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Health recommendations within the internet: Lessons learned from a planned quantitative study on toothbrushing recommendations

Abstract

Background:
Analyzing recommendations on websites is a method that is often applied to understand what advice is given to patients. An important health behavior which is carried out by most people on a regular basis is toothbrushing.

Objective:
Our objective was to assess toothbrushing recommendations on German websites.

Methods:
It was planned to include websites related to oral hygiene in German language and to analyze their recommendations quantitatively by counting them regarding frequency, duration and toothbrushing technique.

Results:
Several obstacles emerged during the study which finally rendered a quantitative analysis impossible. Among them are an unreasonable amount of websites fulfilling the inclusion criterion, multiple and contradictory advice within one and the same internet presence and cross-linking between websites.

Further, it was impossible to clearly define what should be considered a recommendation and if it would be found by patients as some potential recommendations were mentioned just by the way or at unusual parts of the website.

Conclusions:
Lessons learned during this analysis are discussed with respect to the present research question but also to other research on health recommendations on the internet. Problems that might occur during quantitative and qualitative analyses are shown and potential solutions are presented along
with the biases they might cause. Thereby a checklist is provided which should be considered when planning, reporting and evaluating studies analyzing web contents.

**Keywords:**

Patient education; Guidelines; Internet; Health communication; Health education, dental; Organizations; Health behavior; Toothbrushing; Oral hygiene
Introduction

Analyzing patient recommendations on websites is an innovative method. It helps researchers to better understand what advice is given to patients [1–4], what type of information is provided and how it is delivered [5].

An important area where patients might seek advice is oral hygiene behavior. Oral diseases, especially gum diseases such as gingivitis (inflammation of the gums) and periodontitis (inflammation of the tissues around the teeth which involves progressive loss of the alveolar bone), have a high prevalence worldwide [6] and are associated with poor oral hygiene.

Thus, patients are advised to perform good oral hygiene. One source where patients can find information how to perform oral hygiene appropriately is the internet.

It thus might be interesting to have a closer look at these recommendations and indeed a former study analyzed toothbrushing recommendations provided on the internet in different countries [4].

As websites in German language were not included in this initial study, our objective was to assess toothbrushing recommendations on these websites. While such research usually also judges the quality of information by proving whether it is evidence-based or complies with national policies or guidelines [1; 3; 5] this was not possible in our study due to lack of evidence-based guidelines in Germany and overall lack of evidence regarding tooth-brushing behavior [7–9]. Instead, our aim was to give an overview about the recommendations that organizations give regardless of this lack of evidence, similar to what already had been done for other countries [4]. Therefore, we wanted to quantify the content of the recommendations patients would find on websites in German. In particular, we wanted to investigate the frequency of recommendations found on the websites and whether the advice given is consistent between organizations or whether one will see heterogeneous patterns of advice between organizations or different types of organizations. Therefore, this descriptive content analysis was planned to be carried out in a quantitative approach.
Methods

Similar to an earlier study [4], it was planned to include websites from dental association web pages, toothbrush and toothpaste companies, dental textbooks and also to use Google Scholar and Google Books to assess studies and books on toothbrushing recommendations and guidelines. All websites and sources available on the internet in German language were to be included in this approach, thus encompassing websites not only from Germany but also from Austria, Belgium, Italy, Liechtenstein, Luxembourg and Switzerland.

All type of information should be included (e.g. documents, videos, leaflets, magazines) that was freely accessible and written (or spoken) in German. If the websites had a search function, this had to be used additionally with the key words toothbrushing (Zähneputzen, Zähne putzen) and oral hygiene (Mundhygiene).

Similar to the previous study [4], a quantitative analysis of the recommendations was planned. Therefore, the categories formulated within that former study [4], specifically the frequency, duration and technique of toothbrushing were to be assessed together with the origin of these recommendations and results were to be counted.

Results

When trying to apply the methods described above, several obstacles emerged which finally rendered the implementation of these methods impossible. For the ease of reading the problems and the approaches to them are presented in the following in a numerical order though several of these problems co-occurred.

Problem 1:

The number of websites fulfilling the selection criteria named above was unreasonably high (>1000 different websites). Approach to problem 1: The scope was narrowed in several steps and was finally limited to non-commercial websites of German institutions with a high authority regarding dental advice, i.e. university dental clinics, governmental health institutions, self-governing bodies of the public health sector, scientific professional societies (members/associates of the German Society for Dental and Oral Medicine (DGZMK) or dental professional

groups of the Association of the Scientific Medical Societies in Germany (AWMF)), federal associations of panel dentists, federal dental chambers. This resulted in a final sample of 126 organizations (a list of these organizations is provided in the Web Appendix).

**Problem 2:**

Similar to the previous study [4], it was planned not only to search the sitemap of the website but also to use the search function on the websites in case it was provided. Using this approach, the search function sometimes yielded more than 100 hits, which often did not fit and which also patients might not follow (see examples given in Table 1). *First approach to problem 2*: It was planned to resign from the search function and only click through the sitemap. To ensure the reliability of this approach, two different researchers searched a website by either using the search function or by clicking through the sitemap. As a result, they found different recommendations on this website, demonstrating that this approach is not reliable. *Second approach to problem 2*: It was decided to apply the search function in addition but in case there were more than 25 hits, only the first three hits were fully read and the following hits were only read in case the title was related to the topic oral hygiene because studies on click through rates show that users are likely to click only on the first results of a search [10; 11].
Table 1 Examples and further explanations regarding problem no. 2

<table>
<thead>
<tr>
<th>Examples and further explanations (translated into English) regarding problem no. 2: (&gt;100 results within a website when using the search function)</th>
<th>Organization [English translation], URL, date accessed, Webcitation Link</th>
</tr>
</thead>
</table>
| 103 hits when merely searching for “tooth brushing” | Das Informationssystem der Gesundheitsberichterstattung des Bundes [Information System of the Federal Health Reporting Service]  
http://www.gbe-bund.de/gbe10/pkg_stichwort.prc_stichwort?query_id=&button=0&p_uid=gast&p_aid=80313192&p_sprache=D&cb_wk=cb_wk&x=0&fort=&erg_art=ALL&suchstring=z%E4hne+putzen&p_methode=1&p_volltext=1&p_soundex=1  
2017-07-24  
http://www.webcitation.org/6sCI3BaQX |
| 156 hits when searching merely for tooth brushing | Kassenzahnärztliche Bundesvereinigung (KZBV) [Federal Association of Panel Dentists]  
http://www.kzbv.de/suchergebnisse.333.de.html?q=z%C3%A4hne+putzen#search  
2017-07-21  
http://www.webcitation.org/6s7fWkxA2 |
| 1219 hits when searching merely for tooth brushing | Bundeszahnärztekammer (BZAEBK) [Federal dental chamber]  
https://www.bzaek.de/suche.html?id=54&tx_kesearch_pi1%5Bword%5D=z%C3%A4hne+putzen&tx_kesearch_pi1%5Bpage%5D=1&tx_kesearch_pi1%5BresetFilters%5D=0&tx_kesearch_pi1%5BsortByField%5D=&tx_kesearch_pi1%5BsortByDir%5D=  
2017-07-21  
http://www.webcitation.org/6s7ggSoZJ |
Problem 3:

The next problem emerging was the definition of “recommendation”. For example, there were sometimes non-recommendations (“Don´t use the scrub-technique”) and advice was given indirectly (“Two thirds of all children brush their teeth at least twice a day as recommended by …“) or was only vague. Some of this advice cannot be quantitatively assessed and the other is too vague to be given the same value in quantitative analyses as direct advice as this might bias the results (see examples given in Table 2). Approach to problem 3: Only direct advice, characterized by imperative forms or phrases like “you should”, was included. However, in some cases an unequivocal decision whether an advice fulfilled these criteria or not was impossible.

Table 2 Examples and further explanations of problem no. 3

<table>
<thead>
<tr>
<th>Examples and further explanations (translated into English) regarding problem no. 3: Unclear whether a statement can be considered as a recommendation (problem of defining a recommendation)</th>
<th>Organization [English translation], URL, date accessed, Webcitation Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect recommendation: The following statement is made in the context of a description of professional tooth cleaning: “Those who brush their teeth at least twice a day thoroughly and also use floss or interproximal brushes are doing a lot for their dental health.”</td>
<td>Kassenzahnärztliche Bundesvereinigung (KZBV) [Federal Association of Panel Dentists] <a href="http://www.kzbv.de/professionelle-zahnreinigung.709.de.html">http://www.kzbv.de/professionelle-zahnreinigung.709.de.html</a> 2017-07-25 <a href="http://www.webcitation.org/6sDWYCwo4">http://www.webcitation.org/6sDWYCwo4</a></td>
</tr>
<tr>
<td>Vague recommendation: In a video “Healthy teeth for children” they recommend the KAI technique (an Acronym of the German words for Occlusal surfaces – Outer surfaces – Inner Surfaces) but only describe a sequence of brushing children should follow and that parents should brush their children´s teeth after they have finished, additionally.</td>
<td>Kassenzahnärztliche Bundesvereinigung (KZBV) [Federal Association of Panel Dentists] <a href="http://www.kzbv.de/video-gesunde-kinderzahne.482.de.html">http://www.kzbv.de/video-gesunde-kinderzahne.482.de.html</a> 2017-07-24; video was also downloaded <a href="http://www.webcitation.org/6sCISzMOL">http://www.webcitation.org/6sCISzMOL</a></td>
</tr>
</tbody>
</table>
Problem 4:

More than one recommendation addressing the same topic (e.g. brushing technique or frequency) was often found within one website. These recommendations sometimes were even contradictory (see examples given in Table 3. Approach to Problem 4: To assess whether different indications (e.g. patients with gingivitis, periodontitis, dental braces, dental implants) might explain the variety of the recommendations the indication was included as a further category into the analyses. This, however, did not provide a solution in several cases. This problem thus remained unsolved.
<table>
<thead>
<tr>
<th>Examples and further explanations (translated into English) regarding problem no. 4: More than one recommendation on one website addressing the same topic</th>
<th>Organization [English translation], URL, date accessed, Webcitation Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Website A  Recommendation 1 regarding technique</td>
<td>„Move your toothbrush from the gum to the tooth (from “red to white”) or move it in small circular movements. Avoid horizontal “scrubbing”.“</td>
</tr>
<tr>
<td>Website A  Recommendation 2 regarding technique</td>
<td>„…Older children and adults can switch to the Bass-technique. Within this technique, the toothbrush is placed on the teeth and gums at an angle. Little jiggling forward and backward movements are done at one place and afterwards you wipe out from red (gums) to white (teeth). That is how plaque will be loosened and removed gently. For each dental section, you should make at least ten jiggling movements and it should be done systematically. More important than the method is to clean all areas.”</td>
</tr>
<tr>
<td>Website A  Recommendation 3 regarding technique</td>
<td>„… One should focus on a thorough but gentle brushing technique.”</td>
</tr>
</tbody>
</table>
| Website A | Recommendation 4 regarding technique | „…Your dentist and his/her staff can show you which technique is suitable for you depending on your characteristics and problems.” | Universitätszahnklinik Freiburg [Dental university clinic of Freiburg]  
https://www.uniklinik-freiburg.de/zahnerhaltung/patienten-info/behandlungsspektrum/prophylaxe.html  
2017-07-25  
http://www.webcitation.org/6sDVtofFp |
|-----------|--------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Website B | Recommendation 1 regarding frequency | „Those who brush their teeth at least twice a day thoroughly and also use floss or interproximal brushes are also doing a lot for their dental health.” | Kassenzahnärztliche Bundesvereinigung (KZBV) [Federal Association of Panel Dentists]  
http://www.kzbv.de/professionelle-zahnreinigung.709.de.html  
2017-07-25  
http://www.webcitation.org/6sDWYCwo4 |
| Website B | Recommendation 2 regarding frequency | „Regarding the effectiveness of fluorides for the prophylaxis of caries, it is fundamental to use them continuously. Continuous application may for example refer to using fluoride-containing toothpaste on a daily basis.” | Kassenzahnärztliche Bundesvereinigung (KZBV) [Federal Association of Panel Dentists]  
http://www.kzbv.de/zzq-pi-fluoridierungsmassnahmen-kariespraevention.download.619606bb1de0291740eaa67de56d4cc5.pdf  
2017-07-25  
http://www.webcitation.org/6sDXBQOeO |
| Website B | Recommendation 3 regarding frequency | „Twice a day fluoride-containing toothpaste for adults“ | Kassenzahnärztliche Bundesvereinigung (KZBV) [Federal Association of Panel Dentists]  
http://www.kzbv.de/zzq-pi-fluoridierungsmassnahmen-kariespraevention.download.619606bb1de0291740eaa67de56d4cc5.pdf  
2017-07-25  
http://www.webcitation.org/6sDXBQOeO |
<table>
<thead>
<tr>
<th>Website B</th>
<th>Recommendation 4 regarding frequency</th>
<th>„After the first permanent teeth have broken through (about the age of 6 years), daily tooth cleaning can be performed at least twice a day with an adult-toothpaste (0.10–0.15% fluoride = 1000-1500 ppm).“</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Kassenzahnärztliche Bundesvereinigung (KZBV) [Federal Association of Panel Dentists] <a href="http://www.kzbv.de/zzq-pi-fluoridierungsmassnahmen-kariespraevention.download.619606bb1de0291740eaa67de56d4cc5.pdf">http://www.kzbv.de/zzq-pi-fluoridierungsmassnahmen-kariespraevention.download.619606bb1de0291740eaa67de56d4cc5.pdf</a> 2017-07-25 <a href="http://www.webcitation.org/6sDXBQOeO">http://www.webcitation.org/6sDXBQOeO</a></td>
</tr>
<tr>
<td>Website B</td>
<td>Recommendation 5 regarding frequency</td>
<td>„A little hourglass shows, when the recommended brushing time of round about three minutes is over. That is how long it takes at least until all teeth of the upper and lower jaw are cleaned from all sides and in between. Such a thorough way of toothbrushing is sufficient once a day before going to bed. Three minutes is also more or less the time that the fluoride from the toothpaste needs to be stored into the dental enamel.“</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kassenzahnärztliche Bundesvereinigung (KZBV) [Federal Association of Panel Dentists] <a href="http://www.kzbv.de/zahnseide-und-weitere-hilfsmittel.59.de.html">http://www.kzbv.de/zahnseide-und-weitere-hilfsmittel.59.de.html</a> 2017-07-25 <a href="http://www.webcitation.org/6sDXY1ai">http://www.webcitation.org/6sDXY1ai</a></td>
</tr>
</tbody>
</table>

**Problem 5:**

In several cases when seeking recommendations one was linked to other websites or to materials of third parties (e.g. conference reports) and it often remained unclear whether the organization which had set the link also had adopted these recommendations (see examples given in Table 4). **Approach to problem 5:** As this might bias the quantitative analyses and sometimes turned out to be a source of new contradictions it was decided to ignore these links for quantitative analyses. However, in some cases it remained unclear whether a document had its origin in a third party or in the current organization. One should also consider that the approach mentioned above might induce other biases: First: Recommendations which are seen several times by a patient when he or she seeks advice at differing websites are counted only once when these websites refer to each other. Second: If this website linked to a website outside the scope of the current analyses the advice given there would not be counted at all even though it might represent what is considered the best by the organization setting the link. Thus, no satisfactory solution was found for problem 5.
Examples and further explanations (translated into English) regarding problem no. 5: Unclear whether organization adopted document as its own

<table>
<thead>
<tr>
<th>Examples and further explanations (translated into English) regarding problem no. 5: Unclear whether organization adopted document as its own</th>
<th>Organization [English translation], URL, date accessed, Webcitation Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linking to other websites</td>
<td>Kassenzahnärztliche Bundesvereinigung (KZBV) [Federal Association of Panel Dentists] <a href="https://www.kzbv.de/blickpunkt-patient/kinder-beim-zahnarzt/">https://www.kzbv.de/blickpunkt-patient/kinder-beim-zahnarzt/</a> 2017-07-24 <a href="http://www.webcitation.org/6sC7Cot7c">http://www.webcitation.org/6sC7Cot7c</a></td>
</tr>
<tr>
<td>„2 – 4 years: […] A special learning toothbrush facilitates the independent brushing with the KAI-method.” (Linking to <a href="http://www.putzi.de/putzi_putzen.htm">http://www.putzi.de/putzi_putzen.htm</a>); „8 – 12 years […] (parts of the texts from the magazine „Lückenlos“) linking to <a href="http://www.lueckenlos.info">www.lueckenlos.info</a>) “Video for children’s dental care […] further to the video of the kzbv” (linking to <a href="http://www.kzbv.de/video-gesunde-kinderzaehne.482.de.html">http://www.kzbv.de/video-gesunde-kinderzaehne.482.de.html</a>); “Information for schools and kindergartens. Further information for schools, kindergartens and parents is provided by the federal working group of conservative dentistry e.V. (LAGZ).” (Linking to <a href="http://www.lagz.de">www.lagz.de</a>)</td>
<td></td>
</tr>
<tr>
<td>Under „Dental knowledge“, there are different links to websites of other organizations: “As a guide of reliable and acknowledged dental health information, we have put together the following links for you.”</td>
<td></td>
</tr>
<tr>
<td>Under „Information for patients“ there are links to „Lückenlos“, „BZÄK“, and „DGZMK“</td>
<td></td>
</tr>
</tbody>
</table>
Problem 6:
When analyzing the full internet presence of an organization or institution one can often find recommendations at sites which apparently address other groups rather than patients. Furthermore, recommendations can sometimes be found at very unusual places, e.g. hidden in documents dealing with other topics. Counting these recommendations nevertheless might again bias quantitative analyses and represent a new source of contradictory advice (see examples given in Table 5). **Approach to problem 6:** It was decided to include only those recommendations in the quantitative analyses that a patient might find intuitively. To assess the validity of this approach,
five different researchers were instructed to intuitively search one website (from a big national organization [12]) from a patient’s point of view and to record the locations within the internet. The number of locations recorded by the five researchers within this approach ranged between 24 and 40 resulting in values below 0.13 both for Fleiss’ Kappa and Krippendorff’s alpha when coding dichotomously whether a location has been found or not. It went down to zero when locations that have not been found were coded as missing. Also, the total agreement was very poor. From the total number of 67 locations found by the researchers only 3 locations (4%) were found by all 5 researchers. There was no solution found yet for obtaining better intercoder-reliability.

Table 5 Examples and further explanations of problem no. 6

<table>
<thead>
<tr>
<th>Example and further explanations (translated into English) regarding problem no. 6: Other groups addressed rather than patients</th>
<th>Organization [English translation], URL, date accessed, Webcitation Link</th>
</tr>
</thead>
</table>
| Other groups addressed indicated by “specialist jargon” | Zahnklinik der Medizinischen Hochschule Hannover [University dental clinic of Hanover]  
[https://www.mh-hannover.de/8145.html  
2017-07-25](http://www.webcitation.org/6sDSV0Kzs) |
| „Prophylaxis of caries with fluoride compounds: The solubility of the dental enamel is reduced through the integration of fluoride into the crystal grating of the tooth structure, i.e. the tooth structure is more resistant to caries attacks. Further, the remineralization of minerals in the tooth structure is supported. One distinguishes between local and systemic actions of fluoride…” |  |
| Other groups addressed indicated by unusual place where document was found | Kassenzahnärztliche Vereinigung Sachsen-Anhalt [Association of Panel Dentists of Saxony-Anhalt]  
[https://www.kzv-lsa.de/files/KZV-SA/Inhalte/Dokumente/Diverses/Anlage1_Koop_Vertrag_Bsp.pdf  
2017-07-24](http://www.webcitation.org/6sCE7ZgDP) |
| Care plan for oral hygiene for people in need of care, difficult to find: attachment to a cooperation agreement (blank form for care plan) „Tooth cleaning (twice a day)“ |  |
Other groups addressed indicated by unusual place where document was found

Federal law with an attached document for parents

“Guidelines from the ministry of social affairs regarding the implementation of youth dental care
From the 15th of January 1996 (GBI p.140), last amended by administrative regulation from the 15th of November 2004, Az.: 54-5433.2

According to § 8 Abs. 2 of the health service law from the 12th of December 1994 (GBI p.633) and…

… Dear parents,

Healthy teeth and healthy gums are a prerequisite for a “healthy bite”. Thorough and regular toothbrushing helps with this. Ideally after every meal, but at least in the morning and in the evening for the prevention of dental diseases and caries…”

| Landeszahnärztekammer Baden-Württemberg |
| [Dental chamber of Baden-Wuerttemberg] |
| http://www.lzkbw.de/PHB/PHB-CD/Gesetze_Vorschriften/Landesgesetze/Richtlinie_Durchfuehrung_Jugendzahnpflege.doc |
| 2017-07-26 |
| http://www.webcitation.org/6sF1qvbRe |

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**Final Decision**

As good intercoder-agreement is a prerequisite for a reliable and valid analysis and as there were several other unsolvable problems that had emerged during the study, the intent to give a quantitative overview about recommendations patients might find in the internet for oral hygiene was finally abandoned.

**Discussion**

**Summary**

A quantitative analysis of recommendations patients find in the internet for oral hygiene behavior was impeded by several factors finally dooming it to failure. Although the quantitative analysis that was planned could not be pursued, there were some lessons learned during this study, especially as former quantitative research [4] did not unveil these problems. These problems appear to be wide-spread and do not seem to be confined to recommendations regarding oral health behavior but rather apply to many other areas like nutrition, physical activity or sun exposure, to name some examples.

Therefore, a checklist for future studies is provided.
Checklist for future planning, reporting and evaluating quantitative analyses of web health recommendations

1.) When conducting a website analysis, one might face the problem of an unreasonably high amount of websites potentially being of interest. In many cases it thus might be necessary to restrict the research to specific websites. This should be considered when planning the study and clear inclusion and exclusion criteria should be defined and justified. To ease reproducibility of the research a full list of all hits included should be reported. One should also consider and discuss that these restrictions might limit the informative value of the analysis.

2.) One will often find more than one recommendation within one and the same internet presence. These recommendations might be heterogeneous or even contradictory. In this case, it is required to clearly state how to deal with that. Dependent on the research aim and type of analysis, one option might be to report the most frequently given recommendation or to count how many different and how many contradictory recommendations were given. One should consider when discussing the data that heterogeneity and contradictions both might bias the results.

3.) It often is not clear what is considered to be a recommendation both by the organization hosting the internet presence and by the patients reading it. One option might be to count each and every statement which potentially might be meant or read as recommendation. This, however, might bias results in several ways. It might increase the overall number of recommendations, their heterogeneity and the number of contradictions. Furthermore, the clearness by which a statement is presented as recommendation might also represent its significance. It might thus not be valid to weigh all statements equally notwithstanding their differences in clearness. Another option would thus be to count only clear-cut recommendations. In that case a clear definition of what is considered a clear-cut recommendation must be given and justified (e.g. by former research on what a patient considers a clear-cut recommendation). Regardless of which option is chosen: Inter-coder accordance of what is counted as recommendation has to be proven and potential biases resulting from the way of analysis must be discussed.

4.) Recommendations sometimes are not given by indicating what to do but rather by indicating what to avoid. These non-recommendations might or might not reflect the mere opposite of a positive recommendation (e.g. “avoid saturated fatty acids” vs. “prefer non-saturated fatty acids”;

“avoid the sun” vs. “prefer the shadow”; “don’t scrub your teeth” vs. “brush your teeth with circling movements”; “avoid sitting all day long” vs. “increase physical activity”). These non-recommendations should thus be counted as separate categories. It has to be considered and discussed, however, that this again might distort results by counting statements of equivalent meaning in different categories.

5.) When searching the entire sitemap of an internet presence, recommendations can be found at unusual places where probably a patient would not search. Again, it depends on the research question whether the whole web presence should be evaluated or whether it should be examined from a patient point of view. Whatever option is chosen, it again has to be justified and potential biases resulting from that have to be discussed. Analyzing all parts of an internet presence might lead to over-counting, might add to the heterogeneity and bring about contradictive recommendations. Restricting research to “patient sites” brings about problems with the definition what should be considered a patient site, especially if organization do not clearly indicate which sites are dedicated to patients and which are not. It might be necessary to address this problem by conducting a pilot study assessing patients’ site preferences. In final analyses inter-coder accordance of what is considered countable sites has to be proven.

6.) Within an internet presence one often finds materials of third parties (e.g. interviews with scientists, magazines) or links to other internet presences which also contain recommendations (see table 4). Again, it is difficult to decide how to deal with this and the decision depends on the precise research question and must be justified. When one wants to analyze the recommendations of the organization hosting the internet presence it might be important to know whether the organization has adopted these recommendations as their own. When aiming to count the recommendations across websites one has to decide whether cross-links should be counted twice (as they represent what is found on the linking site and on the site linked to) or once (representing the physical presence of the advice). Both would again lead to biases which have to be discussed.

Implications for future research

Considering the difficulties unveiled by this research one might doubt the value of quantitative analyses of web recommendations on health, at all. Indeed, their value appears to be limited and might be restricted to very specific research questions. Prior to conducting such analyses one
should therefore consider to what degree the above mentioned problems emerge and whether they can be dealt with in a meaningful way. Depending on the research question other approaches might be more promising and significant as for instance studying real patients’ behavior when searching the internet and assessing which information they adopt while doing that.

The above checklist of problems and potential biases also provides a methodological check-list for authors, reviewers and readers when it comes to planning, reporting and evaluating studies analyzing web contents on health recommendations. Many of the problems will be faced both when running quantitative and qualitative analyses. It is essential for the understanding of the significance of the research to mention which of these problems emerged, how researchers have dealt with them and which bias might have resulted.

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Authors´contributions:

SE: planning the study, analysis of the websites, writing the article, discussing study results
RD: planning and supervising the study, writing the article, discussing study results

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Conflicts of Interest

None of the authors has any personal or financial interests related to this study.

Multimedia Appendix 1

List of included organizations and (if available) their websites
References


