

Google Scholar and the gray literature: A reply to Bonato's review*

Enrique Orduna-Malea¹, Alberto Martín-Martín²,
Emilio Delgado López-Cózar²

² EC3: Evaluación de la Ciencia y de la Comunicación Científica, Universitat Politècnica de València (Spain)


¹ EC3: Evaluación de la Ciencia y de la Comunicación Científica, Universidad de Granada (Spain)

ABSTRACT

Recently, a review concluded that Google Scholar (GS) is not a suitable source of information “for identifying recent conference papers or other gray literature publications”. The goal of this letter is to demonstrate that GS can be an effective tool to search and find gray literature, as long as appropriate search strategies are used. To do this, we took as examples the same two case studies used by the original review, describing first how GS processes original's search strategies, then proposing alternative search strategies, and finally generalizing each case study to compose a general search procedure aimed at finding gray literature in Google Scholar for two wide selected case studies: a) all contributions belonging to a congress (the ASCO Annual Meeting); and b) indexed guidelines as well as gray literature within medical institutions (National Institutes of Health) and governmental agencies (U.S. Department of Health & Human Services). The results confirm that original search strategies were undertrained offering misleading results and erroneous conclusions. Google Scholar lacks many of the advanced search features available in other bibliographic databases (such as Pubmed), however, it is one thing to have a friendly search experience, and quite another to find gray literature. We finally conclude that Google Scholar is a powerful tool for searching gray literature, as long as the users are familiar with all the possibilities it offers as a search engine. Poorly formulated searches will undoubtedly return misleading results.

KEYWORDS

Google Scholar; Gray literature; Conference proceedings; Guidelines; Academic search engines

 <p>Grupo de Investigación EC3 Evaluación de la Ciencia y de la Comunicación Científica</p>	<p>EC3's Document Serie: EC3 Working Papers N° 23</p> <p>Document History Version 1.0, Published on 11 February 2017, Granada</p>
<p>Cited as Orduna-Malea, E.; Martín-Martín, A. & Delgado López-Cózar, E. (2017). Google Scholar and the gray literature: A reply to Bonato's review. <i>EC3 Working Papers</i>, 27. 11 February 2017</p>	
<p>Corresponding author Emilio Delgado López-Cózar. edelgado@ugr.es</p>	

* This work has been rejected in the Journal of the Medical Library Association (JMLA), both the full version (24th December, 2016) and a letter to editor version (31st January, 2017).

1. INTRODUCTION

Google Scholar, currently the preferential scientific literature's search tool platform to find scientific literature across all disciplines (Orduna-Malea et al, 2016), particularly in the Biomedicine (Vine, 2006; Hasse et al, 2007; Freeman et al, 2009; Kulkarni et al, 2009; Mastrangelo et al, 2010; Tober, 2011; Nourbakhsh et al, 2012; Bramer, 2016; Trapp, 2016), is now also being used as a source of data to elaborate systematic reviews (Boeker, Vach & Motschall, 2013; Gehanno, Rollin & Darmoni, 2013; Giustini & Boulos, 2013; Bramer, Giustini & Kramer, 2013; 2016).

Recently, a review (Bonato, 2016) inquired into the search options in Google Scholar and Scopus for finding gray literature concluding – after running few queries – that Google Scholar is not such an ideal information source “for identifying recent conference papers or other gray literature publications”, leaving much to be desired as a source for scientific information.

The goal of this working paper is to prove how fallacious and disproportionate this statement is, since its conclusions are derived from few specific searches and sustained on erroneous search strategies. The secondary goal of this working paper is to demonstrate that Google Scholar can be an effective tool to search and find gray literature, as long as appropriate search strategies are used

2. METHOD

We will take as a sample the same two case studies performed by Bonato. The first aims to locate conference papers on the drug panobinostat (using three different search variations) whereas the second aims to locate one specific document, the “Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents” (using one search variation), published by the US Department of Health and Human Services.

For each case, first we highlight how Google Scholar operates the search strategies performed by Bonato. Second, we propose an expert search to properly solve each case study. And third, we generalize each case study to compose a general search procedure aimed at finding gray literature in Google Scholar for two wide selected case studies.

As regards the first case study, we propose to find all contributions belonging to a congress (the ASCO Annual Meeting). As with the second case study, we propose a procedure to find indexed guidelines as well as gray literature within medical institutions (National Institutes of Health) and governmental agencies (U.S. Department of Health & Human Services).

To do this we use the Google Scholar's advance search as well as the following available search filters and commands:

- **“allintitle” command:** restricts results to those containing all the query terms you specify in the title of the document
- **“site” command:** get results from certain sites or domains
- **“author” command:** restrict results to documents signed by specified authors
- **Publication field:** restrict results to specific sources
- **Date of publication field:** restrict results to specific year of publication
- **Quotation marks:** the results only include documents containing the same words in the same order as the ones inside the quotes
- **Patents and citations:** the user may select either the inclusion or exclusion of citations and patents in the search engine results page

By way of illustration, the specific use of these commands will be detailed when describing each proposed procedure in the results section. All searches were performed on August 2016 in the Google Scholar’s English version.

3. RESULTS

Case study A: Conference papers

Bonato’s search. Variation-1: Panobinostat conference paper

This search may provoke the following shortcomings:

- Google Scholar will retrieve all documents (including cited references) containing all these three keywords simultaneously.
- Each keyword may be located elsewhere (title, abstract, body, bibliographic references, etc.) as they will be treated independently.

The noise of this query is therefore terrific. Bonato obtained a total of 5480 results.

Bonato’s search. Variation-2: Panobinostat ASCO Annual Meeting

The name of the congress in which a contribution on panobinostat was presented is now introduced. However, the same previous limitations still operate. The number of results drops from 5480 to 848 simply because the four terms used are more restrictive.

Bonato’s search. Variation-3: Phase I/II study of the combination of panobinostat (PAN) and carfilzomib (CFZ) in patients (pts) with relapsed or relapsed/refractory multiple myeloma (MM)

The title of the conference paper is now included. This query is designed again upon the incorporation of single independent keywords. Quotation marks to delimit the keywords’ order are not even used. Bonato obtains just one result, claiming however that this does not correspond to the original contribution.

Search proposal

We directly query for the title of the contribution within quotation marks in the title search field of the Google Scholar's advance feature, which directly introduces the allintitle command (Figure 1), finding one result which contains five versions (Figure 2), of which two correspond with ASCO 2015 meeting, two other belong to the American Society of Hematology (ASH) congress, and the remaining version belongs to Blood, a journal edited by ASH (Figure 3).

The screenshot shows a search bar with the query "allintitle: 'Phase I/II Study of the Combination of Panobinostat PAN and Carfilzomib CFZ'". Below the search bar, it indicates "1 result (0.05 sec)". A button labeled "My Citations" is visible. The search result is a link to a document from bloodjournal.org with the title "A phase I/II study of the combination of panobinostat (PAN) and carfilzomib (CFZ) in patients (pts) with relapsed or relapsed/refractory multiple myeloma (MM): ...". The authors listed are JG Berdeja, TB Gregory, EA Faber, JV Matous, and LL Hart. The document is from Blood, 2015, Am Soc Hematology. A brief background is provided: "Background: Proteasome inhibitors (PI) such as bortezomib (BTZ) and carfilzomib (CFZ) have improved the treatment (tx) of MM; however, resistance invariably develops and MM remains an incurable disease. Changes in histone modification are commonly found in ...". At the bottom of the snippet, it says "Cited by 6 Related articles All 5 versions Import into BibTeX Save More".

Figure 1. A query for ASCO Annual Meeting contribution: query

The screenshot shows a search bar with the same query as in Figure 1. Below the search bar, it indicates "5 results (0.01 sec)". The search results are as follows:

- Result 1: [HTML] A phase I/II study of the combination of panobinostat (PAN) and carfilzomib (CFZ) in patients (pts) with relapsed or relapsed/refractory multiple myeloma (MM): ... [HTML] from bloodjournal.org. Authors: JG Berdeja, TB Gregory, EA Faber, JV Matous, LL Hart... - Blood, 2015 - Am Soc Hematology. Background: Proteasome inhibitors (PI) such as bortezomib (BTZ) and carfilzomib (CFZ) have improved the treatment (tx) of MM; however, resistance invariably develops and MM remains an incurable disease. Changes in histone modification are commonly found in ... Cited by 6 Related articles Import into BibTeX Save More.
- Result 2: A phase I/II study of the combination of panobinostat (PAN) and carfilzomib (CFZ) in patients (pts) with relapsed or relapsed/refractory multiple myeloma (MM). Authors: JG Berdeja, TK Gregory... - ASCO Annual ..., 2015 - hwmain.meeeting.ascopubs.org. Background: Histone deacetylase inhibitors (HDACi) and proteasome inhibitors (PI) act synergistically through inhibition of the proteasome and aggresome pathways. We have previously reported the combination of the HDACi, PAN and the PI, CFZ in pts with ... Import into BibTeX More.
- Result 3: [HTML] A Phase I/II Study of the Combination of Panobinostat (PAN) and Carfilzomib (CFZ) in Patients (pts) with Relapsed or Relapsed/Refractory Multiple Myeloma (... [HTML] from confex.com. Authors: JG Berdeja, TB Gregory, EA Faber... - 57th ASH Annual ..., 2015 - ash.confex.com. Import into BibTeX More.
- Result 4: A phase I/II study of the combination of panobinostat (PAN) and carfilzomib (CFZ) in patients (pts) with relapsed or relapsed/refractory multiple myeloma (MM). Authors: JG Berdeja, TK Gregory, J Matous... - ASCO Annual ..., 2015 - meeting.ascopubs.org. Background: Histone deacetylase inhibitors (HDACi) and proteasome inhibitors (PI) act synergistically through inhibition of the proteasome and aggresome pathways. We have previously reported the combination of the HDACi, PAN and the PI, CFZ in pts with ... Import into BibTeX More.
- Result 5: [HTML] A Phase I/II Study of the Combination of Panobinostat (PAN) and Carfilzomib (CFZ) in Patients (pts) with Relapsed or Relapsed/Refractory Multiple Myeloma (... [HTML] from confex.com. Authors: JG Berdeja, TB Gregory, EA Faber... - 57th ASH Annual ..., 2015 - ash.confex.com. Import into BibTeX More.

Figure 2. A query for ASCO Annual Meeting contribution: versions located



Figure 3. A query for ASCO Annual Meeting contribution: publications

Searching for a general conference: ASCO Annual Meeting

A first attempt to search for a conference would be constructing a query based on the name of the congress (ASCO Annual Meeting). By doing this, we find out of 138000 documents (Figure 4). However, this Boolean search with an implicit “AND” is not appropriated since the three keywords may be located in any section of the retrieved documents independently, as previously commented.

ASCO Annual Meeting

About 138,000 results (0.03 sec)

Biomarker analyses from a phase III, randomized, open-label, first-line study of gefitinib (G) versus carboplatin/paclitaxel (C/P) in clinically selected patients (pts) with ...
 M Fukuoka, Y Wu, S Thongprasert... - ... **Annual Meeting** ..., 2009 - [meeting.ascopubs.org](#)
 Abstract Biomarker analyses from a phase III, randomized, open-label, first-line study of gefitinib (G) versus carboplatin/paclitaxel (C/P) in clinically selected patients (pts) with advanced non-small cell lung cancer (NSCLC) in Asia (IPASS)
 Cited by 114 Related articles All 4 versions Import into BibTeX Save More

A randomized, double-blind phase III study of pazopanib in treatment-naive and cytokine-pretreated patients with advanced renal cell carcinoma (RCC)
 CN Sternberg, C Szczylik, E Lee... - ... **Annual Meeting** ..., 2009 - [hwmain.meeting.ascopubs.org](#)
 In compliance with the guidelines established by the **ASCO** Conflict of Interest Policy (J Clin Oncol. 2006 Jan 20;24[3]:519–521) and the Accreditation Council for Continuing Medical Education (ACCME), **ASCO** strives to promote balance, independence, objectivity, and scientific ...
 Cited by 133 Related articles All 2 versions Import into BibTeX Save More

Randomized clinical trial of adjuvant chemotherapy with paclitaxel and carboplatin following resection in stage IB non-small cell lung cancer (NSCLC): report of ...
 GM Strauss, J Herndon, MA Maddaus... - ... **Annual Meeting** ..., 2004 - [meeting.ascopubs.org](#)
 Background: The value of adjuvant chemotherapy in resectable lung cancer remains controversial. The International Adjuvant Lung Trial (IALT) reported a modest but statistically significant survival advantage with cisplatin-based adjuvant chemotherapy in stages IA to ...
 Cited by 487 Related articles All 2 versions Import into BibTeX Save More

Figure 4. Search using the Boolean “AND” without quotation marks delimiting character chain

We can delimit the year of publication to 2015 (Figure 5). In this case, the results reduce to 10400 documents. However, Google Scholar provides not only documents published in the conference but also documents citing those documents.

ASCO Annual Meeting

About 10,400 results (0.03 sec)

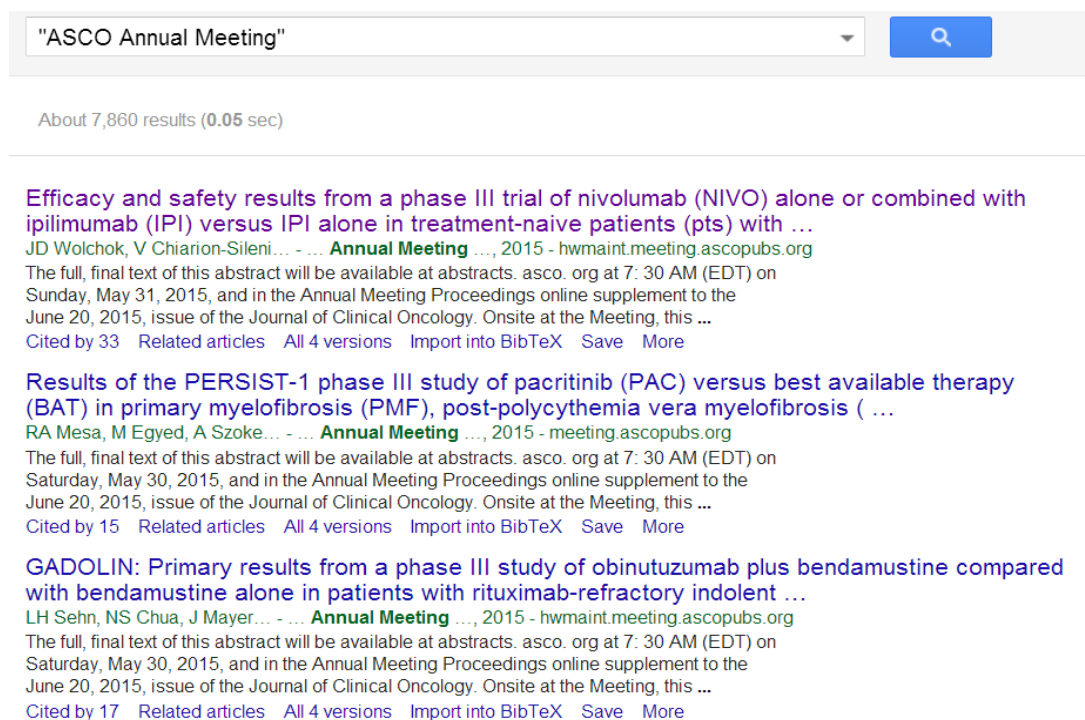
Efficacy and safety results from a phase III trial of nivolumab (NIVO) alone or combined with ipilimumab (IPI) versus IPI alone in treatment-naive patients (pts) with ...
 JD Wolchok, V Chiarion-Sileni... - ... **Annual Meeting** ..., 2015 - [hwmain.meeting.ascopubs.org](#)
 The full, final text of this abstract will be available at abstracts. [asco.org](#) at 7: 30 AM (EDT) on Sunday, May 31, 2015, and in the **Annual Meeting** Proceedings online supplement to the June 20, 2015, issue of the Journal of Clinical Oncology. Onsite at the **Meeting**, this ...
 Cited by 33 Related articles All 4 versions Import into BibTeX Save More

[HTML] The social media revolution is changing the conference experience: analytics and trends [HTML] from wiley.com from eight international meetings
 SE Wilkinson, MY Basto, G Perovic... - BJU ..., 2015 - Wiley Online Library
 ... we prospectively registered hashtags for two **meetings** [the EAU **Annual** Congress and the American Society of Clinical Oncology (**ASCO**) **Annual Meeting**] over a 3-year period (2012–2014) to analyse trends in the use of Twitter at a popular urology **conference** compared with a ...
 Cited by 45 Related articles All 8 versions Import into BibTeX Save More

Results of the PERSIST-1 phase III study of pacritinib (PAC) versus best available therapy (BAT) in primary myelofibrosis (PMF), post-polycythemia vera myelofibrosis (...
 RA Mesa, M Egyed, A Szoke... - ... **Annual Meeting** ..., 2015 - [meeting.ascopubs.org](#)
 The full, final text of this abstract will be available at abstracts. [asco.org](#) at 7: 30 AM (EDT) on Saturday, May 30, 2015, and in the **Annual Meeting** Proceedings online supplement to the June 20, 2015, issue of the Journal of Clinical Oncology. Onsite at the **Meeting**, this ...
 Cited by 15 Related articles All 4 versions Import into BibTeX Save More

Figure 5. Search using the Boolean “AND” without quotation marks delimiting character chain, delimiting year of publication to 2015

We can add a quotation mark to the query in order to delimit the presence of the three keywords exactly in this sequence order, reducing to 7860 documents (Figure 6).



The screenshot shows a search interface with a search bar containing the query "ASCO Annual Meeting". Below the search bar, it indicates "About 7,860 results (0.05 sec)". Three search results are displayed, each with a title, authors, publication information, and a brief description of the abstract's content.

Efficacy and safety results from a phase III trial of nivolumab (NIVO) alone or combined with ipilimumab (IPI) versus IPI alone in treatment-naive patients (pts) with ...
JD Wolchok, V Chiarion-Sileni... - ... **Annual Meeting** ..., 2015 - hwmaint.meeting.ascopubs.org
The full, final text of this abstract will be available at abstracts. asco. org at 7: 30 AM (EDT) on Sunday, May 31, 2015, and in the Annual Meeting Proceedings online supplement to the June 20, 2015, issue of the Journal of Clinical Oncology. Onsite at the Meeting, this ...
Cited by 33 Related articles All 4 versions Import into BibTeX Save More

Results of the PERSIST-1 phase III study of pacritinib (PAC) versus best available therapy (BAT) in primary myelofibrosis (PMF), post-polycythemia vera myelofibrosis (...
RA Mesa, M Egyed, A Szoke... - ... **Annual Meeting** ..., 2015 - meeting.ascopubs.org
The full, final text of this abstract will be available at abstracts. asco. org at 7: 30 AM (EDT) on Saturday, May 30, 2015, and in the Annual Meeting Proceedings online supplement to the June 20, 2015, issue of the Journal of Clinical Oncology. Onsite at the Meeting, this ...
Cited by 15 Related articles All 4 versions Import into BibTeX Save More

GADOLIN: Primary results from a phase III study of obinutuzumab plus bendamustine compared with bendamustine alone in patients with rituximab-refractory indolent ...
LH Sehn, NS Chua, J Mayer... - ... **Annual Meeting** ..., 2015 - hwmaint.meeting.ascopubs.org
The full, final text of this abstract will be available at abstracts. asco. org at 7: 30 AM (EDT) on Saturday, May 30, 2015, and in the Annual Meeting Proceedings online supplement to the June 20, 2015, issue of the Journal of Clinical Oncology. Onsite at the Meeting, this ...
Cited by 17 Related articles All 4 versions Import into BibTeX Save More

Figure 6. Search using the Boolean “AND” with quotation marks delimiting character chain, delimiting year of publication to 2015

Then, we can eliminate the citing documents by adding “ASCO Annual Meeting” in the “Publication” field (Figure 7). Additionally, the option “citations included” should be unchecked, recovering a final set of 6260 results.

✕

Find articles

with **all** of the words

with the **exact phrase**

with **at least one** of the words

without the words

where my words occur

anywhere in the article

in the title of the article

Return articles **authored by**
e.g., "PJ Hayes" or McCarthy

Return articles **published in**
e.g., J Biol Chem or Nature

Return articles **dated between** —
e.g., 1996

Scholar About 6,260 results (0.04 sec)

Articles

Case law

My library

Any time

Since 2016

Since 2015

Since 2012

Custom range...

—

Sort by **relevance**

Sort by date

include patents

include citations

Publication: "ASCO Annual Meeting" ✕

Phase III, randomized trial (CheckMate 057) of nivolumab (NIVO) versus docetaxel (DOC) in advanced non-squamous cell (non-SQ) non-small cell lung cancer (...
 L Paz-Ares, L Horn, H Borghaei... - ... **Annual Meeting** ..., 2015 - hwmaint.meeting.ascopubs.org
 Background: Options for advanced non-SQ NSCLC patients (pts) who progress after platinum-based doublet chemotherapy (PT-DC) are limited, with minimal improvement in overall survival (OS). We report results from a randomized, global phase III study of NIVO, ...
 Cited by 91 [Related articles](#) [All 4 versions](#) [Import into BibTeX](#) [Save](#) [More](#)

Efficacy, safety and predictive biomarker results from a randomized phase II study comparing MPDL3280A vs docetaxel in 2L/3L NSCLC (POPLAR).
 Al Spira, K Park, J Mazieres... - ... **Annual Meeting** ..., 2015 - hwmaint.meeting.ascopubs.org
 Background: MPDL3280A (anti-PDL1) has demonstrated promising response rates in NSCLC that correlated with PD-L1 expression on tumor-infiltrating immune cells (IC) and/or tumor cells (TC)(Horn et al, ASCO 2015). Methods: Previously treated NSCLC patients (pts ...
 Cited by 64 [Related articles](#) [All 2 versions](#) [Import into BibTeX](#) [Save](#) [More](#)

Phase I/II safety and antitumor activity of nivolumab in patients with advanced hepatocellular carcinoma (HCC): CA209-040.
 AB El-Khoueiry, I Melero... - ... **Annual Meeting** ..., 2015 - hwmaint.meeting.ascopubs.org
 Background: Overexpression of PD-L1 in HCC has a poor prognosis. Safety and preliminary antitumor efficacy of nivolumab, a fully human IgG4 monoclonal antibody PD-1 inhibitor, was evaluated in a multiple ascending-dose, phase I/II study in patients (pts) with HCC. ...
 Cited by 58 [Related articles](#) [All 4 versions](#) [Import into BibTeX](#) [Save](#) [More](#)

Antitumor activity and safety of pembrolizumab in patients (pts) with advanced squamous cell carcinoma of the head and neck (SCCHN): preliminary results from ...
 TY Seiwert, RI Haddad, S Gupta... - ... **Annual Meeting** ..., 2015 - meeting.ascopubs.org
 Background: Pembrolizumab (MK-3475) is a humanized monoclonal antibody that blocks interaction of PD-1 with its ligands, PD-L1 and PD-L2, thereby promoting activity of tumor-specific effector T cells. KEYNOTE 012 (NCT01848834) had previously demonstrated ...
 Cited by 55 [Related articles](#) [All 4 versions](#) [Import into BibTeX](#) [Save](#) [More](#)

Figure 7. Google Scholar’s advanced search features: selecting publication source (up) and visualizing results (bottom)

The results page shows URLs where these documents are online available. We can easily verify the existence of the meeting.ascopubs.org and hwmaint.meeting.ascopubs.org web domains (Figure 8). Since the conference proceedings are available in these two different locations, the corresponding records are likely to be duplicated.

2 results (0.03 sec)

[A phase III study \(CheckMate 017\) of nivolumab \(NIVO; anti-programmed death-1 \[PD-1\]\) vs docetaxel \(DOC\) in previously treated advanced or metastatic squamous \(...](#)

DR Spigel, KL Reckamp, NA Rizvi... - ASCO Annual Meeting Abstracts, 2015 - meeting.ascopubs.org
 Background: Treatment options are limited for patients (pts) with advanced SQ NSCLC who fail platinum-based doublet chemotherapy (PT-DC). We report results of a randomized, open-label, global phase III study of NIVO, a fully human IgG4 PD-1 immune checkpoint inhibitor ...
 Cited by 25 Related articles Import into BibTeX Save More

[A phase III study \(CheckMate 017\) of nivolumab \(NIVO; anti-programmed death-1 \[PD-1\]\) vs docetaxel \(DOC\) in previously treated advanced or metastatic squamous \(...](#)

DR Spigel, KL Reckamp... - ASCO Annual Meeting Abstracts, 2015 - hwmaint.meeting.ascopubs.org
 Background: Treatment options are limited for patients (pts) with advanced SQ NSCLC who fail platinum-based doublet chemotherapy (PT-DC). We report results of a randomized, open-label, global phase III study of NIVO, a fully human IgG4 PD-1 immune checkpoint inhibitor ...
 Import into BibTeX More



Figure 8. Different online locations for ASCO Annual Meeting in Google Scholar

Then we can finally use the “site” search command to restrict results to those documents hosted within one of the two identified web domains, which may provide an accurate value of the Google Scholar’s index for this particular conference. The following query `site:meeting.ascopubs.org -site:hwmaint.meeting.ascopubs.org` provides a final count of 3060 results (Figure 9).

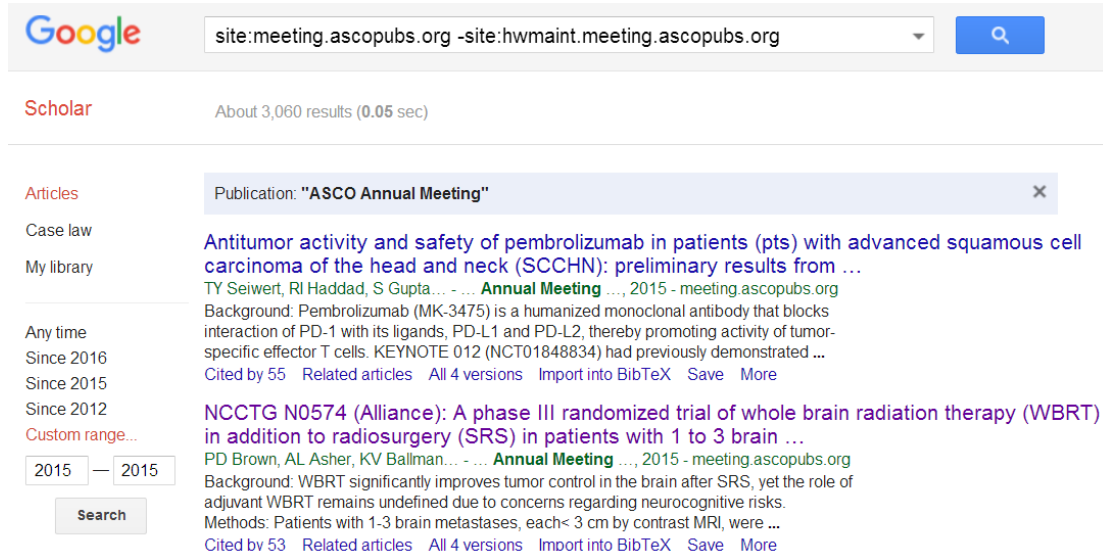
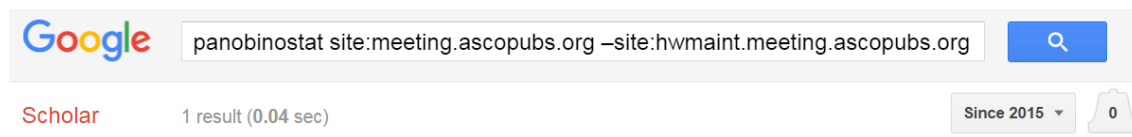


Figure 9. A query for ASCO Annual Meeting in Google Scholar using “site” search command to specific web domains

Once located the congress, we can even search easily for documents on specific topics. Coming back to the Bonato's original strategy, we can add a topical keyword to the previous query `panobinostat site:meeting.ascopubs.org – site:hwmaint.meeting.ascopubs.org`, obtaining the desired result in each of the two web domains previously identified. The following reference URL can be used for re-executed iterations Figure 10):

`https://scholar.google.com/scholar?as_ylo=2015&q=panobinostat+site:meeting.ascopubs.org+%E2%80%93site:hwmaint.meeting.ascopubs.org&hl=en&as_sdt=0,5`



Panobinostat plus bortezomib and dexamethasone in patients with relapsed or relapsed and refractory multiple myeloma who received prior bortezomib and IMiDs: A ...

JF San Miguel, V Hungria... - ASCO Annual ... , 2015 - hwmaint.meeting.ascopubs.org

Background: **Panobinostat** (PAN) is a potent pan-deacetylase inhibitor (pan-DACi) that targets key biological aberrations in multiple myeloma (MM), including epigenetics and protein metabolism. PAN+ bortezomib (BTZ) and dexamethasone (Dex; PAN-BTZ-Dex) ...

Cited by 3 Related articles All 2 versions Cite Save

Figure 10. Complete query for ASCO Annual Meeting contribution adding topic keyword

Case study B: searching for guidelines on particular topic


Bonato's Search: Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescent

Bonato's search strategy is based on the simple addition of words (a search keyword under Google's jargon) obtaining about 17700 results. However, we should highlight the following concerns:

- The date of publication is not delimited. Filtering documents from 2015 onwards, the number of results drops from 17700 to about 2770.
- Quotations are not used. Google Scholar will check the appearance of all keywords regardless their position and order. This procedure is discouraged when searching for document titles.
- Document source is not delimited.

Search proposal

We directly include the title of the document within quotation marks in the title search field (or directly through the `allintitle` command) (Figure 11). We find one result that corresponds with the targeted document, which is cited five times: three citations correspond with previous editions (2006 and 2008), one is correct, and the remaining citation is unknown (Figure 12).

allintitle: "Guidelines for the Use of Antiretroviral Agents in HIV 1 Infected Adu" 

1 result (0.02 sec)

[CITATION] Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents, 2015
National Institutes of Health - 2015
Cited by 5 Related articles Import into BibTeX Save More

Figure 11. A query for Guidelines, using the “allintitle” search command

5 results (0.01 sec)

Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents, 2015
 Search within citing articles

Long-term mortality in HIV-positive individuals virally suppressed for > 3 years with incomplete CD4 recovery [HTML] from oxfordjournals.org
FN Engsig, R Zangerle, O Katsarou... - Clinical infectious ... 2014 - cid.oxfordjournals.org
Background: Some human immunodeficiency virus (HIV)-infected individuals initiating combination antiretroviral therapy (cART) with low CD4 counts achieve viral suppression but not CD4 cell recovery. We aimed to identify (1) risk factors for failure to achieve CD4 count ...
Cited by 33 Related articles All 14 versions Import into BibTeX Save More

[HTML] **Financial burden of health services for people with HIV/AIDS in India** [HTML] from nih.gov
N Kumarasamy, KK Venkatesh, KH Mayer... - The Indian journal of ... 2007 - ncbi.nlm.nih.gov
Abstract In resource-limited settings, illness can impose a major financial burden on patients and their families. With the advent and increasing accessibility of antiretroviral therapy, HIV/AIDS has now become a fundamentally chronic treatable disease with far reaching ...
Cited by 28 Related articles All 11 versions Import into BibTeX Save More

Hit me with your best shot: dolutegravir—a space in the next WHO guidelines?
J Cohn, LG Bakker, H Bygrave, A Calmy - AIDS, 2015 - journals.lww.com
Since 2002, WHO guidelines have moved to safer, bettertolerated and more effective antiretroviral drugs (Table 1). There are over 12.9 million people receiving antiretroviral drugs and at \$136 USD per patient per year, the once daily generic fixed-dose ...
Cited by 2 Related articles All 4 versions Import into BibTeX Save More

[HTML] **Utility of total lymphocyte count as a surrogate for absolute CD4 count in the adult Indian HIV population: A prospective study** [HTML] from nih.gov
SS Karanth, NR Rau, A Gupta, A Kamath... - Avicenna journal of ... 2014 - ncbi.nlm.nih.gov
Background: Standard methods of CD4 counts and plasma viral load estimation require specialized equipment, highly trained personnel and are extremely expensive. This remains a major challenge for the initiation of anti-retroviral therapy for patients in resource-limited ...
Cited by 3 Related articles All 9 versions Import into BibTeX Save More

[HTML] **Factors Associated with Retention to Care in an HIV Clinic in Gabon, Central Africa** [HTML] from plos.org
S Janssen, RW Wieten, S Stolp, AL Cremers... - PLoS one, 2015 - journals.plos.org
Background Retention to HIV care is vital for patients' survival, to prevent onward transmission and emergence of drug resistance. Travelling to receive care might influence adherence. Data on the functioning of and retention to HIV care in the Central African ...
Related articles All 11 versions Import into BibTeX Save More

Figure 12. Citations received by the Guidelines according to Google Scholar

However, the record is not directly indexed by Google Scholar, appearing only as a citation (with the [C] mark) because it was cited in another document already indexed by Google Scholar. The reason probably relies in the fact that the corresponding PDF file weights approximately 5 MB, being this size the limit to be directly indexed in the database.

Searching for guidelines

We can employ two general approaches to find medical guidelines in Google Scholar. The first one has been already explained in the expert search proposal, and consists of searching directly for a specific title. Of course, it operates only when the user knows such title. A complementary approach consists of searching for guidelines covering specific topics, where the inclusion of search keywords is mandatory. For example: allintitle: “guidelines” heart OR cardiology. This strategy retrieves all those guidelines in which the terms heart or cardiology appear in the title (about 4870 results; if citations are excluded the

results drop to 1690). If we perform the equivalent search in Pubmed ((guidelines[Title]) AND (heart[Title]) OR cardiology[Title])), we obtain a total of 1176 results.¹

One step further consists of specifying all those guidelines published by one specific institution. We can then operate in two different ways. On the one hand can apply a search using the “author” search command: allintitle:"guidelines" author:"National Institutes of Health". This query sheds 373 results (Figure 13). We obtain only three hits when restricting results to 2015, among which we can find Bonato’s targeted guideline.

The screenshot shows a search bar with the query: allintitle: "Guidelines" author:"National Institutes of Health". Below the search bar, it indicates "About 373 results (0.04 sec)". Three search results are displayed:

- [CITATION] Guidelines for the conduct of research involving human subjects at the National Institutes of Health**
National Institutes of Health (US) - 1993 - US Department of Health and ...
Cited by 47 Related articles Cite Save More
- [HTML] Guidelines for prevention and treatment of opportunistic infections in HIV-infected adults and adolescents** [HTML] cdc.gov
..., National Institutes of Health... - MMWR Recomm ... , 2009 - francais.cdc.gov
CDC, our planners, and our content specialists wish to disclose they have no financial interests or other relationships with the manufacturers of commercial products, suppliers of commercial services, or commercial supporters, with the exception of Constance Benson ...
Cited by 1041 Related articles All 10 versions Cite Save More
- [PDF] Guidelines for the diagnosis and management of asthma: update on selected topics 2002** [PDF] vidyya.com
National Institutes of Health - NIH publication, 2002 - vidyya.com
The National Asthma Education and Prevention Program (NAEPP) keeps clinical practice guidelines up to date by identifying selected topics on asthma that warrant intensive review based on the level of research activity reflected in the published literature or the level of ...
Cited by 467 Related articles All 2 versions Cite Save More
- Guidelines for the diagnosis and management of asthma**
National Institutes of Health - Expert panel report, 1997 - bases.bireme.br
Resumo: State-of-art clinical practice guidelines for diagnosing and managing asthma that update the 1991 expert panel report and incorporate the most recent scientific information available on the care of patient with asthma. Provides information on treating asthma at all ...
Cited by 406 Related articles Cite Save More

Figure 13. Use of Allintitle and Author search commands

On the other hand, we may wish to employ a more generic query where the institution is signaled within quotation marks instead of the author search command. For example: allintitle: guidelines "American Heart Association". This search sheds 566 results, whereas the equivalent search in Pubmed guidelines[Title] AND (American Heart Association[Title]), gives only 26.

Searching documents in medical institutions

A second possible generalization consists of searching for gray literature in medical institutions. We expose two paradigmatic examples: National Institute of Health (NIH), and the U.S. Department of Health and Human Services (HHS).

a) National Institute of Health (NIH) (<http://www.nih.gov>)

¹ Savvy users may notice whether parentheses are used to contain a query or forms part of the query itself. Some reviewers unfortunately did not.

Since Pubmed repository (ncbi.nlm.nih.gov) is indexed in Google Scholar, any document indexed in this database, whether or not published by NIH, will be retrieved if we do nothing about it. Therefore, Pubmed should be filtered. We can also restrict only those documents in specific file formats (PDF and HTML mainly). For example, the following query (allintitle: guidelines site:nih.gov -site:ncbi.nlm.nih.gov filetype:pdf) gives a total of 9 guidelines (Figure 14). If eliminating the term guideline in the title of documents, we obtain 12000 results.

allintitle:guidelines site:nih.gov -site:ncbi.nlm.nih.gov filetype:pdf

9 results (0.04 sec)

[PDF] Appropriate **guidelines** for the selection of human subjects for participation in biomedical and behavioral research [PDF] nih.gov
 RJ Levine - ... : ethical principles and **guidelines** for the protection of ..., 1976 - [videocast.nih.gov](#)
 The Commission is charged with the responsibility to consider." Appropriate **guidelines** for the selection of human subjects for participation in biomedical and behavioral research."
 This paper is an attempt to identify and to begin to analyze the issues that must be ...
 Cited by 18 Related articles All 3 versions Cite Save More Subdomain

[PDF] **Guidelines** for insulin management of diabetes in school [PDF] nih.gov
 J Silverstein, S Patrick - School nurse news, 2007 - [ndep.nih.gov](#)
 Diabetes affects 1 in every 400-500 persons under 20 years of age. Management of diabetes is essential while the child is at school. The school nurse is an essential member of the child's healthcare team, which also includes the child, parents, teachers, other school ...
 Cited by 4 Related articles All 5 versions Cite Save More

[PDF] **Guidelines** [PDF] nih.gov
 FR Centers - [profiles.nlm.nih.gov](#)
GUIDELINES: Since the investigators involved in most proposed centers will be individuals of recognized competence, many will have grant support which has already been reviewed by their peers. Retention of these grants does not preclude participation in the center ...
 All 2 versions Cite Save More

[PDF] **GUIDELINES FOR ESTABLISHING AND POLICY** [PDF] nih.gov
 MH GUIDE - POLICY, 1973 - [archives.nih.gov](#)
 1. PURPOSE The purpose of this issuance is to provide **guidelines** for the development of a consortium grant when the institutions involved believe such an arrangement to be necessary or preferred over a traditional project grant made to a single institution. These ...
 All 4 versions Cite Save More

Figure 14. Guidelines in PDF file format, excluding Pubmed

We can observe different subdomains within the nih.gov website which are hosting gray literature. A recommended procedure consists of identifying the main subdomains analyzing them individually. In the table 1 we provide an example for the NIH. In this case we have identified (by manually checking) all those centers allocated within the nih.gov web domain. Additionally, we have added the Archived sites services, which stores online historical information.

For each of the websites we can check the total number of documents indexed by Google Scholar (site:*.nih.gov). Excluding Pubmed, the number of documents indexed by Google Scholar is high (15300), showing a skewed distribution among centers.

Table 1. Documents hosted by National Institutes of Health (NIH) indexed in Google Scholar (as of October 2016)

SOURCE	URL	DOCS
*National Institutes of Health	nih.gov	15300
*National Library of Medicine	nlm.nih.gov	9850
National Institute of Environmental Health Sciences	niehs.nih.gov	2870
National Institute of Mental Health	nimh.nih.gov	840
National Institute on Alcohol Abuse and Alcoholism	niaaa.nih.gov	406
National Institute of Diabetes and Digestive and Kidney Diseases	niddk.nih.gov	193
National Institute of Arthritis and Musculoskeletal and Skin Diseases	niams.nih.gov	137
National Heart, Lung, and Blood Institute	nhlbi.nih.gov	84
Eunice Kennedy Shriver National Institute of Child Health and Human Development	nichd.nih.gov	78
National Institute of Neurological Disorders and Stroke	ninds.nih.gov	62
Archived sites	archives.nih.gov	38
National Institute of Biomedical Imaging and Bioengineering	nibib.nih.gov	21
National Institute of Aging	nia.nih.gov	17
National Institute of Allergy and Infectious Diseases	niaid.nih.gov	13
Center for Information Technology	cit.nih.gov	13
National Institute of Dental and Craniofacial Research	nidcr.nih.gov	13
Fogarty International Center	fic.nih.gov	6
National Eye Institute	nei.nih.gov	5
National Institute on Deafness and Other Communication Disorders	nidcd.nih.gov	5
National Center for Advancing Translational Sciences	ncats.nih.gov	4
National Institute of Nursing Research	ninr.nih.gov	3
Center for Scientific Review	csr.nih.gov	2
NIH Clinical center	clinicalcenter.nih.gov	1
National Institute on Minority Health and Health Disparities	nimhd.nih.gov	0
National Center for Complementary and Integrative Health	nccih.nih.gov	0

* Figures obtained excluding Pubmed (-site:ncbi.nlm.nih.gov)

b) U.S. Department of Health and Human Services (HHS) (<http://www.hhs.gov>)

Excluding citations, we find about 732 results by selecting all those documents indexed within the official website (site:hhs.gov). As with the NIH, we can find several subdomains: acf.hhs.gov (about 294 results), aspe.hhs.gov (238), oig.hhs.gov (56), minorityhealth.hhs.gov (19), ori.hhs.gov (16), archive.hhs.gov (17), ncvhs.hhs.gov (10), iacc.hhs.gov (5), and millionhearts.hhs.gov (2). A qualitative analysis of all these 732 documents (out of which 700 offer a link to the full text) would provide evidence about the coverage of gray literature within governmental agencies.

4. DISCUSSION AND CONCLUSIONS

The empirical results obtained in this study clearly differ from those obtained by Bonato (2016), and present a very different picture of the possibilities of GS as tool to find scientific information.

Search features

We entirely agree with Bonato on the issue of Google Scholar's limitations (fluctuation of results, lack of search filters, etc.). Obviously, Google Scholar lacks many of the advanced search features available in other bibliographic

databases, such as Pubmed. These shortcomings have been already identified and described in the scientific literature, and recently compiled (Orduna-Malea et al, 2016). This makes search tedious and time-consuming tasks. However, it is one thing to have a friendly search experience, and quite another to find gray literature. Bonato claims that “Google Scholar also cannot be relied on to capture other gray literature search publications, such as guidelines published by governmental agencies”. The empirical results obtained in this work contradict this statement.

Gray literature

Gray literature - all those materials and research produced outside the commercial publishing and distribution channels - plays an important role in many fields of knowledge. For this reason, it was critical when this material was hard to find. The widespread use of the Web changed this, uncovering contents that were once considered “gray literature” but are now “public” (available online). However, contrary to the assertions by Bonato, gray literature never played such an important role in Biomedicine, with the exception of clinical trials, evidence-based documents, and consensus documents generated by the government and by scientific and professional associations.²

Moreover, conference papers and meeting abstracts published in conferences and other meetings are not essential information sources to the advancement of research and medical practice, because of the following reasons:

- A great percentage of the contents published in these events are eventually published in scientific journals.
- Unpublished documents are deposited in clinical trials databases, such as Clinicaltrials.gov (Thelwall and Kousha, 2016).
- Citation analyses have plainly proved that the impact of conferences is - in bibliometric terms - irrelevant, with exceptions in some areas, such as the computer sciences (Lisée, Lariviere and Archambault, 2008).

Extrapolation

Bonato uses three search strategies to solve the information need presented in the first case study (conference proceedings) and one to approach the second case study (guidelines). This seems insufficient to extrapolate conclusions to the entire database, especially when the advanced search options of the search engine were not taken into consideration. This leads the author to erroneous conclusions.

² We acknowledge a discrepancy on this assertion by one reviewer that must be worth noted.

Below we show his/her blind suggestion:

- Contents may “eventually” be published in scientific journals, but not necessarily in a timely way.
- Only some investigators deposit unpublished results in ClinicalTrials.gov – and this only in recent years.
- Results that are not overwhelmingly positive may not be published in a journal article and may not be highly cited, but may still provide important evidence regarding the benefits/lack of benefit of a particular therapy.

Lastly, we conclude that Google Scholar is a powerful tool for searching gray literature, as long as the users are familiar with all the possibilities Google Scholar offers as a search engine. When searching on a database, especially one as popular and apparently easy to use as Google Scholar, it is important to make an adequate use of the available features; a poorly formulated search will undoubtedly return misleading results.

Bonato's work is considered just a subjective review and not a research paper under the editor's view. However, and beyond some methodological shortcomings highlighted in this working paper, its claims and statements are formally published in the academic system, spreading an erroneous conclusion about Google Scholar.

Acknowledgment

The authors wish to formally express that we do not have any conflict of interest with Google Scholar, and our points of view are only determined by our objective empirical evidences while testing Google Scholar both as a source for scientific information discovery and a tool for scientific evaluation.

REFERENCES

- Boeker, M., Vach, W. & Motschall, E. (2013). "Google Scholar as replacement for systematic literature searches: good relative recall and precision are not enough". *BMC Medical Research Methodology*, 13(131). Available at: <http://dx.doi.org/10.1186/1471-2288-13-13>
- Bonato S. (2016). "Google Scholar and Scopus for finding gray literature publications". *Journal of the Medical Library Association*, 104(3), 252-254.
- Bramer, W.M., Giustini, D. & Kramer, B.M. (2016). "Comparing the coverage, recall, and precision of searches for 120 systematic reviews in Embase, MEDLINE, and Google Scholar: a prospective study". *Systematic Reviews*, 5(1), 1. <http://dx.doi.org/10.1186/s13643-016-0215-7>
- Bramer, W.M., Giustini, D., Kramer, B.M., Anderson, P.F. (2013). "The comparative recall of Google Scholar versus PubMed in identical searches for biomedical systematic reviews: a review of searches used in systematic reviews". *Systematic Reviews*, 2(1), 115. <http://dx.doi.org/10.1186/2046-4053-2-115>
- Freeman, M.K., Lauderdale, S.A., Kendrach, M.G. & Woolley, T.W. (2009). "Google Scholar versus PubMed in locating primary literature to answer drug-related questions". *Annals of Pharmacotherapy*, 43(3), 478-484. <http://dx.doi.org/10.1345/aph.1L223>
- Gehanno, J.F., Rollin, L. & Darmoni, S. (2013). "Is the coverage of Google Scholar enough to be used alone for systematic reviews". *BMC Medical Informatics and Decision Making*, 13(7). <http://dx.doi.org/10.1186/1472-6947-13-7>
- Giustini, D. & Boulos, M.N.K., (2013). "Google Scholar is not enough to be used alone for systematic reviews". *Online Journal Of Public Health Informatics*, 5(2), 214. <http://dx.doi.org/10.5210/ojphi.v5i2.4623>
- Haase, A., Follmann, M., Skipka, G. & Kirchner, H. (2007). "Developing search strategies for clinical practice guidelines in SUMSearch and Google Scholar and

- assessing their retrieval performance". *BMC Medical Research Methodology*, 7(1), 28.
<http://dx.doi.org/10.1186/1471-2288-7-28>
- Kulkarni, A.V., Aziz, B., Shams, I. & Busse, J.W. (2009). "Comparisons of citations in Web of Science, Scopus, and Google Scholar for articles published in general medical journals". *JAMA*, 302(10), 1092-1096.
<http://dx.doi.org/10.1001/jama.2009.1307>
- Lisée, C., Larivière V. & Archambault É. (2008). "Conference proceedings as a source of scientific information: A bibliometric analysis". *JASIST*.59(11), 1776-1784.
<https://doi.org/10.1002/asi.20888>
- Mastrangelo, G., Fadda, E., Rossi, C.R., Zamprogno, E., Buja, A. & Cegolon, L. (2010). "Literature search on risk factors for sarcoma: PubMed and Google Scholar may be complementary sources". *BMC Research Notes*, 3(1), 131.
<http://dx.doi.org/10.1186/1756-0500-3->
- Nourbakhsh, E., Nugent, R., Wang, H., Cevik, C. & Nugent, K. (2012). "Medical literature searches: a comparison of PubMed and Google Scholar". *Health Information & Libraries Journal*, 29, 214–222.
<http://dx.doi.org/10.1111/j.1471-1842.2012.00992.x>
- Orduna-Malea, E., Martín-Martin, A., Ayllón, Juan A. & Delgado Lopez-Cozar, E. (2016). *La revolución Google Scholar*. Granada: UNE.
- Shariff, S.Z., Bejaimal, S.A.D., Sontrop, J.M., Iansavichus, A.V., Haynes, R.B., Weir, M.A. & Garg, A.X. (2013). "Retrieving Clinical Evidence: A Comparison of PubMed and Google Scholar for Quick Clinical Searches". *Journal of Medical Internet Research*, 15(8).
<http://dx.doi.org/10.2196/jmir.2624>
- Thelwall M. & Kousha, K. (2016). Are citations from clinical trials evidence of higher impact research? An analysis of ClinicalTrials.gov. 2016. *Scientometrics*. 109(2), 1341-1352.
<http://link.springer.com/article/10.1007/s11192-016-2112-1>
- Tober, M. (2011). "PubMed, ScienceDirect, Scopus or Google Scholar – Which is the best search engine for an effective literature research in laser medicine?" *Medical Laser Application*, 26(3), 139–144.
<http://dx.doi.org/10.1016/j.mla.2011.05.006>
- Trapp, J. (2016). "Web of Science, Scopus, and Google Scholar citation rates: a case study of medical physics and biomedical engineering: what gets cited and what doesn't?" *Australasian Physical & Engineering Sciences in Medicine*. Online available at:
<http://dx.doi.org/10.1007/s13246-016-0478-2>
- Vine R. (2006). Google scholar. *Journal of the Medical Library Association*, 94(1), 97.