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Title	**Comparison of two different fracture risk estimation processes in Alberta: a cross-sectional chart review**
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Reviewer 1	Dr. IR Reid
Institution	Aukland NZ
General comments and author response	**This study demonstrates the difficulties in classifying patients according to their fracture risk. All estimates are an approximation only, and changing the instrument used will frequently give a different answer. This has practical importance to doctors and patients who are basing treatment decisions on these calculators.** **1. My only question relates to the difference in ascertainment of fractures between the radiology practices and the clinics. Is some of that difference attributable to the fact that CAROC only considers fractures occurring after the age of 40 whereas FRAX includes any fracture occurring in adulthood.** *We have added the following sentence to the Discussion (Page 13, Paragraph 2) to address this important point:* *"Although data regarding timing of prior fractures were not available for all patients in this study, the discrepancy may relate, in part, to the fact that BMD risk assessments (using CAROC) incorporate fractures sustained after age 40, while clinic assessments (using FRAX) incorporate all fractures sustained in adulthood."*
Reviewer 2	**Dr. Adrian Lau**
Institution	Women's College Hospital
General comments and author response	**A great, timely study. Definitely agree that reported fracture risk conclusions on BMD reports do not match the fracture risk derived on clinical assessment.** **There were quite a number of different factors that this study assessed: BMD report vs clinical assessment; CAROC vs FRAX; adequacy / accuracy of reported fractures, etc.** **Some questions for thought:** **1. If the fracture risk assessment from the clinical assessment was performed using CAROC instead of FRAX, would the discrepancies be similar?** *A total of 38 patients had different fracture risk factors listed on their BMD report than ascertained in clinical consultation, which would have resulted in a change in CAROC risk categorization had it been calculated in the clinical setting. Differing fracture history was observed in 36 patients, differing glucocorticoid history in 1 patient, and differing fracture and glucocorticoid history in 1 patient. Assessment of risk with CAROC using*

	the risk factors listed in the clinic chart resulted in a change from discordant to concordant in 19 of these patients, concordant to discordant in 15 patients, and no change in risk categorization in 4 patients. Overall discordance between BMD reports and clinical estimates would therefore be present in 95 (50%) of patients as compared to 99 (52%) using this strategy. *The effects of calculating fracture risk using CAROC in individuals who had a history of fracture identified as part of clinical assessment that was not indicated in the BMD report are described in the Results, as follows, and could be expanded upon if requested:* *"Of the 37 patients with inconsistencies in fracture history between BMD reports and clinic charts, 28 had a history of fracture reported in their clinic chart but not their BMD report. We considered how the inclusion of these fractures in the CAROC-generated risk estimate provided on the BMD report would affect risk category discordance for each of these patients. For 13 of 28 (46.4%), inclusion of the fracture would result in a change from concordant to discordant, while for 12 (42.9%), inclusion of the fracture would result in a change from discordant to concordant. For the remaining three patients, including the fracture in the CAROC-generated risk estimate would not affect the agreement in risk categorization."* **2. Were all the BMDs reported by radiologists? in the community setting? Are there BMDs reported by clinicians? or performed in the academic setting? I tend to find that certain BMD centres have more thorough processes with their patient questionnaires, which may result in more accurate information - ie also inquiring into bones that were fractured, and mechanism of fracture, etc, as opposed to a simple question of "fragility fracture y/n?" Were there patients who had BMDs at your centre - perhaps reported by clinicians, and were then also assessed in the clinic? Might the discrepancy in their fracture risks be different?** **Not sure if you may have answers to the above, but may certainly add more to your already very valuable study.** *In our health region, all BMD reports are provided by radiologists. Clinicians are not permitted to report BMDs. Although some academic (research) centres provide BMD reports to patients and their physicians, this is not standard practice. All patients included in the present study had a community-based BMD, reported by a radiologist.* *The following section of the Methods (Page 6, Paragraphs 2 and 3) has been reworded to clarify the BMD reporting process:* *"In our health region, BMD acquisition is conducted at community-based radiology offices and all BMDs are reported by radiologists.* *Included patients were postmenopausal women who had a community-based BMD measurement within the 24 months prior to consultation*

	where the report included femoral neck T-score and a fracture risk statement." *We concur with the reviewer that the process used to ascertain clinical risk factors may dictate whether a risk factor is accurately reported, particularly in the case of prior fractures. We agree that it would be interesting to evaluate discrepancies in clinician-reported BMDs and clinical assessment in a future study.*
Reviewer 3	Dr. Lianne Tile
Institution	University Health Network, Toronto, Ont.
General comments and author response	**Thanks for a well conceived and clearly presented study addressing an important problem in clinical osteoporosis care.** **1. CAROC and FRAX are both used in clinical encounters. Is there evidence that FRAX is favoured in clinical encounters (as you state on page 4)? Why is only FRAX used in this clinic?** *We favour the use of FRAX in our osteoporosis clinic as it has been shown to more accurately predict fracture incidence in the Canadian population than CAROC (see Leslie et al, Osteoporosis Int 2016; 27:2689-2695 as cited in the manuscript).* **2. Were these patients treatment naïve, or some on treatment?** *Prior treatment was not a criteria for exclusion, and so some patients had been previously treated.* **3. Your results differ from other studies which report higher level of concordance between CAROC and FRAX. You suggested in your discussion that clinical assessment may explain this. Which aspects of the clinical assessment had most impact on discordance? Did having a BMD within 24 months prior to being seen have an effect on discordance? Because risk factors could be acquired after the BMD is done, but before the clinical encounter.** *This is a good point. Although data regarding timing of prior fractures were not available for all study patients, it is possible that some discrepancies in fracture history between BMD reports and clinical assessments could result from fractures sustained after the patient underwent BMD but prior to the clinic assessment. We have added the following sentence to the Discussion (Page 13, Paragraph 2) to reflect this:* *"Additionally, some discrepancies may have resulted from fractures sustained after the BMD was done but before the clinical assessment."* *It may be seen in the Results (Page 10, Paragraph 2) that discrepancies in clinical risk factors listed on BMD reports and used in clinic fracture risk assessments were not associated with a higher likelihood of discordant*

	risk categorization when the entire study population was considered. However, at the individual level, discrepancies in clinical risk factors common to CAROC and FRAX (i.e. glucocorticoid use, prior fracture) impacted concordance in the majority of patients. That is, of 38 patients with different risk common factor status listed on BMD reports and clinic charts, adjustment of CAROC-estimated risk to align with the risk factors reported in the clinic chart resulted in changes from discordant to concordant or vice versa in 34 (89%). **4. There are subtleties to CAROC including T score of less than or equal to -2.5 at any site implying at least Moderate risk, and hip fracture, vertebral fracture, or two or more low trauma fractures automatically being high risk. This doesn't always mean high risk by FRAX. You mention this in the discussion, but it would be helpful to know if this explained discordance, and if so how much.** *We thank the Reviewer for this thought-provoking observation, and recognize that incorporation of additional risk factors beyond prior fracture and glucocorticoid use (i.e. T-score <-2.5, multiple fragility fractures, prior hip or vertebral fracture) have the potential to change risk categorization when using CAROC. It would be very helpful to determine how many cases of discordance could be explained by these nuances. Unfortunately, the majority of BMD reports in our health region do not provide details regarding number and location of prior fractures and so it is not possible to determine how many patients had CAROC risk estimates that were dependent on these risk factors.* *From a very practical standpoint, we find that many practitioners feel compelled to use the CAROC-derived fracture risk reported by the radiologist regardless of additional factors that you rightly point out. Thus, our goal was to point out how different these risk estimates can be as they are often the basis upon which treatment decisions are made. Substantial discrepancy may lead to over- or under-treatment of patients.* **5. This was a specialty osteoporosis clinic population, although the patients were fairly low risk. Do you think that introduced bias?** *We agree that the patient population used in this study may have introduced bias. Specifically, it is not known whether patients with similar BMD-generated fracture risk profiles who do not get referred for specialty osteoporosis consultation are equally as likely to have discordant fracture risk categorization if fracture risk is assessed in general practice.* *We have added the following sentence to the Discussion (Page 16, Paragraph 1) to address this limitation:* *"This study was conducted at a single tertiary osteoporosis centre, and although our centre uses standard clinical evaluation and tools for risk assessment that are accessible and similar to any specialist or clinic across Canada, it is not known whether our results can be generalized to general practice or other geographic locations."*

	6. **This is an important and useful study that raises important concerns about accuracy and variation in fracture risk assessment, and how this needs to be harmonized.** *Thank you!*