzed these video data to determine the frequency and mechanisms that contribute to hip impact during falls. We hypothesized that risk for hip impact would depend on fall direction (being higher in sideways falls than falls in other directions). We also hypothesized that protective responses (such as hand impact) would decrease risk for hip impact.

METHODS

Over a 39 month period, we video-captured 219 real-life falls experienced by 130 residents in two long-term care (LTC) facilities in the Vancouver area. All falls occurred in common areas of the facilities. Each video was analyzed by a team using a validated, structured questionnaire to determine whether impact occurred to the hip or hand, the cause of imbalance, the fall direction just after imbalance and at landing, and attempts to recover balance by stepping or grasping. These data were input with age and gender to a generalized linear statistical model to determine the factors that associated with the probability of hip impact.

RESULTS

Hip impact occurred in 48% of falls. Risk for hip impact was influenced by initial fall direction (p≤0.001), being higher in forward and sideways falls (probability = 0.61 and 0.71, respectively) than in backward or straight down falls (probability= 0.32 and 0.33). Risk for hip impact also associated with landing configuration (p≤0.001), being higher in sideways configurations (probability=0.95) than forward or backward (probability= 0.0 and 0.38). 33% of falls initially directed forward resulted in a sideways landing configuration, and 36% of falls initially directed sideways ended in a backward landing configuration (Figure 1).

Impact to the hands or knees did not decrease the risk for hip impact. Furthermore, risk for hip impact did not associate with age, gender, cause of imbalance, and attempts to recover balance by stepping or grasping.

Figure 1: Video-captured falls in older adults residing in LTC facilities. A) The resident lost balance by “tripping”. She initially fell forward but landed sideways, impacting her hip. (B) The resident lost balance due to “leg collapse”. He fell backwards but landed sideways, impacting his hip. (C) The resident lost balance due to “incorrect transfer”. She fell sideways but landed backwards, avoiding an impact to her hip.

DISCUSSION & CONCLUSIONS

We analyzed video footage of real-life falls experienced by older adults in LTC, and found that hip impact was equally likely in falls initially directed forward as sideways. This was due to the tendency for axial rotation of the body in the backward direction during descent, causing forward falls to result in a sideways landing configuration, and sideways falls to result in a backward landing configuration. Risk for hip impact was lowest in falls that were initially directed backward or straight down. Impact to the hand did not reduce risk for hip impact. Furthermore, risk for hip impact did not depend on age, gender, cause of imbalance, and attempts to recover balance. These results should contribute to improvements in risk assessment and exercise-based strategies to reduce risk for hip fracture in older adults.

REFERENCES