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ARTICLE DETAILS

TITLE (PROVISIONAL)	Quantifying the prevalence of frailty in English Hospitals
AUTHORS	Soong, John; Poots, Alan; Scott, Stuart; Donald, Kelvin; Woodcock, Thomas; Lovett, Derryn; Bell, Derek

VERSION 1 - REVIEW

REVIEWER	Rodriguez-Mañas, Leocardio GERIATRIC SERVICE GETAFE UNIVERSITY HOSPITAL SPAIN
REVIEW RETURNED	31-May-2015

GENERAL COMMENTS	<p>This manuscript addresses a relevant topic in the field of Geriatric Medicine: the prevalence of frail older adults attended in hospitalary settings and its evolution along the time. However the approach provided by the authors stems from a conceptual framework of frailty that raises many potential sources for bias and misunderstandings. Although it has been established that frailty is different from comorbidity and disability, they have used both as surrogates to define frailty. Moreover, as they have define frailty syndrome by the presence of "at least" one of these conditions, they have included older people meeting only one of them (i.e., falls, or dementia or depression). It is well-known that frailty is more prevalent in people suffering from those conditions, but many older people having these conditions are free from frailty. Thus a great potential for overestimation of the true prevalence exists. But in contrast the authors establish that they have found "a lower prevalence than predicted", suggesting that other sources of bias have produce and underestimation that compesates the other bias. Thus, although there is a bulk of data that will allow to study many other interesting issues about the profile of the older patients attended in acute facilities of those hospitals along the tiem, the approach chosen by the authors does not provid the right view about frail older adults. Because of that, in contrast with the assertion of the authors, I do feel that it does not provide a methodology to reliably quantify frailty.</p>
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REVIEWER	Rockwood, Kenneth Geriatric Medicine Dalhousie University Halifax, Nova Scotia, Canada
REVIEW RETURNED	07-Jun-2015

GENERAL COMMENTS	<p>Thank you for the opportunity to review this interesting paper. Briefly, Soong and colleagues used a very large (>50 million records) administrative database to test what they describe as a</p>
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	<p>novel way to estimate the prevalence of frailty. They identified a great number of codes that could reflect so-called "frailty syndromes", and, on the grounds that frailty syndromes are more likely to occur amongst frail people, estimated frailty burden as a fraction of hospital admissions (if that is what a "spell" means).</p> <p>The authors found that, against a background of sharply rising hospital admissions associated with death, patients with hospital codes that reflected frailty syndromes increased only gradually under the observation period from 2005 to 2013. Frailty syndromes were related to each other and to where they occurred and how this changed. Oddly, in most cases, very old people appear not to be over-represented (or only slightly so) for most syndromes, including dementia, if that is how the Figures on pages 35-38 are meant to be read.</p> <p>This is an interesting paper, but could be improved in my view, as follows:</p> <ol style="list-style-type: none"> 1. Regarding the exposures, being the frailty syndromes. Most of the items they code as frailty syndromes are clear-cut, but as below, anxiety/depression as a frailty syndrome seems debatable. Although, as the authors note, operational definitions vary, there is less disagreement about the essence of frailty being multiply determined risk, from a decreased capacity to respond to stressors. (This is laid out in a 2013 review, which also makes the case for viewing frailty in relation to frailty syndromes, as is done here. The ref is Clegg A, et al., Frailty in elderly people. Lancet 381:752-762.) Further, it is worth considering that a large fraction of papers that use the term "frailty" are referring to it in a statistical sense. Briefly, the term frailty was introduced in 1979 as a term in a regression model to model the so-called mortality plateau, in which the mortality hazard no longer accelerated with age. The explanation was that people had variable rates of ageing. In consequence, at very old ages, or so the argument goes, the people with the fastest ageing rates (the frailest) had died out. By extreme old age (> ~110 years) The only ones left to contribute to the age-mortality relationship were those who, all their lives had experienced a slower ageing rate, and hence an attenuated relationship between ageing and mortality. Unobserved heterogeneity in the ageing rate means that although everyone past about age 15, as they get older is closer to death, not everyone of the same age has the same mortality risk. This is the essence of both "statistical frailty" and "clinical frailty". What that means for this paper is that they can validate their operational definition of frailty by better parsing the relationship between each syndrome and mortality: do these in fact increase the risk of death? 2. Relatedly, Page 3: Lines 28 and 33. What is the relationship between frailty and new institutionalization? hospital length of stay? readmission? Page 6, Lines 33-40 make it look as though you can relate spells to mortality, and therefore, given that you relate spells to the frailty syndromes, it seems possible to relate frailty syndromes to mortality. Inasmuch as this paper reports, as the authors note, a lower than anticipated report of frailty prevalence, the burden for validation of their approach falls on them. 3. Page 4: The rationale for the temporal and spatial analysis is not well developed, which is telling in a paper that otherwise assays frailty without making a better case for validation of their novel approach.
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	<p>4. Lines 50 -52: Does a "spell" mean a single hospital admission?</p> <p>5. Page 6: Line 20. I'm not sure that I get anxiety/depression as a frailty syndrome: more a single system illness, not always disabling... One way to address whether anxiety/depression or any of the syndromes the syndromes are frailty syndromes might be to test them by applying the Searle criteria for whether a health variable can be counted as a deficit: age associated; associated with an adverse outcome; neither too rare nor too common; few missing data; together with other deficits, covers several systems. (Your ref 43.)</p> <p>6. Page 6: Line 50 – presumably "approximately one third" refers to the population aged 65+, as does the fraction of bed days consumed.</p> <p>7. Page 7: Line 26 Or it could be that this approach under-estimates frailty prevalence?</p> <p>8. Page 8: Lines 3-4: Did you observe dose-response in relation to adverse outcomes? (e.g. those with 2 syndromes in the observation period had worse outcomes than those with just one).</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer Name LEOCADIO RODRIGUEZ MAÑAS
Institution and Country GERIATRIC SERVICE, GETAFE UNIVERSITY HOSPITAL
SPAIN

"This manuscript addresses a relevant topic in the field of Geriatric Medicine: the prevalence of frail older adults attended in hospitalary settings and its evolution along the time. However the approach provided by the authors stems from a conceptual framework of frailty that raises many potential sources for bias and misunderstandings. Although it has been established that frailty is different from comorbidity and disability, they have used both as surrogates to define frailty. Moreover, as they have define frailty syndrome by the presence of "at least" one of these conditions, they have included older people meeting only one of them (i.e., falls, or dementia or depression). It is well-known that frailty is more prevalent in people suffering from those conditions, but many older people having these conditions are free from frailty. Thus a great potential for overestimation of the true prevalence exists. But in contrast the authors establish that they have found "a lower prevalence than predicted", suggesting that other sources of bias have produce and underestimation that compesates the other bias. Thus, although there is a bulk of data that will allow to study many other interesting issues about the profile of the older patients attended in acute facilities of those hospitals along the tiem, the approach chosen by the authors does not provid the right view about frail older adults. Because of that, in contrast with the assertion of the authors, I do feel that it does not provide a methodology to reliably quantify frailty."

>>>>>Thank you for your insightful and helpful comments. We have amended main text to expand on to different approaches to frailty measurement (also reflective of comments of second reviewer), particularly within the introduction and discussion section. We have also emphasized UK National guidelines and that the methodology may reflect "the consequences of frailty" or "clinically significant frailty" We have also strengthened the limitations section with explicit mention of bias mentioned above. Thank you, we hope to have addressed these points, and that you will consider us at peer-review

Reviewer: 2

Reviewer Name Kenneth Rockwood, Institution and Country Geriatric Medicine, Dalhousie University
Halifax, Nova Scotia, Canada

"Thank you for the opportunity to review this interesting paper. Briefly, Soong and colleagues used a very large (>50 million records) administrative database to test what they describe as a novel way to estimate the prevalence of frailty. They identified a great number of codes that could reflect so-called "frailty syndromes", and, on the grounds that frailty syndromes are more likely to occur amongst frail people, estimated frailty burden as a fraction of hospital admissions (if that is what a "spell" means)."
>>>>>Thank you for representing our paper well. We have clarified definitions of "spell" in main text to reflect a hospital admission

"The authors found that, against a background of sharply rising hospital admissions associated with death, patients with hospital codes that reflected frailty syndromes increased only gradually under the observation period from 2005 to 2013. Frailty syndromes were related to each other and to where they occurred and how this changed. Oddly, in most cases, very old people appear not to be over-represented (or only slightly so) for most syndromes, including dementia, if that is how the Figures on pages 35-38 are meant to be read.
>>>>> That is accurate. We have this now reflected within discussion section. Possible explanations include Coding inconsistencies and, as this is an English Secondary Care database, not reflect a more accurate reflection of prevalence in the community setting.

"Although, as the authors note, operational definitions vary, there is less disagreement about the essence of frailty being multiply determined risk, from a decreased capacity to respond to stressors. (This is laid out in a 2013 review, which also makes the case for viewing frailty in relation to frailty syndromes, as is done here. The ref is Clegg A, et al., Frailty in elderly people. Lancet 381:752-762.) Further, it is worth considering that a large fraction of papers that use the term "frailty" are referring to it in a statistical sense. Briefly, the term frailty was introduced in 1979 as a term in a regression model to model the so-called mortality plateau, in which the mortality hazard no longer accelerated with age. The explanation was that people had variable rates of ageing. In consequence, at very old ages, or so the argument goes, the people with the fastest ageing rates (the frailest) had died out. By extreme old age (> ~110 years) The only ones left to contribute to the age-mortality relationship were those who, all their lives had experienced a slower ageing rate, and hence an attenuated relationship between ageing and mortality. Unobserved heterogeneity in the ageing rate means that although everyone past about age 15, as they get older is closer to death, not everyone of the same age has the same mortality risk. This is the essence of both "statistical frailty" and "clinical frailty". "
>>>>> Thank you these comments are very insightful and we have updated main body of text

"What that means for this paper is that they can validate their operational definition of frailty by better parsing the relationship between each syndrome and mortality: do these in fact increase the risk of death?

"Relatedly, Page 3: Lines 28 and 33. What is the relationship between frailty and new institutionalization? hospital length of stay? readmission? Page 6, Lines 33-40 make it look as though you can relate spells to mortality, and therefore, given that you relate spells to the frailty syndromes, it seems possible to relate frailty syndromes to mortality. Inasmuch as this paper reports, as the authors note, a lower than anticipated report of frailty prevalence, the burden for validation of their approach falls on them."

"Page 8: Lines 3-4: Did you observe dose-response in relation to adverse outcomes? (e.g. those with 2 syndromes in the observation period had worse outcomes than those with just one)."

>>>>> Thank you for comments. We have submitted much of this as a paper to the BMJ Open which should be out in press shortly

"3. Page 4: The rationale for the temporal and spatial analysis is not well developed, which is telling in a paper that otherwise assays frailty without making a better case for validation of their novel approach."

>>>>> Thank you for your clear and helpful comments. We have now expanded the rationale for this in the discussion section. Briefly, there was a statistical reason for the approach. We needed to observe any shift in coding overtime for reliability. It would also give us a signal if coding of frailty syndromes was increasing over time within HES. Geospatial analysis allows us to consider heterogeneity in frailty syndromes over different geographic health care systems, with implications for service provision, equity of care and link to environmental factors. We think this is potentially a future field of study

"Lines 50 -52: Does a "spell" mean a single hospital admission?"

>>>>> Thank you. We have clarified definitions of "spell" in main text to reflect a hospital admission

"Page 6: Line 20. I'm not sure that I get anxiety/depression as a frailty syndrome: more a single system illness, not always disabling... One way to address whether anxiety/depression or any of the syndromes the syndromes are frailty syndromes might be to test them by applying the Searle criteria for whether a health variable can be counted as a deficit: age associated; associated with an adverse outcome; neither too rare nor too common; few missing data; together with other deficits, covers several systems. (Your ref 43.)"

"Regarding the exposures, being the frailty syndromes. Most of the items they code as frailty syndromes are clear-cut, but as below, anxiety/depression as a frailty syndrome seems debatable."

>>>>> Thank you for helpful comments. We have expanded on rationale for this within discussion, limitations and references sections to reflect recent research into the field. We feel this is particularly important in the acute care setting

6. Page 6: Line 50 – presumably "approximately one third" refers to the population aged 65+, as does the fraction of bed days consumed.

>>>>> That is accurate, and we have clarified in main body of text.

7. Page 7: Line 26 Or it could be that this approach under-estimates frailty prevalence?

>>>>> Thank you. We have strengthened limitations section with explicit mention of this potential bias, and updated main text. We have examined both elective and non-elective English secondary care populations, which may also have contributed

Correction

Soong J, Poots AJ, Scott S, *et al.* Quantifying the prevalence of frailty in English hospitals. *BMJ Open* 2015;5:e008456. The corresponding author's email address is incorrect in this paper. The correct address is j.soong@imperial.ac.uk

BMJ Open 2015;5:e008456corr1. doi:10.1136/bmjopen-2015-008456corr1



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