

## 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

<b>TITLE (PROVISIONAL)</b>	Virtual colleagues, virtually colleagues – physicians' use of Twitter: a population based observational study.
<b>AUTHORS</b>	Brynolf, Anne; Johansson, Stefan; Appelgren, Ester; lynoe, niels; Edstedt Bonamy, Anna-Karin

### VERSION 1 - REVIEW

<b>REVIEWER</b>	Dr Helen O'Sullivan Senior Lecturer in Medical Education Director of the Centre for Excellence in Evidence Based Learning and Teaching Faculty of Health and Life Sciences, The University of Liverpool, UK  The reviewer has no conflict of interest in reviewing this paper.
<b>REVIEW RETURNED</b>	23-Apr-2013

- The reviewer completed the checklist but made no further comments.

<b>REVIEWER</b>	Dr Anne Marie Cunningham, Institute of Primary Care & Public Health Cardiff University School of Medicine Neuadd Meirionnydd Heath Park Cardiff CF14 4YS  I have no competing interests to declare.
<b>REVIEW RETURNED</b>	28-May-2013

<b>THE STUDY</b>	<p>P5 What is the relevance of the statement that doctors identify themselves? Why is it assumed that Swedish doctors behave in a similar way to doctors in other countries?</p> <p>P6 This paragraph needs clarification. Do you mean that the search algorithm might have identified accounts as belonging to doctors or medical students which were not, but that the chances of this happening were reduced because all accounts were assessed by researchers? This is repeated on page 12.</p> <p>Method- More information on how the researchers used the Twitter api to identify Swedish users over the time period stated would be useful. The number of users given is similar to other studies of the Swedish population on Twitter so it seems reasonable.</p> <p>P8 In 24 It should not be presumed that the name given was the 'real name'. Twitter does not have a 'real names' policy and allows the use of pseudonyms.</p>
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<p><b>RESULTS &amp; CONCLUSIONS</b></p>	<p>P9 Ln46 'hang-overs' not 'hung-overs'</p> <p>Results- p10 We do not know if the first and last names given are real names. It would be useful if this data was presented in a tabular form and a column added on whether tweets identified as unprofessional were from self-identified students or doctors.</p> <p>P11 Ln8 'of these' rather than amongst these. It would be clearer to present the percentages of unprofessional tweets as a percentage of healthcare or non-healthcare related tweets rather than the total of all tweets.</p> <p>Discussion- Why was it an advantage to look at all Swedish-speaking doctors/medical students rather than those with over 500 followers as in the Chretien study? Did the data show that those with more or less followers were more likely to be unprofessional? Again, it is not certain that the names given are real names as no attempt to verify identity is described. In any case this is not necessarily surprising as several physician organisations recommend that doctors identify themselves by name on social media sites if discussing medical content. Sometimes the accounts investigated are described as belonging to physicians rather than 'physicians and medical students'. Please address this.</p> <p>P13 Ln19-26 No data is given to support the assertion that physicians or medical students with lower follower counts are more likely to be unprofessional, hence the statement that a feeling of anonymity amongst those with lower follower counts might justify findings is not sustainable.</p> <p>P13 Ln30-33 No data is given for who physicians or medical students interact with in this study.</p> <p>P14 Ln 6 Was the use of 'medical jargon' considered an unprofessional behaviour? If not then this is not relevant to the study.</p> <p>P14 Ln 15-17 Since no analysis of the networks of Swedish-speaking physicians and medical students was performed the conclusion that peer feedback may reduce unprofessional behaviour does not seem to be justified.</p> <p>P14 Ln46-49 The statement that the authors do not believe Swedish-speaking doctors and medical students to be different to those in other countries is not relevant.</p> <p>Conclusion- p15 Ln 3 It is stated that 15 accounts 'committed potential privacy violations' but it is not stated whether these accounts belonged to students or physicians, and the response from other users was not examined. No statistics are given for the total number of accounts which were judged to be unprofessional. It may be that this a high percentage of all accounts analysed which would support the authors conclusion that all physicians should examine their behaviour, but without this analysis I do not think this is justified.</p> <p>P15 Ln 5 I am not aware of research that online physician behaviour impacts on the doctor-patient relationship although it is not an unreasonable assumption. However, since this is not discussed earlier in the paper it does not seem to be a relevant conclusion.</p>
<p><b>GENERAL COMMENTS</b></p>	<p>This is a simple descriptive study which with some additional analysis will add to the body of literature on professionalism in social media. Since all Swedish-speaking physicians and medical students were identified an additional study might identify the networks between them and identify whether incidents of unprofessional conduct were identified and addressed by peers.</p>

## VERSION 1 – AUTHOR RESPONSE

<b>Point-by-point response to reviewers</b>	
R 2.1	What is the relevance of the statement that doctors identify themselves?
Author	<p>To establish a relevant study population, we needed an inclusion criterion. There are no service or register listing Swedish medical students and doctors using Twitter, and therefore the most appropriate inclusion criterion was that the account holder identified himself or herself as a physician or medical student. Also, the statement serves as explanatory; it is the way we established our study group.</p> <p>On page 9 and page 12, we now address this.</p>
R2.2	Why is it assumed that Swedish doctors behave in a similar way to doctors in other countries?
Author	<p>We acknowledge that this statement is not relevant. We have therefore removed this statement from the manuscript (erased sentences: “It is our belief that Swedish physicians using Twitter behave similarly to physicians in other countries with high prevalence of smartphones and Internet access.”)</p> <p>See also R2.16</p>
R2.3	P6 This paragraph needs clarification. Do you mean that the search algorithm might have identified accounts as belonging to doctors or medical students which were not, but that the chances of this happening were reduced because all accounts were assessed by researchers? This is repeated on page 12.
Author	<p>Yes, the search algorithm could have identified accounts held by non-doctors as some keywords could also be used by other health professionals.</p> <p>A paragraph on page 9 in the Methods section has been rephrased to clarify how non-physician accounts were excluded:</p> <p>“After manual assessment of the gross list of accounts, non-physician users (e.g., nurses or bio-medical engineers), mock accounts or accounts used solely for one-way communication (e.g., automatically generated by news feeds) (n=860), were omitted.”</p>
R2.4	Method- More information on how the researchers used the Twitter api to identify Swedish users over the time period stated would be useful. The number of users given is similar to other studies of the Swedish population on Twitter so it seems reasonable.
Author	<p>More information about how Swedish users were identified has been added to the Methods section (page 8).</p>

R2.5	P8 In 24 It should not be presumed that the name given was the 'real name'. Twitter does not have a 'real names' policy and allows the use of pseudonyms.
Author	We have re-phrased to "recorded name" instead of "real name" (page 8 and page 11)
R 2.6	P9 In46 'hang-overs' not 'hung-overs'
Author	We have corrected this.
R2.7	Results- p10 We do not know if the first and last names given are real names. It would be useful if this data was presented in a tabular form and a column added on whether tweets identified as unprofessional were from self-identified students or doctors.
Author	<p>Unprofessionalism was more common among users writing under pseudonym, as compared to those writing under recorded name. We have therefore revised the results section accordingly and added the following paragraph on page 11:</p> <p>"Unprofessionalism was more common among users writing under pseudonym compared to users writing under recorded name. Fourteen of 21 users (67%) writing under pseudonym wrote at least one unprofessional tweet, and among users with recorded name the corresponding proportion was 81 of 216 users (38 %), (p=0.02), When comparing unprofessional tweets between users using pseudonym or recorded the name, the proportion of unprofessional tweets was 71 of 1875 tweets (3.8 %) and 205 of 11905 (1.7 %), respectively (p&lt;0.001)."</p> <p>Moreover, the discussion has been revised on page 14:</p> <p>"In analogy it could be reasoned that the perceived anonymity for a Twitter user might lower the threshold for unprofessional behaviour. This is supported by our finding that users writing under pseudonym more frequently tweet unprofessionally".</p>
R2.8	P11 In8 'of these' rather than amongst these. It would be clearer to present the percentages of unprofessional tweets as a percentage of healthcare or non-healthcare related tweets rather than the total of all tweets.

Author	<p>We have corrected to “of these”.</p> <p>Using only the health-care related tweets in the denominator gives a higher proportion of un-professional tweets. However, a follower of an account sees all tweets in chronological order, and consequently we think that it is more relevant to use the total number of tweets in the denominator when estimating un-professionalism.</p> <p>Despite this, the information might be interesting for the reader of our article. Therefore, we now present the number of unprofessional tweets both as a percentage of healthcare and non-healthcare related tweets, respectively, and as a percentage of the total number of tweets, in the Results section on page 11.</p>						
R 2.9	<p>Discussion- Why was it an advantage to look at all Swedish-speaking doctors/medical students rather than those with over 500 followers as in the Chretien study?</p>						
Author	<p>We believe that selection bias may be a limitation in the study by Chretien et al. It is likely that doctors with more than 500 followers on Twitter are more experienced users of social media, and therefore behave more professionally. In our material, only 1.7 percent of the accounts have more than 500 followers. A population-based approach including all doctors on Twitter is likely to give a more reliable estimate of un-professionalism.</p> <p>We have added a paragraph on page 13 explaining this.</p>						
R 2.10	<p>Did the data show that those with more or less followers were more likely to be unprofessional? Again, it is not certain that the names given are real names as no attempt to verify identity is described. In any case this is not necessarily surprising as several physician organisations recommend that doctors identify themselves by name on social media sites if discussing medical content.</p>						
Author	<table border="1" data-bbox="312 1525 815 2002"> <thead> <tr> <th data-bbox="312 1525 531 1664"><b>Tertiles of follower counts</b></th> <th data-bbox="531 1525 815 1664">Nb unprofessional tweets/total number of tweets analysed.</th> </tr> </thead> <tbody> <tr> <td data-bbox="312 1664 531 1803"><b>Group A (N=79) (0-12 followers)</b></td> <td data-bbox="531 1664 815 1803">58/2196 (2.64%)</td> </tr> <tr> <td data-bbox="312 1803 531 2002"><b>Group B (N=79) (12-44 followers)</b></td> <td data-bbox="531 1803 815 2002">75/4061 (1.85%)</td> </tr> </tbody> </table>	<b>Tertiles of follower counts</b>	Nb unprofessional tweets/total number of tweets analysed.	<b>Group A (N=79) (0-12 followers)</b>	58/2196 (2.64%)	<b>Group B (N=79) (12-44 followers)</b>	75/4061 (1.85%)
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	<p><b>Group C (N=79)</b></p> <p><b>(46-2349 followers)</b></p>	143/7470 (1.91%)	
	<p>We have explored this question by splitting the cohort into three equally large groups depending on numbers of followers and calculating the ratio between the number of unprofessional tweets and the total number of tweets.</p> <p>The rate of unprofessional tweets seems higher in the group with fewer followers. However, it is difficult to draw conclusions from the table above. As we abstracted up 100 tweets per user with &gt;100 tweets and all tweets for per user with &lt;100 tweets, our data includes all tweets for some users and only a sample of all tweets for some users. We believe this introduces some selection bias in our data. To analyze unprofessionalism associated with numbers of followers another study design would be needed.</p> <p>As responded under R2.2 we now address users with names as user with “recorded name”.</p>		
R2.11	Sometimes the accounts investigated are described as belonging to physicians rather than ‘physicians and medical students’. Please address this.		
Author	We have added “and medical students” where it was missing, to clarify the accounts investigated.		
R 2.12	P13 Ln19-26 No data is given to support the assertion that physicians or medical students with lower follower counts are more likely to be unprofessional, hence the statement that a feeling of anonymity amongst those with lower follower counts might justify findings is not sustainable.		
Author	<p>As our data do not support that unprofessionalism is associated with fewer followers, we have re-phrased this statement on page 14.</p> <p>In the statement “In analogy it could be reasoned that the perceived anonymity for a Twitter user might lower the threshold for unprofessional behaviour.” we have erased “with few followers”</p>		
R2.13	P13 Ln30-33 No data is given for who physicians or medical students interact with in this study.		
Author	<p>Interaction between physicians and medical students is indeed an interesting subject. This statement is based on our own experience from being Twitter users. We have clarified this statement by adding “our own ”.</p> <p>With a different study methodology, it would be possible to do such analyses. However,</p>		

	<p>we were not able to do network and clustering analyses within our sample of tweets.</p> <p>“It is our own experience that physician users in our study interact frequently with their “virtual colleagues”, many of whom they’ve probably never met face to face.”</p>
R2.14	<p>P14 Ln 6 Was the use of ‘medical jargon’ considered an unprofessional behaviour? If not then this is not relevant to the study.</p>
Author	<p>Medical jargon was not considered unprofessional behavior unless it was in conflict with the ethical guidelines from the Swedish Medical Association. However, such jargon could be judged as unprofessional by followers.</p> <p>Therefore we have not changed the paragraph.</p>
R2.15	<p>P14 Ln 15-17 Since no analysis of the networks of Swedish-speaking physicians and medical students was performed the conclusion that peer feedback may reduce unprofessional behaviour does not seem to be justified.</p>
Author	<p>Peer feedback is suggested to reduce unprofessional behavior in reference 17 and therefore we would like to add this suggestion as a statement in the Discussion section. We have re-phrased the statement on page 15, with a more distinct referral to reference 19.</p> <p>“As previously suggested, we also believe that peer assessment might offer valuable feedback for physicians or medical student behaving unprofessionally.<sup>19</sup>”</p>
R2.16	<p>P14 Ln46-49 The statement that the authors do not believe Swedish-speaking doctors and medical students to be different to those in other countries is not relevant.</p>
Author	<p>We acknowledge that this statement is not correct. We have therefore removed it from the manuscript.</p> <p>See also R2.2</p>
R2.17	<p>Conclusion- p15 Ln 3 It is stated that 15 accounts ‘committed potential privacy violations’ but it is not stated whether these accounts belonged to students or physicians, and the response from other users was not examined. No statistics are given for the total number of accounts which were judged to be unprofessional. It may be that this a high percentage of all accounts analysed which would support the authors conclusion that all physicians should examine their behaviour, but without this analysis I do not think this is justified.</p>
Author	<p>The reviewer has a point, and we thank her for this remark. Here, we present a table with additional analyses. Although a higher proportion of medical students behave unprofessionally, one third of doctors had posted at least one unprofessional tweet. Consequently, we think it is correct to suggest that all physicians and medical students</p>

	<p>should be conscious about their behavior.</p> <table border="1"> <thead> <tr> <th></th> <th>Accounts N</th> <th>Nb Accounts with <math>\geq 1</math> tweet categorized as unprofessional N (%)</th> </tr> </thead> <tbody> <tr> <td>Accounts: medical students</td> <td>91</td> <td>48 (52.7 %)</td> </tr> <tr> <td>Accounts: physicians</td> <td>146</td> <td>47 (32.2 %)</td> </tr> </tbody> </table> <p>A new paragraph has been added to the Results section on page 11 and the Discussion on page 15 revised accordingly.</p>			Accounts N	Nb Accounts with $\geq 1$ tweet categorized as unprofessional N (%)	Accounts: medical students	91	48 (52.7 %)	Accounts: physicians	146	47 (32.2 %)
	Accounts N	Nb Accounts with $\geq 1$ tweet categorized as unprofessional N (%)									
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R2.18	<p>P15 Ln 5 I am not aware of research that online physician behaviour impacts on the doctor-patient relationship although it is not an unreasonable assumption. However, since this is not discussed earlier in the paper it does not seem to be a relevant conclusion.</p>										
Author	<p>We agree with this comment. The sentence: "Professionalism, both on and off the Internet, is crucial for maintaining the delicate doctor-patient relationship." has been removed.</p>										