PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Rates of self-harm presenting to general hospitals: a comparison of data from the Multicentre Study of Self-Harm in England and Hospital Episode Statistics.
AUTHORS	Clements, Caroline; Turnbull, Pauline; Hawton, Keith; Geulayov, Galit; Waters, Keith; Ness, Jennifer; Townsend, Ellen; Khundakar, Kazem; Kapur, Navneet

VERSION 1 - REVIEW

REVIEWER	Eve Griffin National Suicide Research Foundation, University College Cork, Ireland.
REVIEW RETURNED	09-Sep-2015

GENERAL COMMENTS	This paper has the potential to be quite interesting and informative. As the authors state, much policy and decision-making is anchored in national statistics and therefore it is important that such data are reliable and up-to-date. So it is very necessary work to validate data from different sources, specifically using data from England's Multicentre Study for Self-Harm and Hospital Episode Statistics (HES). However I feel that the manuscript in its current state is not suitable for publication, but would require some restructuring/clarification. In particular, the methods section is lacking much detail on the nature of the data sources and how analyses were performed. General comments 1. A major issue I see is the validity of the HES ED data. I assume (but it's not very clear) that this data would also include admitted cases (so there would be overlap in the two HES data sources). Therefore I can't figure out why the HES ED rates in Table 1 and 2 are similar to (and in some cases lower than) the HES admission rates. Therefore I would question if the ED data can be used in this analysis. 2. The authors raise concerns about the results in the Derby centre – however these seem more accurate than the other centres. The HES ED and Multicentre study rates are fairly similar, and both are higher than those based on the admission data. Is this not what we would expect? As suggested, there may be issues in terms of hospital systems and case ascertainment, but this needs to be addressed more explicitly. 3. One suggestion would be to also compare the Multicentre admission data with the HES admission data, to see how similar they are. Is this possible? 4. A few details on the comparability of the sources are also missing

	in the methods section. How are people counted (e.g. in the HES data are multiple presentations by a person more likely to be combined into one record)? If repetition rates are different, then it might not be appropriate for presentation-based rates to be calculated. Additionally, no information on how the rates are calculated. Is it by area of residence or based on hospital presentations in a catchment area?

REVIEWER	Robert Carroll University of Bristol, UK
REVIEW RETURNED	14-Sep-2015

GENERAL COMMENTS	This is an original and well written paper addressing an important issue regarding the reliability of HES data to estimate the incidence of self-harm. It comes as little surprise that HES data underestimate the incidence of hospital presenting self-harm but the estimated magnitude of this underestimate is considerable and it is important for researchers and policy makers to be aware of this. Methodologically this is a robust piece of work and I only have a few minor comments below: The methods suggest local authority boundaries were used to identify appropriate HES data (p7 line 43). Do the catchment areas of the hospitals included in the multicentre data converge with local authority boundaries? Why not just focus on HES data from the hospitals involved in the multicentre study – is there no hospital ID in HES data? Perhaps more detail could be added on this process to the methods and if it is a potential limitation it should be mentioned. It wasn't immediately clear to me that national HES data had also been used. To make this clearer to readers, the sentence “National data for the same time period, ICD-10 codes, and deliberate self-harm patient group, were also request for HES admission and HES emergency department data” (on p8 line14) could be moved to the section where you originally define the data/time periods used in the methods (i.e. to p7 around line 51). The tables in the manuscript are clear and well presented, but I was slightly confused by the footnote in Table 1 suggesting Oxford’s HES ED data was incomplete. The data in Table 1 (according to the title) are national HES data and not just HES data from multicentre study areas. I presume it is just coincidence that of all the hospitals in England, Oxford is the only one missing HES ED data (in which case no action required). Or have I misinterpreted this table – if so it perhaps needs to be made clearer what data is being used here.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Comment: This paper has the potential to be quite interesting and informative. As the authors state, much policy and decision-making is anchored in national statistics and therefore it is important that such data are reliable and up-to-date. So it is very necessary work to validate data from different sources, specifically using data from England’s Multicentre Study for Self-Harm and Hospital Episode Statistics (HES). However I feel that the manuscript in its current state is not suitable for publication, but would require some restructuring/clarification. In particular, the methods section is lacking much

detail on the nature of the data sources and how analyses were performed.

Response: The paper has been amended and the methods section expanded to include further detail relating to the reviewers comments, as detailed below.

Comment 1: A major issue I see is the validity of the HES ED data. I assume (but it's not very clear) that this data would also include admitted cases (so there would be overlap in the two HES data sources). Therefore I can't figure out why the HES ED rates in Table 1 and 2 are similar to (and in some cases lower than) the HES admission rates. Therefore I would question if the ED data can be used in this analysis.

Response: HES ED data on self-harm include both admitted and non-admitted cases. We absolutely agree with the reviewer that the HES ED rates of self-harm are much lower than they should be. This is, in fact, one of the main points of the paper. In England, HES self-harm data from emergency department and inpatient settings are often quoted in health departments and the media as the definitive 'rates of self-harm' [1-3] and they have been identified as a potential source for a national indicator of self-harm [4]. We, like others, have doubts that HES data can be used in this way. The rationale for the paper was to compare HES data sources to bespoke methods of data collection.

Our findings suggest that HES data significantly underestimate self-harm. As the second reviewer notes, this is important information for researchers, policy makers (and we would add, the general public) to be aware of. We hope that our paper has clarified the possible extent of this inaccuracy, and highlighted the potential problems with using HES data as a national indicator of self-harm. The reasons for the inaccuracy in HES ED data probably lie in the coding undertaken by non-clinical staff.

We have now clarified and strengthened the rationale for our paper in the introduction and discussed why HES data may be inaccurate in our discussion.

HES emergency department data include people who go on to be admitted to a hospital bed as well as people who are discharged directly from the emergency department, as stated at the top of page 8 in the original manuscript. We also discuss the fact that we would expect HES emergency department data to be roughly double HES inpatient data on page 16 – emphasising the under-ascertainment of cases in HES emergency department data.

Comment 2: The authors raise concerns about the results in the Derby centre – however these seem more accurate than the other centres. The HES ED and Multicentre study rates are fairly similar, and both are higher than those based on the admission data. Is this not what we would expect? As suggested, there may be issues in terms of hospital systems and case ascertainment, but this needs to be addressed more explicitly.

Response: We agree that superficially the standardised rates are similar between Multicentre Study data and HES emergency department data for the Derby area. However, when we examined the year on year data, potential problems with the HES emergency department data become apparent – hence the inclusion of Figure 1 which shows the fluctuations in figures for hospital presentations of self-harm for the three data sources, over time.

To summarise: % change from previous year in HES ED data
2008 – 2009 = - 68%
2009 – 2010 = +195%
2010 – 2011 = - 35%
2011 – 2012 = - 13%

Changes in HES emergency department data were inconsistent with the figures produced by the Multicentre Study and HES inpatient data for the same period, e.g. a 70% underestimate of Multicentre Study figures in 2009 which became a 200% over estimate a year later. Coding may have improved of course but another possibility is that the 'deliberate self-harm' category used in HES ED data collection was being used inconsistently and perhaps over-applied to a range of other mental health issues in later years.

We have now added more detail to our discussion of the Derby data to clarify the potential difficulty with the HES ED data at this site.

Comment 3. One suggestion would be to also compare the Multicentre admission data with the HES admission data, to see how similar they are. Is this possible?

The main purpose of the paper was to compare overall incidence of hospital presentations for self-harm from three data sources and our rationale is discussed above. Our aim was not to compare the number of admitted cases identified by the different data sources as HES inpatient data are regarded as being reasonably well coded according to ICD criteria. However, we agree that an exploration of this issue might be of some interest. We have now expanded our post-hoc analysis comparing Multicentre Study data for admitted episodes and HES admission data on page 17 of the manuscript.

Using data for the years 2010 -12 inclusive we found a 7% difference between multicentre data on self-harm admissions and HES inpatient data. This varied by centre – admitted self-harm from the multicentre data compared to HES data was 13% lower in Manchester, 8% higher in Oxford, and 6% lower in Derby. These are small differences but possible reasons for the lower incidence in two of the centres could have been related to the fact that the HES data included ICD codes for episodes of undetermined intent (some of which clinicians may not have judged to be intentional self-harm in the multicentre data).

Comment 4. A few details on the comparability of the sources are also missing in the methods section. How are people counted (e.g. in the HES data are multiple presentations by a person more likely to be combined into one record)? If repetition rates are different, then it might not be appropriate for presentation-based rates to be calculated. Additionally, no information on how the rates are calculated. Is it by area of residence or based on hospital presentations in a catchment area?

Response: Both HES emergency data and HES admission data are based on individual 'spells' of care and each attendance by the same individual will be recorded separately. The combination of separate presentations into a single episode is therefore highly unlikely and any instances that did occur would be a result of unintentional coding errors at the hospital site. We do not expect this to have had a major impact on the overall rates presented, or general trends over time. Multicentre study data are also available by episode. We have now expanded the methods section to more explicitly state the nature of the HES data and how people are counted. We have also added more detail to the text to emphasise that rates are calculated based on local authority area of residence – in line with methods commonly used in work from the Multicentre Study of Self-harm in England. We opted for an episode-based approach to analysis which might better capture the overall burden of self-harm than an individual-based approach

Reviewer: 2

This is an original and well written paper addressing an important issue regarding the reliability of HES data to estimate the incidence of self-harm. It comes as little surprise that HES data underestimate the incidence of hospital presenting self-harm but the estimated magnitude of this underestimate is considerable and it is important for researchers and policy makers to be aware of

this. Methodologically this is a robust piece of work and I only have a few minor comments below:

Comment 1: The methods suggest local authority boundaries were used to identify appropriate HES data (p7 line 43). Do the catchment areas of the hospitals included in the multicentre data converge with local authority boundaries? Why not just focus on HES data from the hospitals involved in the multicentre study – is there no hospital ID in HES data? Perhaps more detail could be added on this process to the methods and if it is a potential limitation it should be mentioned.

Response: The reviewer is correct. We used local authority areas to identify local HES data. We also restricted Multicentre Study data to those from the local authority area (based on postcode of residence) to create an equivalent dataset. Broadly speaking, local authority boundaries do converge with catchment area for hospitals included in the study, although there are out of area admissions in all hospitals. However, since we used residence within local authority area as a criteria for inclusion in both HES data and multicentre study data we are confident we had comparable datasets. This is now mentioned in the limitations section. Hospital ID is available from HES but we opted to quote area based rates as this is the method typically used in Multicentre Study work [6, 7]. In addition, changes to hospital sites during the study period (e.g. hospital mergers and changes in emergency department provision in Derby) would have made an approach based solely on hospital ID challenging.

Comment 2: It wasn't immediately clear to me that national HES data had also been used. To make this clearer to readers, the sentence “National data for the same time period, ICD-10 codes, and deliberate self-harm patient group, were also request for HES admission and HES emergency department data” (on p8 line14) could be moved to the section where you originally define the data/time periods used in the methods (i.e. to p7 around line 51).

Response: The sentence has been moved, as requested by the reviewer.

Comment 3: The tables in the manuscript are clear and well presented, but I was slightly confused by the footnote in Table 1 suggesting Oxford’s HES ED data was incomplete. The data in Table 1 (according to the title) are national HES data and not just HES data from multicentre study areas. I presume it is just coincidence that of all the hospitals in England, Oxford is the only one missing HES ED data (in which case no action required). Or have I misinterpreted this table – if so it perhaps needs to be made clearer what data is being used here.

Response: We thank the reviewer for pointing this out. The format of the table had been copied over from the Oxford local area table and the footnote had been retained in error. This has now been corrected and the footnote deleted.

References

1. http://www.bbc.co.uk/news/health-30445092
2. https://www.selfharm.co.uk/get/facts/self-harm_statistics
3 Self-harm: hospital admission rate per 100,000 population in North East almost triple the rate in London. (December 08, 2012) http://www.hscic.gov.uk/article/2430
5. Hospital Episode Statistics, Admitted Patient Care, England – 2013-14 (January 28 2015) http://www.hscic.gov.uk/searchcatalogue?productid=17192
6. Hawton K, Casey D, Bale E, et al. Self-Harm in Oxford 2012. Available at cebmh.warne.ox.ac.uk/csr/images/annualreport2012.pdf.
7. Bickley H, Steeg S, Turnbull P, et al. Self-Harm in Manchester: January 2010 to December 2011. Available at bbmh.manchester.ac.uk/cmhr/research/centreforsuicideprevention/MaSH/MASHREPORT1011.pdf

VERSION 2 – REVIEW

REVIEWER	Eve Griffin National Suicide Research Foundation, University College Cork, Ireland.
REVIEW RETURNED	02-Nov-2015

GENERAL COMMENTS	**General comments** I would like to thank the authors for addressing all of the reviewers' comments, and for making the appropriate amendments. I think these have added clarity to the manuscript, and it is more apparent that the primary aim is to compare the different data sources. A couple of additional changes would solidify the focus of the paper. Could the authors check that the aim of the paper is stated consistently throughout? Sentences such as page 16 Line 11 ("…to compare overall burden…") are a bit confusing. The abstract states that the objective of the paper is to compare self-harm rates using different sources, and I would agree that that this is the main thrust of the paper (rather than estimating burden of self-harm). Perhaps the first two aims could be re-worded to align to the primary objective? One of my previous comments referred to the appropriateness of comparing HES admission data to Multicentre data and HES ED data. In reality the rates are never going to converge (as the former is restricted to admitted cases), although I do recognise that this isn't a primary focus for the authors. The post-hoc analysis in the discussion clarifies this point. However this analysis shows that this admission data is indeed fairly accurate, with small differences emerging. Therefore I don't think that it's entirely accurate to state (in the introduction in particular) that the HES admission data underestimate hospital presentations by 40-50%. Perhaps saying that the admission data captures a smaller portion of attendances might be more correct. In the specific comments below, there is a suggestion to change 'Table 1' of the results section. As they currently sit, I think the results aren't very illustrative. Separating the data according to centre, gender and age-group seems to detract from the overall aim of the study. I would think it would be more helpful to focus on overall differences across datasets (annually), and then compare gender/age. See for example Thomas et al 2013. Validation of suicide and self-harm records in the Clinical Practice Research Datalink, *British Journal of Clinical Pharmacology*. **Specific comments** *Abstract* Remove third person tense here. *Introduction* 1. Page 4, Line 2: suggest re-wording "a contributing factor in …" to "a contributory factor to …".

2. Page 4, Line 5: A recent review/meta-analysis (Carroll et al, 2014) reports person-based repetition rates of 16% - I would suggest using this reference also. Carroll, R, Metcalfe, C, Gunnell, D. 2014. Hospital Presenting Self-Harm and Risk of Fatal and Non-Fatal Repetition: Systematic Review and Meta-Analysis. *PlosOne*.
3. Page 4, Line 7: Consider rewording "Given the high estimates of the number of people attending hospital …" to "Given the high estimates of hospital attendances due to self-harm …", or something similar.
4. Page 4, Line 18: Suggest replacing "the national self-harm data collection in Ireland …" with "The National Self-Harm Registry Ireland ...".
5. Page 4, Line 21: Spell out HES acronym in first instance.
6. Page 5, Line 7: Suggest replacing "HES started to collect…" with "HES began data collection…"
7. Page 5, First paragraph: The scope of the HES ED data is wider than that of the Multicentre data (e.g. walk-in centres). Do you get a breakdown of sites- i.e. can you limit it to EDs only?

Methods

1. Page 8, Line 9: Does the Multicentre study have data on those aged 12 and under? Can you clarify that the age-range is standardised across all data?
2. General: I would suggest breaking the HES data into subsections: ED data and admissions, and detail both separately.
3. General: What is the definition for the patient group 'deliberate self-harm' used by HES? Is it comparable to that used by the Multicentre study? This needs to be specified clearly.

Results

1. I would suggest that the results should begin by outlining the study sample. This might be a breakdown of numbers/rates according to data source, and then a breakdown by centre. The numbers involved need to be clearly stated from the outset.
2. I think the focus of the results should be re-adjusted. Age and gender shouldn't be a primary issue here - if there are differences it should be across the board. Therefore it might be of more interest to plot trends annually, and across centres.
3. Page 27, 28, Figures 2 and 3: Y-axis labels missing here.

Discussion

1. Page 1, Paragraph 2: Perhaps the first limitation could be moved down the list. The paper focuses on hospital-treated self-harm exclusively, so it is natural that presentations to GPs or those that don't seek help would not be included.
2. Suggestions for limitations: No details on methods of self-harm.
3. Page 16, Line 7: This suppression was mentioned briefly in the methods, but what was suppressed? Do we have an estimate of the effect?

REVIEWER	Robert Carroll University of Bristol, UK
REVIEW RETURNED	19-Oct-2015

GENERAL COMMENTS	The authors have responded well to the previous comments and I have no further issues to raise.

VERSION 2 – AUTHOR RESPONSE

Reviewer 1
I would like to thank the authors for addressing all of the reviewers' comments, and for making the appropriate amendments. I think these have added clarity to the manuscript, and it is more apparent that the primary aim is to compare the different data sources.
A couple of additional changes would solidify the focus of the paper.

Comment: Could the authors check that the aim of the paper is stated consistently throughout? Sentences such as page 16 Line 11 ("…to compare overall burden…") are a bit confusing. The abstract states that the objective of the paper is to compare self-harm rates using different sources, and I would agree that that this is the main thrust of the paper (rather than estimating burden of self-harm). Perhaps the first two aims could be re-worded to align to the primary objective?

Response: We agree that the aim of the paper should be stated consistently throughout the paper. We have altered the manuscript in line with this suggestion. We have also amended the title of the paper to make this clear: Rates of self-harm presenting to general hospitals: a comparison of data from the Multicentre Study of Self-Harm in England and Hospital Episode Statistics.

Comment: One of my previous comments referred to the appropriateness of comparing HES admission data to Multicentre data and HES ED data. In reality the rates are never going to converge (as the former is restricted to admitted cases), although I do recognise that this isn't a primary focus for the authors. The post-hoc analysis in the discussion clarifies this point. However this analysis shows that this admission data is indeed fairly accurate, with small differences emerging. Therefore I don't think that it's entirely accurate to state (in the introduction in particular) that the HES admission data underestimate hospital presentations by 40-50%. Perhaps saying that the admission data captures a smaller portion of attendances might be more correct.

Response: We accept the reviewers point that the term 'underestimate' could be misleading in the context of HES admission data which is not intended to capture all presentations, and is fairly accurate within its remit. We have changed the wording in the manuscript to more accurately reflect this.

Comment: In the specific comments below, there is a suggestion to change 'Table 1' of the results section. As they currently sit, I think the results aren't very illustrative. Separating the data according to centre, gender and age-group seems to detract from the overall aim of the study. I would think it would be more helpful to focus on overall differences across datasets (annually), and then compare gender/age. See for example Thomas et al 2013. Validation of suicide and self-harm records in the Clinical Practice Research Datalink, British Journal of Clinical Pharmacology.

Response: We thank the reviewer for this suggestion. We have considered it carefully and also checked the Thomas et al paper from Bristol. It was always our aim to compare centres individually because we felt that the relationship between routine and bespoke data collection might vary between

centre. This was in fact borne out in our presentation of HES ED data. We have therefore not amended our tables. Table 1 presents aggregate data (not by centre) using national and local data sources. See also our comments below.

Comment: Abstract - remove third person tense here.

Response: Amended as reviewer suggests.

Comment: Introduction - Page 4, Line 2: suggest re-wording “a contributing factor in …” to “a contributory factor to …”. | Page 4, Line 5: A recent review/meta-analysis (Carroll et al, 2014) reports person-based repetition rates of 16% - I would suggest using this reference also. Carroll, R, Metcalfe, C, Gunnell, D. 2014. Hospital Presenting Self-Harm and Risk of Fatal and Non-Fatal Repetition: Systematic Review and Meta-Analysis. PlosOne. | Page 4, Line 7: Consider rewording “Given the high estimates of the number of people attending hospital …” to “Given the high estimates of hospital attendances due to self-harm …”, or something similar. | Page 4, Line 18: Suggest replacing “the national self-harm data collection in Ireland …” with “The National Self-Harm Registry Ireland ...”. I Page 4, Line 21: Spell out HES acronym in first instance. | Page 5, Line 7: Suggest replacing “HES started to collect…” with “HES began data collection…”

Response: Many thanks. The manuscript has been amended in line with the reviewer’s suggestions.

Comment: Page 5, First paragraph: The scope of the HES ED data is wider than that of the Multicentre data (e.g. walk-in centres). Do you get a breakdown of sites- i.e. can you limit it to EDs only?

Response: Although published HES ED data does include walk-in centres and minor injury units, for the purposes of this study we requested and were provided with only emergency department data (not including walk-in centres etc). Our contact at Public Health England has confirmed this and gives the following definition of emergency departments or the data provided: Emergency departments are a consultant led 24-hour service with full resuscitation facilities and designated accommodation for the reception of accident and emergency patients. We have clarified this in the paper.

Comment: Methods – Page 8, Line 9: Does the Multicentre study have data on those aged 12 and under? Can you clarify that the age-range is standardised across all data?

Response: The Multicentre study does hold data on people aged under 12 years, and age-ranges were matched across all data.

Comment: I would suggest breaking the HES data into subsections: ED data and admissions, and detail both separately.

Response: The manuscript has been amended as suggested.

Comment: What is the definition for the patient group ‘deliberate self-harm’ used by HES? Is it comparable to that used by the Multicentre study? This needs to be specified clearly.

Response: For HES inpatient admission data the definition is based on ICD10 codes. For both multicentre data and HES ED data, self-harm is a clinical code recorded by clinicians (for the multicentre study) and coding staff (for HES ED data). This has now been clarified in the paper.

Comment: Results - I would suggest that the results should begin by outlining the study sample. This might be a breakdown of numbers/rates according to data source, and then a breakdown by centre.

The numbers involved need to be clearly stated from the outset.

Response: A section stating the overall figures for the different data sources 2010-2012 has now been added.

Comment: I think the focus of the results should be re-adjusted. Age and gender shouldn't be a primary issue here - if there are differences it should be across the board. Therefore it might be of more interest to plot trends annually, and across centres.

Response: See also our comments above. Exploring the data by age and gender subgroup was specified a priori and was designed to investigate the important question of whether any particular group was being systematically under-represented in the HES data (for example, whether young people were less likely to be captured on routine data sources). We have now clarified this rationale in the paper. Our local findings do in fact show some age related differences (which vary by centre), and gender differences (for example, HES ED data may capture a greater proportion of self-harm by men than by women). Although we understand the reviewer's rationale , we have not therefore made the suggested amendments to the tables which would also represent a significant departure from our original study design.

Comment: Page 27, 28, Figures 2 and 3: Y-axis labels missing here.

Response: Many thanks. These figures have been revised.

Comment: Discussion - Page 1, Paragraph 2: Perhaps the first limitation could be moved down the list. The paper focuses on hospital-treated self-harm exclusively, so it is natural that presentations to GPs or those that don't seek help would not be included.

Response: This has now been amended.

Comment: Suggestions for limitations: No details on methods of self-harm.

Response: We agree we did not examine differences in the capture of cases according to method of self-harm. For example, it is plausible that the discrepancy between data sources could have been greater for self-cutting than self-poisoning. We have added this as a limitation.

Comment: Page 16, Line 7: This suppression was mentioned briefly in the methods, but what was suppressed? Do we have an estimate of the effect?

Response: Cells with counts of 5 or less are supressed by HES to maintain anonymity of patients. While there were a number of suppressed values in the overall data provided to us by Public Health England, the data for 2010 to 2012 presented within the paper is unaffected. Only local HES emergency department data for Oxford had supressed values and only for 2010, where HES emergency department data was incomplete and therefore we decided to exclude these 2010 data from analysis. This has now been clarified in the discussion.

Reviewer 2

Comment: The authors have responded well to the previous comments and I have no further issues to raise.

Response: We would like to thank the reviewer for their comments.

VERSION 3 - REVIEW

REVIEWER	Eve Griffin National Suicide Research Foundation, University College Cork, Ireland.
REVIEW RETURNED	23-Nov-2015

GENERAL COMMENTS	I would like to thank the authors for carefully addressing all comments. I have no further comments to add.