Author’s response to reviews

Title: A cross-sectional study examining convergent validity of a frailty index based on electronic medical records in a Canadian primary care program

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Author’s response to reviews:

Dear editorial team,

We have substantially revised our article “A cross-sectional study examining convergent validity of a frailty index based on electronic medical records in a Canadian primary care program” to address all of the reviewers’ comments. Our response will be shown in italics, subsequently for each point.

Reviewer reports:

Wei-Ju Lee (Reviewer)

1): The study examined the convergent validity between eFI and Fi-CGA in the Canadian primary care setting by using an analytic method of correlation coefficients. In general, I don't think the topic is novel and interesting enough for readers of BMC Geriatrics.

Response: As mentioned in the manuscript, the eFI is based on the deficit accumulation approach to frailty. This approach identifies frailty based on a range of variables (e.g., signs, symptoms, diseases, disabilities, impairments, abnormal test values) collectively referred to as health deficits.1 According to this model, frailty can be measured by calculating a frailty index (FI) that can be generated from any appropriately populated healthcare database2–4 provided that there is
a sufficient number of health deficits that satisfy certain criteria. 3, 5 Primary care electronic medical records (EMRs) contain rich data on a patient’s health and psychosocial context that make it a promising dataset to generate an eFI. The gap in knowledge that this project aimed to address was that despite the eFI being widely available in the UK, other frailty measures based on routinely available electronic health data are not yet widely available internationally. There are differences in how electronic health data is recorded internationally, as we describe in Canada, but this does not take away from a growing interest in the development of frailty measures based on routinely available data. This project’s results of providing evidence for convergent validity for the eFI generated from this Canadian Primary care environment provides support for the use of the 36 deficit list in this EMR system (i.e. outside of the UK). Granted more research is needed to understand its performance in Canadian EMR data and in a more representative community sample, this paper advances the rationale to do so and adds to the body of knowledge of frailty identification in the primary care setting.

Only 85 participants recruited from a single senior's community hub, which may result in selection bias and limit generalizability.

Response: We agree with this point and it has been mentioned in study limitations, “An important limitation was that the study sample was small; nevertheless, the 95% confidence interval was narrow, which indicates a statistically significant correlation even in such a small sample size. In addition, the sample consisted of community-dwelling older adults, not living in long-term care facilities, that were identified by family physicians as having ongoing concerns (in many cases, multiple concerns), and thus received an assessment by the SCH. This may limit the generalizability of the study findings to the very fit/robust or more functionally dependent or severely frail older adult populations.”

The authors examined the convergent validity with a fair correlation (r>0.7), but did not examine the criteria validity. Criteria validity would help us to understand sensitivity and specificity of the new tool before implementing in a large scale.

Response: We added to the manuscript the following: “Other limitation is that the cross sectional design does not allow to compare the predictive performance of the eFI and FI-CGA, however the FI-CGA and eFI FI-CGA have been previously validated based on its ability to predict individuals at higher risk of adverse health outcomes.”

Dae Kim, MD, MPH, ScD (Reviewer 2): General Comments

Major Comments

1. The eFI here was manually calculated by a trained research assistant by manual review of all EMR information available (billing codes, diagnostic codes, problem list, medication list, and free-text notes), which is very different from automated calculation of eFI based on Read codes at the point of care in UK. Thus, the work presented here is not an evaluation of eFI. Although
it is not easy to implement eFI in the primary practices participating in this study, the manual process of calculating eFI should mimic how eFI is calculated as much as possible (i.e., only limiting to billing codes and diagnostic codes).

Response: EMRs in Canada were developed for transactional patient management rather than reporting and much of the data is in narrative/open text form, especially deficits related to social vulnerability, mobility and care requirement. Multiple studies have shown that the combination of structured and unstructured data (ICD-9 codes, information about medications, laboratory values, visit notes) in EMR results in the best performance for disease identification. Therefore, a trained research assistant manually calculated the eFI scores from patient EMR using all available data sources (e.g. billing and diagnostic codes, problem list, medication list, and free text (visit notes)). As such, it differs from the eFI validated in the UK where over 2000 Read codes collected at point of care are used to populate 36 health deficits.

2. Another important information missing is how much ("look-back" period) of EMR data were used to calculate eFI. It is implied it did not include the actual CGA visit itself, but otherwise it is unclear. Obviously, detection of chronic conditions may improve as look-back period is applied. It also does not seem to be from the last visit, or from a single point in time as visit notes were used as a data source as well. Was there any minimal number of medical visits or minimal length of look-back period required for calculation of eFI?

Response: This point is now clarified in the manuscript: “Deficits were coded as 1 if present in the EMR data for that patient; and 0 if absent, whether the patient does not have that deficit or this information is missing in the EMR. All structured and unstructured data available starting 2012 (i.e. when the EMR was implemented in the participating clinic) was used for eFI calculation. For example, if chronic kidney disease was mentioned in 2013, the corresponding eFI deficit was checked off. However, for temporary conditions (e.g. anemia) the “look-back” period was one year. The eFI score was calculated by dividing the total number of deficits present by 36.”

Specific Comments

1. The r from the Pearson correlation will by definition match the simple linear regression's r², as they are computing the same thing. The p value from a simple Pearson correlation would also be expected to match that from the linear regression identically. Thus it's unclear why both are necessary.

Response: This is true. We eliminated the R2 reporting from the regression analysis to avoid this redundancy.

In the discussion (page 6, fourth paragraph), the authors discuss sex difference in FI-CGA levels. They do not discuss why the sex difference was not observed in eFI level.
Response: The eFI scores did not differ between males and females, which could be reflection of greater emphasis on comorbidities in eFI rather than functional measures as a core component of frailty.

2. As a cross-sectional analysis, lack of clinical outcomes does not allow comparing the predictive performance of eFI and FI-CGA. This should be mentioned as a limitation.

Response: This was addressed in manuscript “Other limitation is that the cross sectional design does not allow to compare the predictive performance of the eFI and FI-CGA, however the FI-CGA and eFI FI-CGA have been previously validated based on its ability to predict individuals at higher risk of adverse health outcomes."

Minor Comments

1. Abstract, line 50: type in Methods section "enrolment"- misspelling was corrected

2. Discussion, page 6, line 24: "celling" should be "ceiling".- misspelling was corrected

References:


