Journal of Clinical and Translational Research
Peer review process file 07.202104.006

Google trends as a tool for evaluating public interest in total knee arthroplasty and total hip arthroplasty

Samuel A. Cohen*, Landon E. Cohen, Jonathan D. Tijerina, Gabriel Bouz, Rachel Lefebvre, Milan Stevanovic, Nathanael D. Heckmann

*Corresponding author
Samuel A. Cohen
Stanford University School of Medicine 291 Campus Drive, Stanford, CA, 94305

Handling editor:
Michal Heger
Department of Pharmaceutics, Utrecht University, the Netherlands
Department of Pharmaceutics, Jiaxing University Medical College, Zhejiang, China

Review timeline:

Received: 13 May, 2021
Editorial decision: 15 June, 2021
Revision received: 16 June, 2021
Editorial decision: 16 June, 2021
Published online: 16 July, 2021

1st Editorial decision
15-Jun-2021

Ref.: Ms. No. JCTRes-D-21-00071
Google Trends as a Tool for Evaluating Public Interest in Total Knee Arthroplasty and Total Hip Arthroplasty
Journal of Clinical and Translational Research

Dear author(s),

Reviewers have submitted their critical appraisal of your paper. The reviewers' comments are appended below. Based on their comments and evaluation by the editorial board, your work was FOUND SUITABLE FOR PUBLICATION AFTER MINOR REVISION.

If you decide to revise the work, please itemize the reviewers' comments and provide a point-by-point response to every comment. An exemplary rebuttal letter can be found on at http://www.jctres.com/en/author-guidelines/ under "Manuscript preparation." Also, please use the track changes function in the original document so that the reviewers can easily verify your responses.

Your revision is due by Jul 15, 2021.

To submit a revision, go to https://www.editorialmanager.com/jctres/ and log in as an Author. You will see a menu item call Submission Needing Revision. You will find your submission record there.

Yours sincerely,

Michal Heger
Editor-in-Chief
Journal of Clinical and Translational Research

Reviewers' comments:

Reviewer #1: The authors have presented an interesting manuscript. I have the following comments:
- What may be the implications of an increase in the public interest in TKA and THA?
- Why do you think no significant correlation between GT search data and TKA case volumes was detected for the search terms "total knee arthroplasty", "knee arthroplasty"?
- In the discussion, could you kindly elaborate on the shortcomings that are currently present in the healthcare utilization related to TKA and THA or other procedures (examples, provide further literature on pitfalls in OR scheduling, cost containment, resource allocation…), and specify how GT can help address these issues? This will provide further clinical background to your study
- The ease of the of use of Google Trends by surgeons is repeatedly mentioned, however, the significance of GT analysis is highlighted for rather administrative and institutional purposes. Are there ways a surgeon specifically may benefit from this technology? (Page 20, line 19: "These models, however, are often complex and therefore inaccessible to a non-technologically advanced orthopaedic surgeon")
- Do you believe data from Google Trends may potentially replace traditional data collection methods for population health? There are currently several "big data" available that may assist in predicting trends and seasonal variations of different orthopedic surgeries; it would be interesting to highlight how Google Trends compare or assist traditional data collection and -analyses methods.

Authors' response

June 15, 2021

RE: Revision JCTRes-D-21-00071

Dear Dr. Heger,

Thank you for your consideration of our manuscript entitled, "**Google Trends as a Tool for Evaluating Public Interest in Total Knee Arthroplasty and Total Hip Arthroplasty".** We are grateful for the reviewer's constructive comments regarding the utility and informative nature of this manuscript. We also thank the reviewer for their thorough critiques that have been helpful in improving the revised manuscript. Below are point-by-point responses to the reviewer's comments. Reviewer comments are shown first and italicized:

Reviewer #1

1. What may be the implications of an increase in the public interest in TKA and THA?
Thank you for this insightful question. There are many implications of the increase in public interest in TKA and THA. First, trends in public interest in procedures such as TKA and THA can be used to help guide a physician's expectations for the patient encounter. This could lead

to the creation of decision aids that can be used to help explain the risks and benefits of procedures such as TKA/THA to patients who are coming to the office with increased interest in the respective procedures. There are also financial implications for increased public interest in TKA and THA, as anticipated increases in TKA and THA in conjunction with frequently changing insurance policies will financially impact both patients and providers. Lines 348-373 discuss some of the financial consequences of the anticipated increase in TKA/THA, but we have modified the manuscript to also indicate that the increased public interest in TKA/THA identified by GT data could lead to the creation of decision aids/tools that impact the patient encounter. The text now reads the following:
"Additionally, increased public interest in TKA/THA over time, as reflected by greater GT search volumes, indicates the need for the creation of decision aids that discuss the risks and benefits of TKA/THA to inform an increasingly curious public about the respective procedures." (Page 18-19, lines 312-314)

2. Why do you think no significant correlation between GT search data and TKA case volumes was detected for the search terms "total knee arthroplasty", "knee arthroplasty"?
Thank you for this clarifying question. We believe that there was no correlation between GT search data and TKA case volumes for "total knee arthroplasty" and "knee arthroplasty" because the phrases are more technical and less colloquial than the terms "total knee replacement" and "knee replacement." The vast majority of the people searching for information about total knee arthroplasty on the internet will not have medical degrees, so they would likely search for "total knee replacement" or "knee replacement" as opposed to "total knee arthroplasty" or "knee arthroplasty." We mention that colloquial rather than technical names associated with TKA and THA were more strongly associated with case volumes in lines 318-320, and our results were consistent with previous studies that also looked at both colloquial and technical terms.

3. In the discussion, could you kindly elaborate on the shortcomings that are currently present in the healthcare utilization related to TKA and THA or other procedures (examples, provide further literature on pitfalls in OR scheduling, cost containment, resource allocation…), and specify how GT can help address these issues? This will provide further clinical background to your study
Thank you for this insightful feedback. We agree that adding more examples of clinical shortcomings that may be addressed by the GT tool would be beneficial to our study. As a result, we have added a paragraph to the discussion to address these concerns. In this paragraph, we discussed the clinical applications of using the GT tool to 1) create guidelines for controversial or unproven therapies that are popular amongst the general public and 2) measure abrupt, real-time changes in public interest in medical conditions or procedures, which is very difficult to do using traditional medical research databases that often lag by about 2 years. We also added several new references in order to support these claims. The text now reads the following:

"The power of the GT tool to characterize public interest in medical conditions and procedures in real-time has many clinical implications. For one, GT may help to track public interest in more controversial procedures/therapies that have not yet been proven effective, which can lead to policy changes or recommendations. For example, previous reports indicate an increase in public interest for both stem cells and platelet-rich plasma to treat hip/knee osteoarthritis, despite the fact that limited evidence exists for the use of either therapy.[16,17] When GT data demonstrates that public interest in an unproven therapy is increasing, it is vital that medical personnel and organizations make a concerted effort to release guidelines that provide the public with trusted information

about the therapy, which is often difficult to find on the internet -- where medical information is often misleading or false.[36,37] Secondly, unlike many current medical research databases that provide medical utilization information about patients nearly two years after insurance claims are submitted, GT can be used to measure abrupt, real-time changes in public interest in medical conditions or procedures, which can help to gauge the public's response to changing healthcare policy and to better inform forecasting models." (Page 21-22, Lines 380-393)

4. The ease of the of use of Google Trends by surgeons is repeatedly mentioned, however, the significance of GT analysis is highlighted for rather administrative and institutional purposes. Are there ways a surgeon specifically may benefit from this technology? (Page 20, line 19: "These models, however, are often complex and therefore inaccessible to a non-technologically advanced orthopaedic surgeon")

Thank you for this clarifying question. The models referenced on Page 20, line 19 that are "often inaccessible to a non-technologically advanced orthopaedic surgeon" refer to the machine learning models that have been researched previously, not the easily accessible Google Trends data. We can see how this line may have been confusing, and as a result, we have added the qualifier "machine learning" before the word "models" to indicate that the machine learning models previously analyzed, and not the GT tool, were inaccessible to non-technologically advanced orthopaedic surgeons.

The text now reads the following:

"**These machine learning models, however, are often complex and therefore inaccessible to a non-technologically advanced orthopaedic surgeon." (Page 20, Lines 343-344)**

Additionally, with regards to ways a surgeon specifically may benefit from this technology, the sentence that we added to the discussion based on a previous reviewer comment (comment 1) addresses this question. This is because the Google Trends tool can be used by surgeons to anticipate patient treatment expectations for a given condition, such as knee/hip pain, that may allow for decision aids or tools to be made that can best inform patients about the respective procedures. Decision aids may benefit both the patient and the physician, as the patient will be equipped with the information to ask targeted questions regarding the procedure that may improve clinic efficiency. The line that we added to the discussion in response to that reviewer comment was the following:

"Additionally, increased public interest in TKA/THA over time, as reflected by greater GT search volumes, indicates the need for the creation of decision aids that discuss the risks and benefits of TKA/THA to inform an increasingly curious public about the respective procedures." (Page 18-19, lines 312-314)

5. Do you believe data from Google Trends may potentially replace traditional data collection methods for population health? There are currently several "big data" available that may assist in predicting trends and seasonal variations of different orthopedic surgeries; it would be interesting to highlight how Google Trends compare or assist traditional data collection and analyses methods.

Although Google Trends may be an extremely valuable resource to healthcare professionals as well as healthcare systems, we don't think that it will fully replace other traditional data collection methods or "big data" for population health. We come to this conclusion primarily because there are some limitations to the use of Google Trends, which we mention in our manuscript. For one, Google Trends provides very limited demographic data about the users whose search traffic data are represented in our study. Until there is more granularity with regards to demographic information of Google Trends users, other, more traditional data

collection methods will still be useful. It's possible that Google Trends will ultimately release more information about user data, and if this is the case, we could see a scenario where Google Trends becomes a dominant force comparable to other "big data" in terms of healthcare forecasting. In order to highlight how Google Trends compares to traditional "big data" collection and analyses methods, we have added to the discussion section. The text now reads the following:

"GT data tracking public interest in a given procedure such as TKA/THA can be combined with other "big data" that provides additional demographic information in order to gain a clearer understanding of who and what is driving various healthcare trends, which can result in more informed procedure forecasting and more efficient scheduling. GT provides actionable data that can be used by orthopaedic surgeons and healthcare systems to match the supply of OR time with demand for TKA and THA procedures as temporal, seasonal, and geographic trends dictate." (Page 20, Lines 347-353)

Thank you again for the constructive feedback regarding our manuscript. Should you need any further information or clarification from the authors, please do not hesitate to contact us.

Best regards,
Samuel Cohen
Samuel Cohen
Stanford University School of Medicine

2nd Editorial decision
16-Jun-2021

Ref.: Ms. No. JCTRes-D-21-00071R1
Google Trends as a Tool for Evaluating Public Interest in Total Knee Arthroplasty and Total Hip Arthroplasty
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Dear authors,

I am pleased to inform you that your manuscript has been accepted for publication in the Journal of Clinical and Translational Research.

You will receive the proofs of your article shortly, which we kindly ask you to thoroughly review for any errors.

Thank you for submitting your work to JCTR.

Kindest regards,

Michal Heger
Editor-in-Chief
Journal of Clinical and Translational Research

Comments from the editors and reviewers: