Reviewer's report

Title: A retrospective cohort study on the influence of UV index and race/ethnicity on risk of stress and lower limb fractures

Version: 1 Date: 27 November 2012

Reviewer: Aharon Finestone

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Major Compulsory Revisions
The authors followed up on a recommendation published by Craney et al. in Am J Clin Nutr in a review of evidence on the effect of vitamin D deficiency on health. They graded soldiers' Home Of Record state, with each of 144 cells given an annual average UV index level.

They then compared this with data on bone injuries as reported in the SADR, SIDR & HCSR/TED databases.

Having done power analysis (#=20%), the failure to find a relationship between UV index level & fractures should rule out this connection, with a likelihood of 80%.

First, I must commend the authors on their idea of using these data to this end. But I do have some concerns about the methods that should be addressed:

1) Codes for pathological fractures were included, as were codes for frank fractures. Readers would benefit from a break down into these 3 categories, before and after dedicated stress fracture codes were implemented. This would also support or cast doubt on the assumption in lines 140-2.

2) Vitamin D levels show considerable seasonal fluctuation. While this is probably true in southern states, in northern states where daylight is almost twice as long in the summer than in the winter, calculating annual averages seems incorrect. Monthly data being available, it seems only natural to break the data down by month or season of induction.

3) Studies based on diagnosis databases like this one, are limited by the coding system employed. While this might be effective for frank fractures, this is not necessarily accurate for stress fractures, where some time might elapse between the first encounter and the final diagnosis. To be clearer, a soldier complaining of tibial pain might be sent for an X-ray or a bone scan for a suspect tibial stress fracture. In the majority of cases, the diagnosis is negative. But the clinician at the first encounter would probably have to code "stress fracture". This source of noise needs to be discussed, in light of what is customary in the relevant military clinics.

So, in all, the study is trying to correlate a crude measure of sunlight exposure to a crude measure of stress fractures, which is supposed to be mediated by vitamin D. Obviously, the authors failed to find the expected relationship. Is the
data able to support a lack of relationship (with 80% certainty)? In my opinion, the problems I have mentioned prevent that conclusion. I therefore think that with further analysis, this data is worthy of publishing, but these limitations must be stated, together with the fact that, as the data is presented currently, there is no clear "take home" message.

Minor Essential Revisions:

Specific comments:

1) Background: UV index is usually used in connection with the risk of UVA radiation. Vitamin D synthesis is by UVB. My brief review of Pubmed failed to find a good source connecting UV index and vitamin D levels. This should be discussed. Also see Fioletov VE, McArthur LJ, Mathews TW, Marrett L. On the relationship between erythemal and vitamin D action spectrum weighted ultraviolet radiation. J Photochem Photobiol B. 2009 Apr 2;95(1):9-16. Epub 2008 Dec 24.

2) The introduction does not make a clear case for the necessity of the study. Did the authors think that a positive finding might justify screening for HOR, ad if in certain areas measure vitamin D or supplement it?

3) It is not clear from the paragraph on statistics what models were tested in the logistic regression in order to see if UVI had any effect after correcting for the well known risk factors for stress fractures (age, gender, race, height, weight).

4) The beginning of the discussion repeats the results too overtly.

5) I think the authors should make a recommendation on further research or explain why they do not. It might be to test the relationship between HOR and vitamin D levels in a cohort of recruits (this would seem as justifiable as the present study).

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

'I declare that I have no competing interests.