Reviewer's report

Title: Mortality in Rheumatoid Arthritis (RA): Factors Associated with Recording RA on Death Certificates

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Reviewer: Keith Rose

Reviewer's report:

General Response:
This is an interesting and well written manuscript suggesting an under-representation of Rheumatoid Arthritis (RA) on death certificates. In this study, the authors take advantage of a cohort of 1328 patients with Rheumatoid Arthritis who were entered into a database between 1996 and 2009. They then evaluated the death certificates of the 325 known deaths from this population, and found that only 17.9% of the death certificates actually recorded RA in any form. They were then able to perform an analysis to determine which clinical variables made it more or less likely for Rheumatoid Arthritis to be documented on a death certificate.

The authors point to a potential problem with the omission of RA as a diagnosis on death certificates which could potentially have downstream effects, i.e. evaluation of disease prevalence/surveillance, public health records, effects on research priorities and grant funding. Similar findings have been published concerning other disease states such as Hepatitis C, and Alzheimer’s dementia, and it is becoming an increasingly important area of focus. One of the main concerns with these type of evaluations however is determining if the diagnoses were missed (omission error) or simply not related to the cause of death.

I have some specific comments and questions relating to this article below, but I first thought it would be helpful to briefly describe an overview of death certificates.

Death Certificate formats in the US are somewhat variable depending on the locality, but they all adhere to a standard format put forth by the National Center for Health Statistics (NCHS). Part 1 of a death certificate identifies the immediate, intermediate and underlying causes of death (CODs). This is done in a causative chain, where the underlying disease or condition causes the intermediate one, which in turn causes the immediate condition leading to death. The underlying COD is generally considered by most public health experts to be the most important as it captures the chronic illness that ultimately leads to death.

Part 2 of the death certificate captures other CODs that may have contributed to the death but were not directly causative. There is no place on a death certificate to capture underlying diseases that do not contribute to the cause of death.

Below are my specific comments. I believe that this article contributes to current literature, and is an inter
Major Points:

1. The authors that RA is often underreported on death certificates. It is difficult however to interpret the lack of RA documentation on these death certificates as being an omission error. Indeed patients with RA tend to have a higher mortality rate, and many of the RA treatments put these patients at higher risk of other complications. However, we do not have enough information on what these specific patients died from. Many people may have RA and yet die of unrelated causes. Without going through these cases (chart review) it will be impossible to clearly determine if RA should have been included and was for whatever reason omitted. The difference is whether these people are dying with a disease versus from a disease. A chart review of these cases (at least the patients that died in the hospital) might prove very interesting, and perhaps make the author's points stronger. This should at least be better highlighted in the discussion.

   a. Of note, this is in keeping with the finding that the greater number of co-morbidities was inversely associated with putting RA on the death certificate and that the greater number of deformities increased the likelihood, presumably owing to more significant or severe disease. These patients may have been dying of other things.

2. Were the patients in the cohort being followed after 2009? If so, how often? If not, how was the ante-mortem data obtained after this period?

3. Numerous studies have found death certificates in general to be unreliable and inaccurate, though efforts are underway to improve this. For instance, it has been well documented that cardiovascular disease is generally over-represented. This study could potentially add to the identification of areas for errors. as has been shown in prior studies with RA. The last point to this is with a CV.

4. The authors note that “only” 2 of the 58 death certificates containing an RA diagnosis actually have it listed as the immediate COD. This is not surprising, as RA would rarely be an immediate COD, (in fact I am a little surprised there were even two cases) but much more likely to play a role as an underlying COD. It would be helpful to know how often RA was documented as an underlying COD, vs listed as a contributing factor in Part 2.

Minor Points:

1. There were 326 deaths yet only 325 were reviewed. What happened to this last case?

2. Identification of the deaths seems arbitrary. Were there any attempts to contact all the patients in the database? Was there follow up on these patients. It is not critical, but would be interesting to consider the mortality rate in the cohort.

3. Analysis ended in December 2013. Yet 16 months have passed since. Is there a cause for the delay?

4. Page 7 line 152. The authors state patients “who were older at the time of death” were more likely to have RA recorded on the death certificate. I believe you meant to write “younger” here.

5. Page 9 line 202- comma after because- does not belong there- need to

7. Page 9 line 216-218. “Given that there is…” Would reword this sentence.

**Level of interest:** An article of importance in its field

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**

'I declare that I have no competing interests