

AUT PARAMEDICINE RESEARCH DAY 2025

Factors Associated with Mortality Among Falls Patients not Transported by Ambulance: A Retrospective Cohort Study in Aotearoa New Zealand

S. Dijkstra¹, VF. Todd, G. Howie, B. Dicker

¹MHPrac, BHSc (Para), BSc (Anat), MACPara



INTRODUCTION

- In Aotearoa New Zealand (AoNZ), falls and motor vehicle accidents are the two most common mechanisms of injury among trauma patients across all age groups ⁽¹⁾.
- Falls can result in serious injury, disability, or death, with older individuals who experience a fall facing a significantly higher risk of subsequent falls ⁽²⁾.
- Over 40% of those aged 65 and older experience at least one fall annually, and falls-related visits account for 20% of emergency department presentations in this age group ⁽³⁾.
- Due to aging populations, population growth, and the increasing burden of chronic diseases, the incidence of falls is expected to rise ⁽⁴⁾.
- Mortality rates associated with falls are substantial; for individuals over 70, falls are the leading cause of traumatic death⁽²⁾.
- Beyond direct mortality and morbidity, the fear of falling can lead to restricted movement and depression ⁽²⁾. This, in turn, can result in social isolation, loneliness, and overall diminished wellbeing ⁽⁵⁾.
- Hato Hone St John reported that in 2023, 7.4% (30,804) of all ambulance attendances were due to low acuity falls ⁽⁶⁾.



AIM

- Approximately one in five patients attended by ambulance in AoNZ are not transported from the scene ⁽⁷⁾.
- The aim of this study was to examine patients who were attended by ambulance following a fall but were not transported from the scene.
- We sought to define the rate of 30-day mortality for these patients and determine whether this rate varies based on patient demographics, characteristics, and clinical findings.

RESULTS

POPULATION CHARACTERISTICS

- Sex:
 - 44.1% male (n=6,082)
 - 55.8% female (n=7,694)
 - 30-day mortality: More males died (61.7%, n=317) compared to females (38.3%, n=197) (p<0.05)
- Age:
 - 72% were over 66 years (n=9,923)
 - 13.7% were 46-65 years (n=1,893)
 - 8.5% were 16-45 years (n=1,167)
 - 5.8% were 15 or younger (n=801)
 - 30-day mortality: Higher mortality in those >66 years (88.7%, n=456), lower in younger groups (p<0.05)
- Ethnicity:
 - 82.8% New Zealand European/Other (n=11,449)
 - 10.4% Māori (n=1,424)
 - 1.9% Pacific (n=254)
 - 2.6% Asian (n=355)
 - 30-day mortality: Higher death rate among Europeans/Others (89.3%, n=459), lower among other ethnicities (p<0.05)
- Location of Care:
 - 80.8% treated at home (n=11,130)
 - 10% in public locations (n=1,374)
 - 9.2% in aged care, healthcare, or other locations (n=1,280)
 - 30-day mortality: Higher mortality in aged care (9.1%, n=47) and home (85.2%, n=438) compared to other locations (p<0.05)
- Deprivation Index:
 - 27.5% in low deprivation areas (n=3,783)
 - 51.7% in high deprivation areas (n=7,132)
 - 30-day mortality: Higher in low deprivation areas (32.3%, n=166) and lower in high deprivation areas (45.3%, n=233) (p<0.05)

CLINICAL CHARACTERISTICS

- Final Clinical Status:
 - 17.2% status 3 (n=2,369)
 - 81.8% status 4 (n=11,276)
 - 1% status 0-2 (n=138)
 - 30-day mortality:
 - Higher survival rate in status 4 patients (82.5%, n=10,949)
 - Higher death rate in status 3 patients (25.7%, n=132)
 - Higher death rate in status 0-2 patients (10.5%, n=54) (p<0.05)
- Initial Temperature:
 - 12.5% low (n=1,723)
 - 69.2% normal (n=9,539)
 - 1.6% high (n=216)
 - 16.7% no temperature recorded (n=2,306)
 - 30-day mortality:
 - Higher survival rate in patients with normal temperature (69.6%, n=9,235)
 - Higher death rate in patients with low (16.5%, n=85) or high (3.1%, n=16) temperatures (p<0.05)
- Heart Rate:
 - 69.6% normal (n=9,599)
 - 19.9% mildly tachycardic (n=2,739)
 - 5.3% significantly tachycardic (n=728)
 - 0.5% bradycardic (n=69)
 - 4.7% missing (n=649)
 - 30-day mortality:
 - Lower death rate in patients with normal heart rate (57.2%, n=294)
 - Higher death rate in significantly tachycardic patients (9.7%, n=50) (p<0.05)

METHOD

- This retrospective cohort study examined non-transported fall patients attended by ambulance.
- We included all patient attendances by Hato Hone St John. This study utilised deidentified information from the ePRF database with ethics approval for research using the Aotearoa New Zealand, Paramedic Care Collection (ANZPaCC) from the Northern B Health and Disability Ethics Committee (2022 FULL 13415).
- The dataset included 313,056 patients attended between 1 Jan 2023 and 30 Sep 2023.
- The outcome variable was 30-day mortality following ambulance attendance and non-transport. Mortality data was provided by Manatū Hauora (Ministry of Health).
- Variables were categorized and presented as totals and percentages. A Pearson Chi-square test (χ^2) was used to compare nominal variables, with p<0.05 considered significant.

Screening

- In total 13,784 patients met eligibility criteria and were attended by ambulance following a fall resulting in a non-transport, of whom 514 (3.7%) died within 30 days.

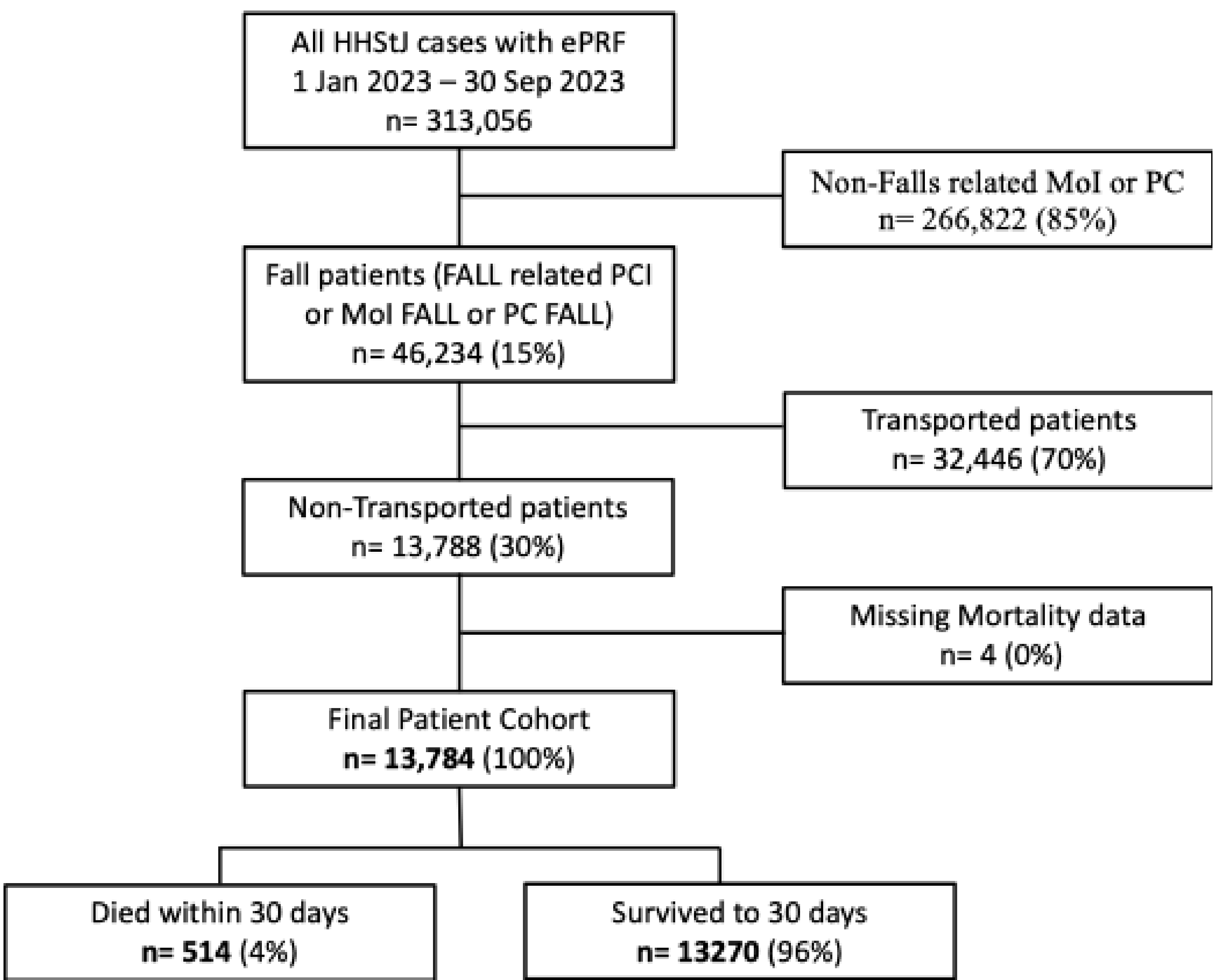


Figure 1. Inclusion and exclusion criteria for cases included in study HHSTJ, Hato Hone St John; ePRF, Electronic Patient Report Form; MoI, Mechanism of Injury; PC, Presenting Complaint; PCI, Primary Clinical Impression.

KEY FINDINGS & CONCLUSIONS

- This study found that 30% of patients attended by ambulance following a fall were not transported from scene.
- We identified a total 30-day mortality rate of 3.7% among falls patients that are not transported; significantly higher than a mortality rate of 1.9% previously reported among all low-acuity patients not transported from scene by ambulance ⁽⁸⁾. This draws into question the safety of non-transport decision-making in this context.
- The majority (88.7%) of all deaths in this study occurred in individuals over the age of 65 highlighting the increased clinical risk associated with non-transport in elderly patients following a fall.
- Of concern, 16.7% of patients had no temperature recorded, this is a requirement under clinical practice guidelines and a crucial assessment in the context of falls.
- Further research is needed to understand these findings and improve patient safety, possibly by integrating demographic risk factors into guidelines or using NZEWS to aid decision-making.

Increases in 30-day mortality were observed in male patients, older patients, patients from areas of low deprivation, and those located at home or in aged care facilities.

A lower clinical status, abnormal heart rate, and abnormal temperature findings were all associated with increased 30-day mortality.

REFERENCES

1. Montoya L, Kool B, Dicker B, Davie G. Epidemiology of major trauma in New Zealand: a systematic review. The New Zealand Medical Journal (Online). 2022;135(1550):86-110. <https://doi.org/10.1136/njnyjprev-2021-safety95>

2. Salari N, Darvishi N, Ahmadipanah M, Shohaimi S, Mohammadi M. Global prevalence of falls in the older adults: a comprehensive systematic review and meta-analysis. Journal of Orthopaedic Surgery and Research. 2022;17(1):334. <https://doi.org/10.1186/s13018-022-03222-1>

3. Mikolaizak AS, Simpson PM, Tiedemann A, Lord SR, Caplan GA, Bendall JC, et al. Intervention to prevent further falls in older people who call an ambulance as a result of a fall: a protocol for the IPREFER randomised controlled trial. BMC Health Services Research. 2013;13:1-8. <https://doi.org/10.1186/1472-6963-13-360>

4. Snooks HA, Anthony R, Chatters R, Dale J, Fothergill RT, Gaze S, et al. Paramedic assessment of older adults after falls, including community care referral pathway: cluster randomized trial. Annals of Emergency Medicine. 2017;70(4):495-505. e28. <https://doi.org/10.1016/j.annemergmed.2017.01.006>

5. Petersen N, König H-H, Hajek A. The link between falls, social isolation and loneliness: a systematic review. Archives of gerontology and geriatrics. 2020;88:104020. <https://doi.org/10.1016/j.archger.2020.104020>

6. Hato Hone St John. Breakdown of emergency ambulance incidents by clinical impression 2024 [Available from: https://www.stjohn.org.nz/globalassets/documents/national-performance-statistics/op3610-ambulance-incidents-clinical-breakdown_may24v4.pdf].

7. Todd VF, Swain A, Howie G, Tunnage B, Smith T, Dicker B. Factors associated with emergency medical service reattendance in low acuity patients not transported by ambulance. Prehospital Emergency Care. 2022;26(1):66-77. <https://doi.org/10.1080/10903127.2020.1862943>

8. Todd VF, Moylan M, Howie G, Swain A, Brett A, Smith T, et al. Predictive value of the New Zealand Early Warning Score for early mortality in low-acuity patients discharged at scene by paramedics: an observational study. BMJ open. 2022;12(7):e058462. <https://doi.org/10.1136/bmjopen-2021-058462>