**PEER REVIEW HISTORY**

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (see an example) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below. Some articles will have been accepted based in part or entirely on reviews undertaken for other BMJ Group journals. These will be reproduced where possible.

**ARTICLE DETAILS**

<table>
<thead>
<tr>
<th>TITLE (PROVISIONAL)</th>
<th>Young people’s use of NHS Direct: A national study of symptoms and outcome of calls for children aged 0-15</th>
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<tbody>
<tr>
<td>AUTHORS</td>
<td>Cook, Erica; Randhawa, Gurch; Large, Shirley; Guppy, Andy; Chater, Angel; Pang, Dong</td>
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</tbody>
</table>

**GENERAL COMMENTS**

The manuscript bmjopen-2013-004106, entitled “Young people’s use of NHS Direct: A national study of symptoms and outcome of calls for children aged 0-15.” is an interesting study reporting a snapshot of the symptoms of children aged 0-15 that have used NHS Direct with some important suggestions about the influence of some variables in using this service. The topic is of potential interest, however some minor concerns need to be addressed.

**Abstract:**
- please describe briefly the aim of the study;
- a definition of “call rates” could be useful to improve the comprehensibility of the abstract.

**Strength and limitations:**
- The authors wrote: “National call data across a one year period (July 2010, October 2010, January 2011. April 2011) was linked to population statistics to determine variations by rates of calls per person per annum”. If you consider this choice in methodology a strength point of your study please declare it. However, the potential interesting consequences of the seasonality are not available inside the paper.

**Background:**
- In some points the English language of the paper it is not very fluent (i.e. Page 5 Line 10 “which has aimed to support” o “aiming to support”).
- Page 5 Line 49-50 - The authors wrote “…symptomatic variations of uptake.”. Please clarify what do you mean.

**Methodology:**
- Page 7 Line 17 - The authors should clarify better at the beginning of the sentence what they mean for “algorithms” (symptoms classification).
- Page 7 Line 32-35 - The authors wrote “Following the call assessment of patients by nurses who are supported using the CAS system patients are given an outcome following their call”. Please rephrase the sentence.
Results:
- Page 10 Line 21-22 - I think that “(Table 3)” should be the right table describing these results.
- Page 10 Line 54-56. The authors wrote that “poisoning and overdose” symptoms were in majority of cases triaged as “self-care” or “health information”. It’s quite interesting, probably it should deserve a short comment on Discussion section.

Limitations:
- Page 15 Line 16-23 - The authors wrote “Further, previous research has suggested that whilst deprivation has been shown to increase uptake it is shown to be reduced in calls about children…”. Please clarify.

Tables:
I suggest some minor corrections to make the tables more readable. As example, I suggest to insert on columns of Table 2 “N” and “CR (pppa)” and to delete the many % inside Table 3 maybe putting the symbol % at the apex of columns.

REVIEWER | Duncan Cooper  
Public Health England  
England

REVIEW RETURNED | 16-Oct-2013

GENERAL COMMENTS | Reviewers comments – 16/9/2013 for BMJ open

This is a descriptive paper about the symptoms, outcomes, ages and time of call for a national sample of NHS Direct calls. Is outlines some interesting findings about the most prevalent symptoms/syndromes reported. However the paper has many grammatical errors and could do with a careful redraft, tightening up the language particularly around describing the results. More importantly I don’t get a feel of how these results are actually going to assist in planning NHS Direct, or possibly the new NHS 111 service or other health services. Examples and some further discussion could be included here to strengthen the manuscript.

The following suggestions are provided to authors.

Abstract

Aims are a bit vague – line 28 – what sort of differences are you looking for, as chi-sq analysis will always throw up some differences with big tables and large degrees of freedom. Differences in rates, proportion, overall volumes?

Line 40 doesn’t make sense.

“Time and age differences were also found” – this is vague as the abstract needs to pull out the most important findings.

Page 4 – lines 45-48 – but it didn’t uncover characteristics of aborted calls?
Background

Would be useful to include a sentence on how NHS111 will differ from NHS Direct. i.e. are these results also applicable to NHS 111?

Page 5 – lines 50-56 – sentence a bit confusing. Short clear aim is needed.

Methodology

P6 line 14 – the population is children 0-15 in England, the sample in this research is all calls about children 0-15.

P6 Line 16 – explain what the ‘core’ service is for readers.

P6 Line 18 – why did you only use 4 months only, surely 12 months would be a more robust sample?

P6 line 48 – is this 66.2% of all NHS direct calls or all childhood calls?

P7 – line 17 – need to reference Table 3 to outline groupings.

P7 – line 25 – the numbers don’t add up here. 258,000 + 100,000 is 358,000 but you state in method you extracted 342,000 calls. Please check and also explain what “missing cases” are.

P7 – line 52 – what are “appropriate groups” - bit vague

P7- line 54 – please clarify ,is this calls per person per annum, or calls per 100 population. Clarify in Table 2 , i.e. total rate for <1 year is 35.09 – 35 calls per year or 35 per 100 persons.

P8 – line 3 – standardised residuals of what? You haven’t mentioned chsq analysis yet apart form in the abstract.

P8 – line 11 – please explain for reader briefly what ‘exclusion on an analysis by analysis ‘basis’ means

Results

There are many uses of the word ‘higher’ which needs to be clarified. e.g p9 Line 20 – higher than what? P9 – line 54 – highest number, rate or %?

Page 9 line 14 – what does CR stand for?

P9 – line 53 – this sentence doesn’t make sense?

Regarding the interactions mentioned in the results, with such large tables (e.g cross tab symptoms against outcome) there are going to be many statistically significant differences in frequencies, as health problems and disposition vary considerably within any service. But you need to explain what is interesting about the interactions and in the discussion why this is significant for health service planning.
P10 – line 36 – what is ASR?

Discussion

P13 – line 13 – doesn’t make sense

P13 – line 53-56 – repeats first discussion paragraph

P14 – lines 41-45 – Figure 2 shows that the ‘highest’ time is 3-11pm for all three age groups. Are you talking about numbers of rates?

Page 15 – line 12 – need to clarify that this means patient (child subject of the call) and caller (usually parent of the child).

Page 15 – 30-34 – hw do you know the remaining calls meet the requirements. Did you do a quick analysis of basic characteristics of aborted/missing calls, have other doen beforehand?

P15 – 36-42 – previous work has already looked at seasonal patterns for calls about children (gastrointestinal, respiratory etc...) e.g see work by Loveridge, Cooper, Smith, e.g Vomiting calls to NHS Direct provide an early warning of norovirus outbreaks in hospitals; Tracking the spatial diffusion of influenza and norovirus using telehealth data: a spatiotemporal analysis of syndromic data; What can analysis of calls to NHS direct tell us about the epidemiology of gastrointestinal infections in the community? You need to reference some of this work and consider how your own work builds on this and other previous work.

Conclusion

The conclusion is not really supported by the discussion. Your results may well be extremely useful to health services but it would be useful to hear how, with examples for NHS Direct or hypothesised areas where the data could support planning and development of services.

Table 2 – please explain what the rate is, rate per person, per 100, per 1,000 population.

Table 3 – Please add a total line at the base of the table (as per table 2)

Figure 1 and 2 – y axis labels needed

VERSION 1 – AUTHOR RESPONSE

Reviewer 1

Abstract:
1. Please describe briefly the aim of the study;

The sentence ‘The aim of this study was to examine call rate differences in younger people to enable
a better understanding of the needs of this population in England’ has been added to address this comment.

2. A definition of “call rates” could be useful to improve the comprehensibility of the abstract.

Call rate definition is proved ‘(expressed as calls per 100 persons per annum)’ has been added to the method section.

Strength and limitations:
3. The authors wrote: “National call data across a one year period (July 2010, October 2010, January 2011. April 2011) was linked to population statistics to determine variations by rates of calls per person per annum”. If you consider this choice in methodology a strength point of your study please declare it. However, the potential interesting consequences of the seasonality are not available inside the paper.

This section has now been changed to ‘National call data across 4 one-month periods (July 2010, October 2010, January 2011, April 2011) was linked to population statistics to determine symptom variations by rates of calls per person per annum’

Background:
4. In some points the English language of the paper it is not very fluent (i.e. Page 5 Line 10 “which has aimed to supp” à “aiming to support”).

This has been kept the same, as we are unaware if NHS Direct will do this in the future with the introduction of the 111 service, therefore past tense is most suitable.

5. Page 5 Line 49-50 - The authors wrote “…symptomatic variations of uptake.”. Please clarify what do you mean.

This has now been changed to ‘With the opportunity of using NHS Direct call data (Cooper & Chinemana, 2004) the present study aims to examine call rate differences in symptoms of younger people (0-15) that have used this service, additionally exploring the impact of age and gender on uptake. Moreover, this study aims to investigate the outcome of how these symptoms are managed in this sub-group which will provide useful information to current policy makers to know how the NHS better manage demand for healthcare following the on-going interest to manage non urgent emergency admission(Purdy, 2010).

Methodology:
6. Page 7 Line 17 - The authors should clarify better at the beginning of the sentence what they mean for “algorithms” (symptoms classification).

This has been changed to symptom classification. We have also removed the term algorithm throughout the manuscript and used the term symptom classification.

7. Page 7 Line 32-35 - The authors wrote “Following the call assessment of patients by nurses who are supported using the CAS system patients are given an outcome following their call”. Please rephrase the sentence.

This has now been reworded to ‘Following the assessment by nurses (supported using the CAS system) patients are given an outcome following their call’.

Results:
8. Page 10 Line 21-22 - I think that "(Table 3)" should be the right table describing these results.

This has been changed to Table 3.

9. Page 10 Line 54-56. The authors wrote that “poisoning and overdose” symptoms were in majority of cases triaged as “self-care” or “health information”. It’s quite interesting, probably it should deserve a short comment on Discussion section.

This section has now been added in the discussion to address this ‘An interesting finding was that NHS Direct were able to successfully manage around 60% and 20% of calls relating to ‘poisoning and overdose’ through the provision of self-care and health information respectively. With ingestion of harmful substances being the most common causes of injury, and subsequently a common reason for referral to A&E, this finding highlights that NHS Direct and essentially telephone based health care can safely support parents and caregivers to appropriately and safely manage the child’s symptoms within their own home (Shannon, 2000)’.

Limitations:
10. Page 15 Line 16-23 - The authors wrote “Further, previous research has suggested that whilst deprivation has been shown to increase uptake it is shown to be reduced in calls about children…”. Please clarify.

This now reads ‘Furthermore, whilst previous research has suggested that there is an upward trend of access associated with deprivation (Cook et al., 2012). However, this finding is not consistent across age, whereby deprivation is shown to be related to lower usage for or on behalf of children (<15)(Cook et al., 2013; Cooper et al., 2005). Therefore, it would be useful to explore the role of deprivation on the utilisation of this service in this cohort’ which hopefully clarifies the point being made.

Tables:
11. I suggest some minor corrections to make the tables more readable. As example, I suggest to insert on columns of Table 2 “N” and “CR (pppa)” and to delete the many % inside Table 3 maybe putting the symbol % at the apex of columns.

For Table 2 a header row has been added with the headings ‘N’ and ‘CR’. So that the reader is aware was CR is the table heading has (CR) in brackets next to the call rate definition. For Table 3 a header row has been inserted with the headings ‘N’ and ‘%’ with all % in the cells removed.

Reviewer 2

Abstract
1. Aims are a bit vague – line 28 – what sort of differences are you looking for, as chi-sq analysis will always throw up some differences with big tables and large degrees of freedom. Differences in rates, proportion, overall volumes?

An aim is provided to determine the differences that this study focuses on i.e. differences in call rates.

2. Line 40 doesn’t make sense. “Time and age differences were also found” – this is vague as the abstract needs to pull out the most important findings.

To make the results section more specific this has been changed to ’Time and age differences were also found such that children aged 4-15 were over represented in the 3pm-11pm period and calls on behalf of children aged <1 over represented in the 7am – 3pm period‘.
This has now been changed to read ‘whilst this study uncovers the analysis of a large dataset of over 342,000 child-patients. Whilst it was first thought that these were aborted calls further clarification from NHSD confirm that this is not the case, instead these are calls closed by the front end advisor as they are quick information type calls. Therefore, this has been addressed throughout.

Background

4. Would be useful to include a sentence on how NHS111 will differ from NHS Direct. i.e. are these results also applicable to NHS 111?

A section has now been added ‘The new ‘111’ service similarly to NHS Direct provides 24/7 telephone based health, however marked differences focus on it being a free to call service, acting as a first port of call for all urgent but not emergency calls in an attempt to make it easier for the public to access local health services both in and out of hours (Department of Health, 2010)’ to highlight the differences to 111.

5. Page 5 – lines 50-56 – sentence a bit confusing. Short clear aim is needed.

Also, mentioned by reviewer 1 this has been replaced with ‘With the opportunity of using NHS Direct call data(Cooper & Chinemana, 2004) the present study aims to examine call rate differences in symptoms of younger people (0-15) that have used this service, additionally exploring the impact of age and gender on uptake. Moreover, this study aims to investigate the outcome of how these symptoms are managed in this sub-group which will provide useful information to current policy makers to know how the NHS better manage demand for healthcare following the on-going interest to manage non urgent emergency admission(Purdy, 2010).’

Methodology

6. P6 line 14 – the population is children 0-15 in England, the sample in this research is all calls about children 0-15.

This now reads ‘The sample in this research is all calls about children aged 0-15 who used NHS Direct for a symptomatic consultation using the core 0845 4647 service in England over a one year period, during the combined month periods of July 2010, October 2010, January 2011 and April 2011’.

7. P6 Line 16 – explain what the ‘core’ service is for readers.

This has now been changed to ‘using the core health and information telephone advice line (0845 4647) in England over a one year period’.

8. P6 Line 18 – why did you only use 4 months only, surely 12 months would be a more robust sample?

The reviewer makes a fair point, however, NHS Direct during 2010/11 were taking in excess of 8 million calls per year and as this was a national study it was felt that this sample was too large. Therefore, taking four months across a year period was felt to still remain representative. Studies that have used a year sample have only had data on that population e.g. older people (Hsu et al., 2011) or have focused on a specific area rather than nationally e.g. (Bibi et al., 2008). This has been highlighted in the limitations ‘This study focused on four ‘one month’ periods across a year period, whilst it would have been more robust to have captured a full year sample, it was felt that the data
would have been excessive with the four months felt to still remain representative of the population uptake in England. There are no national studies to compare this to, however, previous studies that have used a year sample have only had data on that population e.g. older people (Hsu et al., 2011) or have focused on a specific geographic area (Bibi et al., 2008; Cooper et al., 2005).

9. P6 line 48 – is this 66.2% of all NHS direct calls or all childhood calls?

‘childhood’ has been added to ensure that the reader knows that this relates to the calls about children not all NHS Direct calls

10. P7 – line 17 – need to reference Table 3 to outline groupings.

‘(see Table 3)’ has now been added to reference the outline groupings used.

11. P7 – line 25 – the numbers don’t add up here. 258,000 + 100,000 is 358,000 but you state in method you extracted 342,000 calls. Please check and also explain what “missing cases” are.

After checking the data I can confirm that the total number of calls are 358,503 and this has been changed throughout. Also for gender, missing calls were different and this has been adjusted. Missing cases are now explained for both gender and symptom classification.

12. P7 – line 52 – what are “appropriate groups” - bit vague

13. P7– line 54 – please clarify, is this calls per person per annum, or calls per 100 population. Clarify in Table 2, i.e. total rate for <1 year is 35.09 – 35 calls per year or 35 per 100 persons.

This has now been changed to per 100 persons/population per annum.


This sentence has been changed to ‘Cross-tabulations (chi-square tests) were used to test both outcome differences by symptom classification. Missing responses were excluded on an analysis by analysis basis. With a large number of cell sizes for some of the cross-tabulations, it can be difficult to determine which groups have significant differences within the analyses; therefore, adjusted standardized residuals (ASR) were calculated for each of the cells in order to determine which cell differences contribute to the chi square test results’.

15. P8 – line 11 – please explain for reader briefly what ‘exclusion on an analysis by analysis basis’ means

Results There are many uses of the word ‘higher’ which needs to be clarified. e.g. p9 Line 20 – higher than what? P9 – line 54 – highest number, rate or %?

To make this statement clearer it has been changed to ‘Missing responses were excluded on an analysis by analysis basis (i.e. total responses included will vary across analyses)’. The term higher has also been clarified throughout the results section.

16. Page 9 line 14 – what does CR stand for?

(CR) has been put into brackets next to call rate to demonstrate the meaning of this abbreviation.

17. P9 – line 53 – this sentence doesn’t make sense?
Regarding the interactions mentioned in the results, with such large tables (e.g. cross tab symptoms against outcome) there are going to be many statistically significant differences in frequencies, as health problems and disposition vary considerably within any service. But you need to explain what is interesting about the interactions and in the discussion why this is significant for health service planning.

18. P10 – line 36 – what is ASR?

(ASR) has been put into brackets next to adjusted standardised residuals to demonstrate the meaning of this abbreviation.

Discussion

19. P13 – line 13 – doesn’t make sense

This has now been rephrased to ‘There has been much controversy surrounding the extent that NHS Direct has managed to relieve the pressure of overstretched healthcare services (Gill et al., 2013). However, NHS Direct remains certain that they are alleviating A&E and GP services, with internal audits suggesting that 41% of callers were being advised to treat themselves at home with….’

20. P13 – line 53-56 – repeats first discussion paragraph

The first paragraph is discussing internal audits, this now makes this clearer as it reads ‘As supported by internal audits the highest outcome of calls across all age groups was health information and/or self-care advice, with statistics suggesting around 40-50% of all calls made by or on behalf of children aged 0-15 were managed with no onward referral needed which supports previous audits (NHS Direct, 2008).’

21. P14 – lines 41-45 – Figure 2 shows that the ‘highest’ time is 3-11pm for all three age groups. Are you talking about numbers of rates?

This is now changed to call rate

22. Page 15 – line 12 – need to clarify that this means patient (child subject of the call) and caller (usually parent of the child).

This now reads ‘This research focused on patient (child subject of the call) data rather than caller (usually the parent/caregiver) data’.

23. Page 15 – 30-34 – how do you know the remaining calls meet the requirements. Did you do a quick analysis of basic characteristics of aborted/missing calls, have other done beforehand?

This now reads clearer and highlights the pre-checking on the data which was done and why the aborted calls were excluded – ‘Although this study used a large sample of call data from 358,503 child-patients there were a number of missing cases which were removed from analysis e.g. symptom classifications were not collected for 100,390 patients. Missing call data is common where calls have been aborted, and whilst it is interesting to determine the characteristics of these patients this study was focused on symptomatic differences and were thus excluded. Nonetheless, following pre-checking the remaining calls used within the analysis meet the requirements of the research aim’.

24. P15 – 36-42 – previous work has already looked at seasonal patterns for calls about children (gastrointestinal, respiratory etc...) e.g see work by Loveridge, Cooper, Smith, e.g Vomiting calls to NHS Direct provide an early warning of norovirus outbreaks in hospitals; Tracking the spatial diffusion of influenza and norovirus using telehealth data: a spatiotemporal analysis of syndromic data; What
can analysis of calls to NHS direct tell us about the epidemiology of gastrointestinal infections in the community? You need to reference some of this work and consider how your own work builds on this and other previous work.

The section 'Over the four month periods there could have been seasonality differences, of which may have caused some bias towards some symptoms recorded and it would have been interesting to have explored seasonality differences for this cohort. Nonetheless, as tele-health systems such as NHS Direct has the potential for informing public health regarding the epidemiology of communicable diseases for common viruses such as influenza, norovirus (Cooper et al., 2008; Cooper et al., 2007; Cooper et al., 2006; Loveridge et al., 2010) this research provides an overview of how these symptoms are managed and the representiveness of this data’ has now been added to add to account for the epidemiology potential for this data.

Conclusion
25. The conclusion is not really supported by the discussion. Your results may well be extremely useful to health services but it would be useful to hear how, with examples for NHS Direct or hypothesised areas where the data could support planning and development of services.

The conclusion has now been changed to be more reflective of the discussion and provide examples how the 111 service can expand on this. It now reads ‘This is the first study to examine the symptoms and outcome of calls made to NHS Direct for and on behalf of young children. It has highlighted that NHS Direct has supported a wide range of symptoms through the provision of health information and self-care support and provides important data relating to symptoms outcome and time of call. Moreover, it highlights the increasing role of telephone based healthcare in England and how the use of technology can provide instant support and reassurance to parents through the provision of clinical knowledge and information to empower them to support many symptoms. As the new 111 telephone based service is rolled out nationally research should now focus on how this new service can further support the health of younger population groups and the impact this has on demand for other health services’.

26. Table 2 – please explain what the rate is , rate per person, per 100, per 1,000 population.

This has been changed to per 100 population.

27. Table 3 – Please add a total line at the base of the table (as per table 2) Figure 1 and 2 – y axis labels needed

A total line has been added and figure labels (% of calls) for Figure 1 and 2 have been added.

**VERSION 2 – REVIEW**

<table>
<thead>
<tr>
<th>REVIEWER</th>
<th>Fabrizio Bert</th>
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<tbody>
<tr>
<td></td>
<td>Department of Public Health, University of Turin</td>
</tr>
<tr>
<td>REVIEW RETURNED</td>
<td>05-Nov-2013</td>
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</tbody>
</table>

**GENERAL COMMENTS**

In my opinion the article is now acceptable for the publication without further revision.