LARGE SCALE PROPENSITY SCORE MATCHING WITH TIME-STRATIFICATION IN OLDER WOMEN WITH OR WITHOUT FRACTURES IN THE UK

Xihang Chen[1], Trishna Rathod-Mistry[1], Gianluca Fabiano[1], Antonella Delmestri[1], Alireza Moayyeri[2], Joshua Warden[2], Rafael Pinedo-Villanueva[1], Eng Hooi Tan[1]

Contact: cheryl.tan@ndorms.ox.ac.uk

Affiliations: [1]Nuffield Department of Orthopaedics, Rheumatology, and Musculoskeletal Sciences, University of Oxford, Oxford, United Kingdom, [2]UCB Pharma, Slough, United Kingdom

Acknowledgement: This project was funded by UCB Pharma and Amgen Inc.

Background

Comparable cohorts need to be defined to estimate the healthcare costs and resource use over a 2-year period attributable to osteoporotic fractures

Objective

To evaluate the performance of data-driven large scale propensity score (PS) matching in patients with

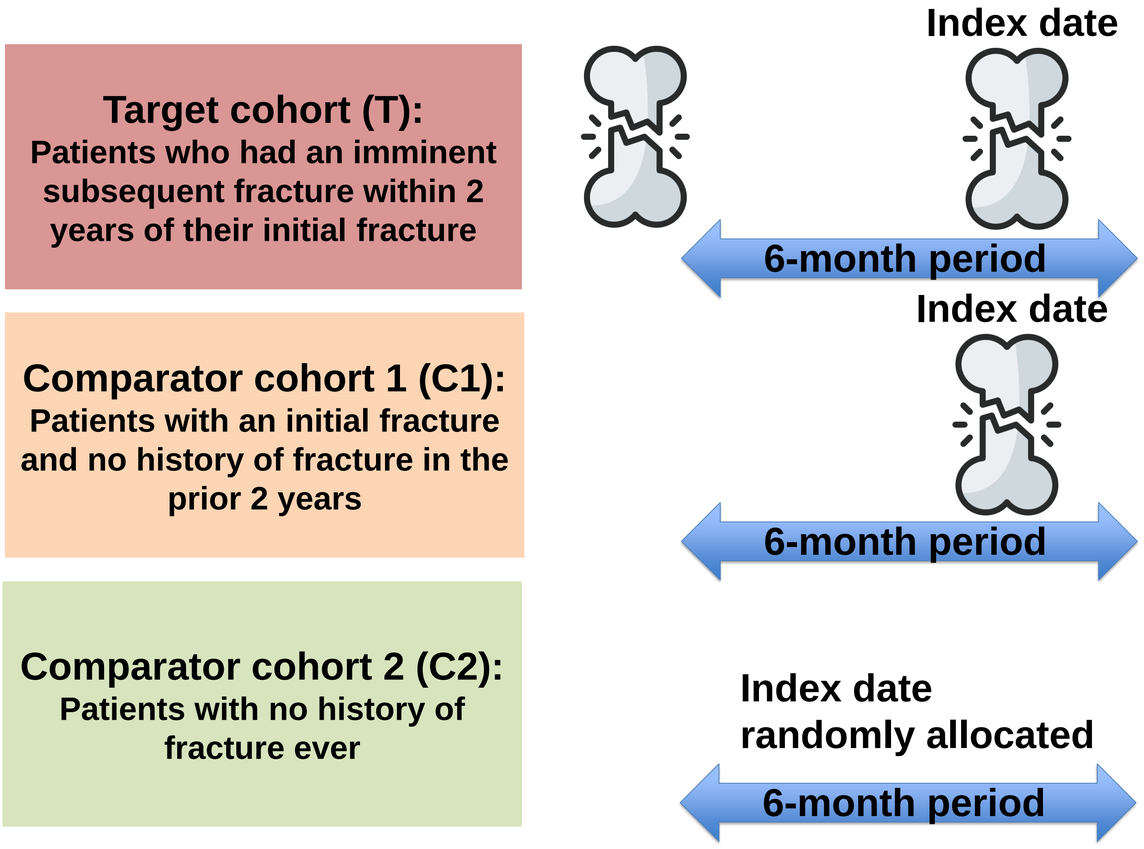
1) imminent subsequent fracture occurring within 2 years of their initial fracture compared to patients with only an initial fracture
2) initial fracture compared to patients without a fracture

Methods

Design: Time-stratified propensity score matched cohort study
Setting: Primary care (CPRD AURUM, UK) linked with hospital databases (HES) mapped to the OMOP CDM [1]
Study period: 01 April 2010 to 31 March 2018, divided into 6-month periods to account for seasonality of fracture occurrence.
Participants: Women aged ≥50 years who met the eligibility criteria were included in three different cohorts (Figure 1)

- ≥ 730 days of prior observation time
- No history of cancer or metabolic bone diseases

Figure 1. Study design



Statistical analysis:

- Large scale L1 regularised (LASSO) regression to identify from 7,479 candidate covariates, defined using individual concept codes, those predictive of fractures.
- Selected covariates included in a logistic regression model to compute the PS separately for cohorts T-C1 and C1-C2.
- Age and PS matching (1:5) was performed for the first 6-month period, and this process was repeated on an iterative rolling basis over calendar time.
- Cohorts were deemed comparable if covariates had absolute standardised mean difference (ASMD) <0.1

Author Disclosures: XC, **TRM**, **GF**, **AD**, **EHT:** Nothing to declare; **AM:** Employee and shareholder of UCB Pharma; **JW:** Employee of UCB Pharma; **RPV:** Research funding from Amgen, Fondation privée des HUG (Geneva, Switzerland), the International Osteoporosis Foundation, Kyowa Kirin Services, the Royal Osteoporosis Society and the UK NIHR. Lecture fees and/or consulting honoraria from Amgen, Astellas, the International Osteoporosis Foundation, Mereo Biopharma and UCB Pharma. .

*Image: Flaticon.com

[1] Hripcsak G, et al. Observational Health Data Sciences and Informatics (OHDSI): Opportunities for Observational Researchers. Stud Health Technol Inform. 2015;216:574-8

Results

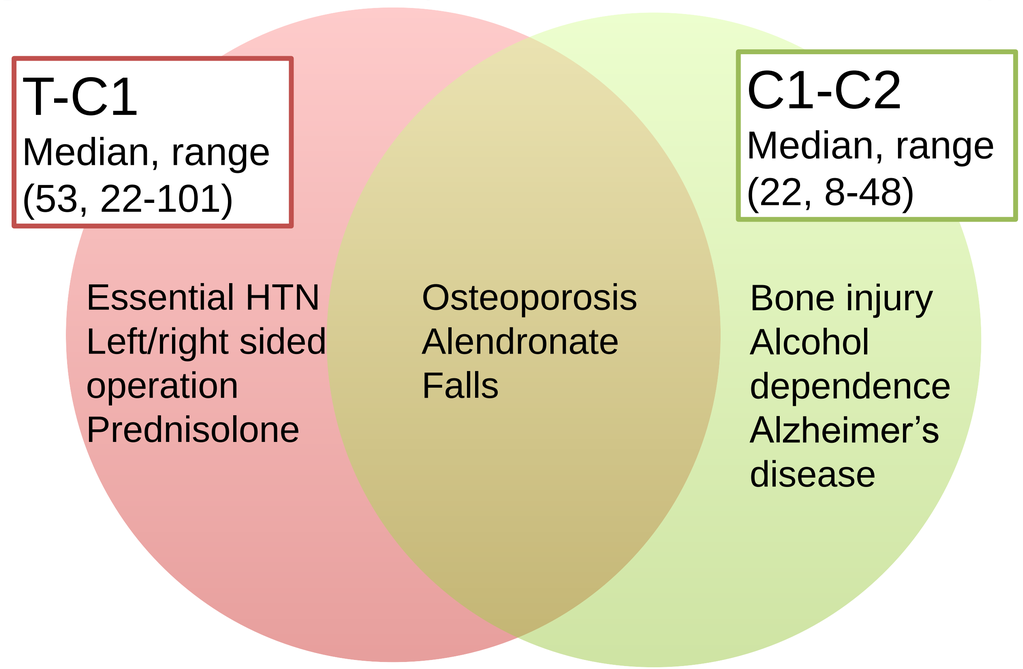
- Before matching, patients with fracture (T and C1) were older and in poorer health than women in the comparison cohorts (Table 1)

Table 1. Selected patient characteristics before and after matching

Char.	Before matching			After matching (T-C1)		After matching (C1-C2)	
	T	C1	C2	T	C1	C1	C2
N	11,836	56,237	432,677	10,790	39,827	55,767	157,692
Median age, yr	77	72	63	76	74	72	72
CKD, %	24	20	11	22	21	20	21
CVD, %	50	40	21	47	44	40	37
HTN, %	58	50	36	55	54	50	51
Ost, %	43	22	4	39	26	22	15
SC, %	16	13	8	15	14	13	12

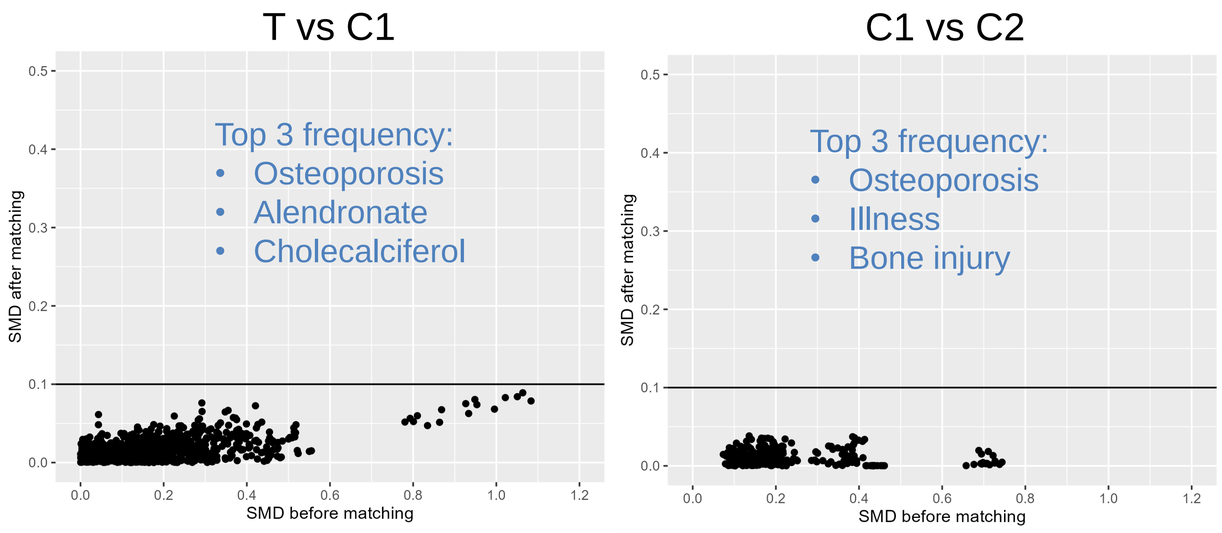
Char: characteristic; CKD: chronic kidney disease; CVD: cardiovascular disease; HTN: hypertension; N: number of patients; Ost: osteoporosis; SC: systemic corticosteroids

Figure 2. Number and examples of selected covariates across periods



- LASSO regression selected higher number of covariates in T-C1 as compared to C1-C2 (Figure 2)
- All covariates in both matched cohorts had ASMD < 0.1 (Figure 3)
- Although fewer selected covariates in the C1-C2 matched cohort, confounders e.g. CVD had ASMD < 0.1, despite unspecified in the PS.

Figure 3. Covariate balance before and after matching



Conclusions

- Data-driven PS matching selected different number of covariates across comparison groups and calendar time periods.
- Covariate balance was achieved after

(1) large number of proxy covariates was selected when comparing women with subsequent fractures to those with single fracture;
(2) limited number of key covariates with clinical importance was selected when comparing women with fracture to those without.