



Professional impact of clinical research¹

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ABSTRACT

In this study, professional impact is defined as the academic literature that is cited in the literature that is used by professions in order to pursue skilled activities that are specific to their expertise. Specifically, we are focusing on the clinical guidelines that are used in the many health and medical professions that are issued by government bodies at national and international levels to ensure a certain quality level and to make results comparable at the national level.

To date, more than 50.000 references have been identified in about 500 Swedish clinical guidelines issued by the above mentioned governmental bodies in Sweden. Of these, 73 % of the references have been matched to a PubMed id.

The goal of this project is to develop a conceptual and theoretical contribution to the development of indicators for measuring the impact of research outside of the specifically academic literature.

INTRODUCTION

Recently, ‘societal impact’ has become the focus of many national and international evaluation assessments such as the UK REF and the Australian ERA. In Sweden, the Swedish Research Council (SRC) has proposed that a focus on “impact of research beyond academia” (2015, p. 38). The SRC, in a report to the Swedish government, proposes that 15 per cent of the share of national funding should be based on such indicators (*ibid.*). While it is generally considered an important part of research outcomes to evaluate, it is hard to identify quantifiable indicators that cover all aspects of research impact on society. Therefore, for evaluation purposes, impact case studies have been used to evaluate impact qualitatively by assessment panels.

But measuring “impact of research beyond academia” in all its variants – Bornman (2012), for example lists ‘third-stream activities’, ‘societal benefits’ or ‘societal quality’, ‘usefulness’, ‘public values’, ‘knowledge transfer’ as concepts to be used before settling on ‘societal impact’ – is increasingly problematic the more conceptualizations that are introduced. Additionally, when it comes to quantifying societal impact, a large share of attempts have been limited to social media impact, or “altmetrics”, which, arguably does not seem to cover a very broad range of varieties of societal impact that are occurring.

In this paper it is proposed that instead of reaching for all-encompassing indicators of societal impact in all its qualitative different variants, specific aspects of societal impact should be identified. For instance, interest in research by the general public as problematized in the critical studies of *public understanding of science* should not be confused with indicators of impact of research on professional practitioners in different areas of society.

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Regarding impact professional practice, two areas of significance have previously been suggested as specifically worthwhile. According to Wilsdon et al (2015), cited references to research in corporate *patents* for innovation and *clinical guidelines* in the health sector could be pursued. Arguably, a third option would be *standards* documents, issued by international and national bodies that provide cited references to research that could be used for citation studies in the same vein in engineering and technical areas. Bornman et al (2015) also proposes that citations to published research in *policy* documents as a relevant source of indicators.

The aim of this ongoing research is to test and validate indicators of impact of clinical research in the literature of the medical and health professions. Such indicators could then be used as indicators that relate clinical research to the activities of the professions that use it.

Traditionally, bibliometric analyses are based on both references and measured citations that are found in any of the established databases that index the scientific literature, predominantly *Web of Science*, and *Scopus*, and to a certain degree, *Google Scholar*. By doing this, much trust is put in the coverage of these databases, and even though coverage is increasing in many areas, it is still true that only certain kinds of research are covered to a high degree (Hicks et al., 2015).

While *academic impact* (here defined as academic research published and cited in source outlets that are indexed in the citation databases) is covered to a high degree (in life sciences and in the natural sciences) or to a certain degree (in the social sciences and the humanities), impact of indexed literature in publications that are not covered by the citation databases is virtually non-existent. In some regards, the opposite is not true, since non-indexed publications could be found by performing a *Cited reference search* in WoS or searching for *Secondary documents* in Scopus.

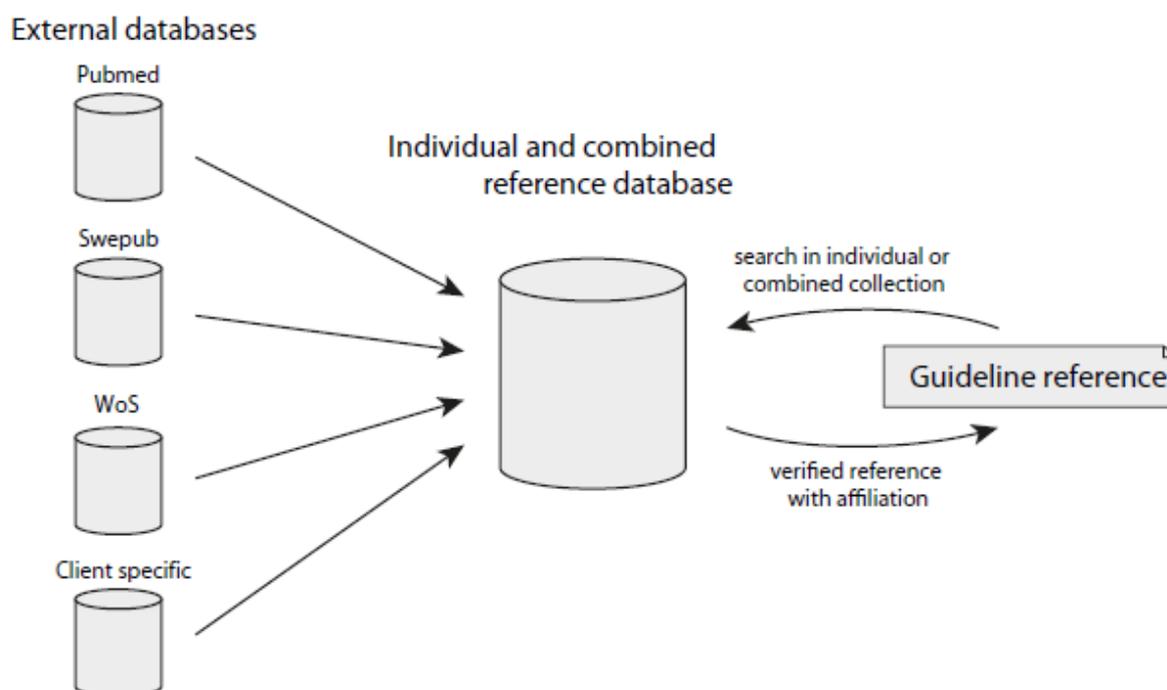
In this study, *professional impact* is defined as the academic literature that is cited in the literature that is used by professions in order to pursue skilled activities that are specific to their expertise. Specifically, we are focusing on the clinical guidelines that are used in the many health and medical professions that are issued by government bodies at national and international levels to ensure a certain quality level and to make results comparable at the national level.

METHOD AND MATERIALS

Examples of such literature are the clinical guidelines that are produced by the *National Board of Health and Welfare* in Sweden, and *SBU – Swedish Agency for Health Technology Assessment and Assessment of Social Services*. These bodies continuously synthesize actual research into guidelines and governing documents for healthcare in practice on a peer review basis. Clinical guidelines has previously been the subject of evaluation of research impact of the medical sciences in the health sector (Andersen, 2013; Lewison, 2004; Lewison and Sullivan, 2008). Here, these results paired with the development of a large database of cited references in Swedish clinical guidelines are used to develop and validate impact indicators at the national level between Swedish regional research bodies within university hospitals.

The process of the research is shown in Figure 1, where the internal database of matched references is validated against external sources such as WoS, assigned with a PubMed id and further validated (if no match is found) against the Swedish national publication database (Swepub) and the possibility of matching against client specific publication databases.

Figure 1. The local reference database based on clinical guideline references verified against Pubmed ID and the local affiliation database.



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Analysis of data

A limited study of cited references from 13 clinical guidelines issued by the Swedish *National Board of Health and Welfare*. Of 6.610 references identified, 5.709 de-duplicated citations were identified by Pubmed ID in Web of Science (Table 1).

Table 1: Clinical guidelines issued by the *Swedish National Board of Health and Welfare*. Name, type of guideline, publication year and number of cited references identified.

Clinical guideline	TYPE	Year	Refs
Cardiac Care	CARDIO	2009	645
Adult Dental Care	DENTA	2011	1301
Diabetes Care	DIABE	2015	523
Methods of Preventing Disease	GENER	2011	316
Antipsychotic Drug Therapy for Schizophrenia or Schizophrenia-type Conditions	MENTH	2014	25
Care in cases of Dementia	MENTH	2010	528
Depression and Anxiety Disorders	MENTH	2010	567
Drug abuse and addiction	MENTH	2015	537
Psychosocial Interventions for Schizophrenia or Schizophrenia-type Conditions	MENTH	2011	106
Treatment of Breast, Prostate and Colorectal Cancers	ONCOL	2014	1.226
Lung Cancer Care and Treatment	ONCOL	2011	277
Palliative Care	PALLIA	2013	78
Musculoskeletal Diseases	REUMA	2012	481
<i>Total</i>			<i>6.610</i>

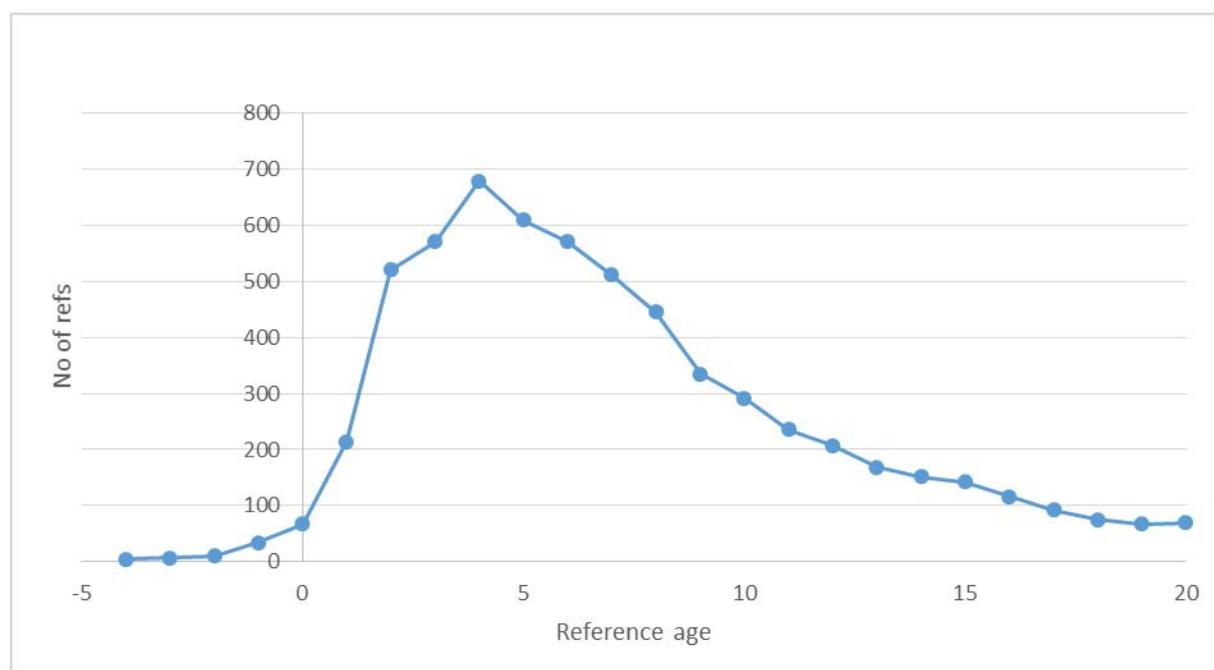
The vast majority of the citations were articles or proceedings papers (86 %), review papers (11.5 %), and other types of literature were in minority.

To a high degree, papers cited in the clinical guidelines are also highly cited in WoS (as indicated by the average number of citations for the ten most cited journals among the guidelines in Table 2). It is noteworthy that this is not always the case. For some journals indicated by italics in the table, the mean number of citations for papers in individual journals were not that high, indicating that to some extent, literature cited in clinical guidelines does not fully overlap with highly cited publications in the academic literature. This is interesting in relation to the results of Thelwall and Maflahi (2016), where it is indicated that since papers cited in NICE clinical guidelines are more cited in general than other papers in the same journal issues, citations in clinical guidelines might not be that different in quality from citations in academic literature. This will be tested further in future research.

Table 2. The ten journals with most cited papers in the clinical guidelines along with total number of WoS citations and mean citations per paper.

#	Journal	Recs	Citations	Avg Cit/rec
1	JOURNAL OF CLINICAL ONCOLOGY	187	54.591	291,9
2	NEW ENGLAND JOURNAL OF MEDICINE	152	16.7521	1102,1
3	STROKE	144	24.435	169,7
4	<i>JOURNAL OF CLINICAL PERIODONTOLOGY</i>	120	7.368	61,4
5	<i>COCHRANE DATABASE OF SYSTEMATIC REVIEWS</i>	112	6.077	54,3
6	LANCET	109	68.433	627,8
7	JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION	101	58.214	576,4
8	<i>JOURNAL OF PERIODONTOLOGY</i>	81	3.373	41,6
9	BRITISH MEDICAL JOURNAL	75	18.110	241,5
10	AMERICAN JOURNAL OF PSYCHIATRY	73	11.070	151,6

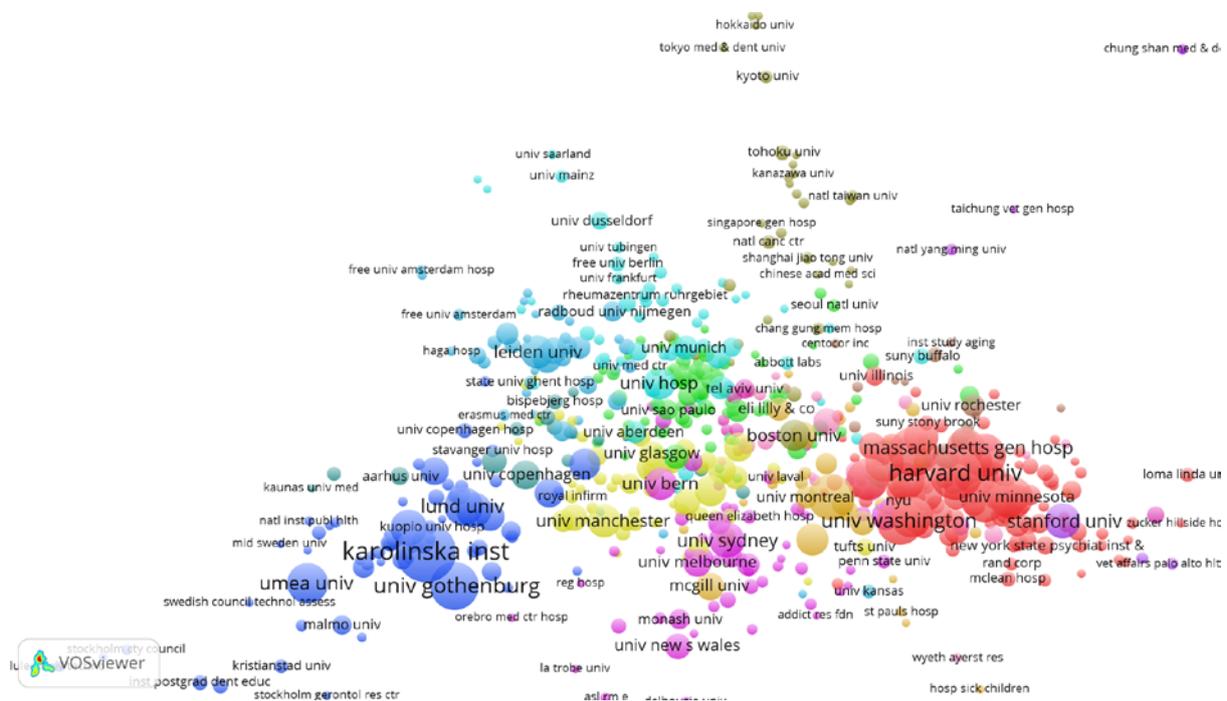
Reference age was noted by calculating the difference between clinical guideline publication year and cited reference year. The mean age of references was 7.8 years, while the maximum age was 57 years before publication of the clinical guideline.

Figure 2. Reference age up to 20 years. A total of 406 references were older than 20 years (max= 57).

Lastly, the institution of origin for the authors cited in the clinical guidelines was noted by identifying institutions from the addresses in the cited papers in WoS data. Swedish institution

names have been harmonized in the visualisation in Figure 3. It is notable that Swedish institutions are found prominently in the guidelines (mostly in the blue cluster), while U.S institutions (red) are expectedly found to a high degree. Cited literature is predominantly Western, while a small set of Asian institutions (predominantly in Japan and China) are found in the centre-top-right part of the map. These aspects of geographical features will be assessed and evaluated further in future research. It is especially relevant to compare qualitative aspects of citation practices in the clinical guidelines to traditional patterns of citation in academic literature to identify differences and biases in the kind of literature.

Figure 3. Co-author map of institutions. Of 6.631 institutions identified, authors from 665 institutions have published at least 5 papers shown here.



DISCUSSION

In this ongoing research, it is argued that it is important to widen the view of the impact of research so that impact can be measured outside the strict academic literature. The reason for this is that there is often long distance between basic academic research and the professional practice within which it is used. Therefore, clinical research must be measured with indicators that are found between the abstract research and its use in the clinic.

This project is positioned on the boundary between traditional bibliometric analysis (that typically measures intra-scientific relevance) and evidence-based *practice*, where criteria of good healthcare builds on more aspects than meta analyses of academic research.

The specific relevance of this research is related to the model for distributing national funding for the participation of Swedish county councils (the level at which healthcare is distributed) to medical education and clinical research at university hospitals as opposed to the medical schools that they are related to. These funds, the so called ALF-funds amounts to the level of

1.500 full time equivalents and between 3.000 and 3.500 publications, according to the Swedish Research Council (2013).

The goal of this project is to develop a conceptual and theoretical contribution to the development of indicators for measuring the impact of research outside of the specifically academic literature.

Outstanding issues that are pursued presently regards:

- The relationship between professional/clinical impact on the one hand and academic impact on the other. Should both kinds of impact be measured and do they complement each other or are they collapsible into each other?
- Citation window length. According to preliminary analyses, impact in clinical guidelines has a mean estimated turnover of about eight years, which is double the quite short citation window of four years that is generally used for academic impact.
- How to handle references to non-clinical research. A certain share of cited references are directed towards other clinical guidelines and reviews instead of to the underlying clinical research.
- The handling of listed, but not used references in the clinical guidelines. In many guidelines, the expert panel list not only the studies used to provide the guidelines, but also references that were judged to be of not sufficient quality. In the collection process, these references must be discarded so as not to include abandoned literature.
- Coverage for sources in PubMed amounts to almost 75 %. What other sources could be included to increase coverage and what is enough?

In sum, it is argued professional impact, here designated as impact of clinical research within clinical guidelines issued at the national or international level, provides grounds for measuring impact closer to the professional expertise that actually uses the research. Professional impact, as opposed to intra-scientific impact within the academic literature and “social impact”, based on mentions in social media or inclusion in on-line reference databases should be viewed as a distinct instance of research impact that operates on its own specific premises.

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