Competing Risk Methods for Fracture Risk Assessment in Older Adults

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Introduction

Cause-specific hazard (csH) and sub-distribution hazard (sdH) regression are competing risk (CR) methods suited for etiologic and prognostic questions, respectively[1]. Using both could provide greater insights on how risk factors relate with events of interest in the presence of CR[2]. However, the evidence on the application of the two methods is limited. We investigated the robustness of the results using both for CR of mortality in determining factors that were associated with i) incident fragility fracture (FF), & ii) incident major osteoporotic fracture (MOF) among older adults.

Methodology

Data from the Global Longitudinal Study on Osteoporosis in Women (GLOW) study, Hamilton cohort were used to assess the risk of fracture among women aged ≥ 55 years. Cause-specific & sub-distribution hazard CR methods were used to account for the CR of death. The resulting estimates were compared by visual assessment and by computing the relative differences between the hazard ratios (RDHR).

Results

257 (6.5%) had a FF, 142 (3.6%) had a MOF, and 103 (2.6%) died before a fracture. Prior fracture & frailty were associated with fragility fracture while BMI & smoking were additional factors associated with MOF. The results from both methods were similar in magnitude, direction,& statistical significance, and the largest relative difference between the effect estimates was 6.5%.

Fragility Fracture	csH		sdH		
Characteristics	aHR (CI)	p	aSHR (CI)	p	RDHR (%)
Prior fracture Yes	1.90 (1.40 – 2.59)	<0.001	1.87 (1.38 – 2.53)	<0.001	1.6
Frailty status Frail	2.14 (1.50 – 3.04)	<0.001	2.00 (1.32 – 3.01)	0.001	6.5
MOF					
BMI (kg/m^2)	0.83 (0.69 – 0.99	0.038	0.83 (0.70 – 0.99)	0.033	0.0
Prior fracture Yes	2.09 (1.43 – 3.07)	<0.001	2.02 (1.35 – 3.03)	0.001	3.3
Parental fracture Yes	1.72 (1.12– 2.65)	0.013	1.74 (1.13 – 2.68)	0.011	1.2
Frailty status Frail	2.83 (1.80 – 4.45)	<0.001	2.65 (1.58 – 4.44)	<0.001	6.4

Conclusions

CsH and sdH methods for fracture risk assessment where CR of death is present may yield numerically similar estimates, with short observation & heavy censoring of data due to low event rate. In such cases, the research objective should determine what method is more appropriate for the primary analysis.

References

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Biography

Chinenye Okpara is a 3rd year PhD student in the Department of Health Research Methods, Evidence and Impact at McMaster University, Canada. She has a Masters in Public Health from the University of Sheffield, UK. Her primary research interest is in the development, improvement, and application of methods for the design, conduct and analysis of clinical trials and cohort studies. Specifically, she is interested in how these methods are applied to studies on special populations including pregnant women, children, and the elderly, who require additional consideration in health research. Her PhD thesis focuses on methodological issues in longitudinal studies of older adults.

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