Dental Practice-Based Research Networks (D-PBRN) worldwide: a scoping review

Short running title: DPBRN worldwide: a scoping review

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Abstract

Objectives: For more than twenty years, dental practice-based research networks (D-PBRN) have helped to structure clinical research in private practice. They bring together practitioners working in several structures and may include a greater number of subjects. The aims of this study were thus to systematically explore the scientific production from dental private practices in general and to map and describe the D-PBRN activity worldwide.

Data sources: Two research procedures were carried out in parallel. The first was conducted as a scoping review to examine peer-reviewed literature indexed in the PubMed database and the second was performed on the World Wide Web to identify the main characteristics of the networks (location, scientific production…).

Study selection: 368 publications were identified among which 202 were published by PBRN members and the others by private practitioners not affiliated to any network. 210 (57% of the included articles) were produced in the USA. A higher number of diverse centers are involved in each study when it is conducted by a PBRN (59.06 ± 66.59 vs. 13.51 ± 31.58 for networks and independent teams, respectively; p < 0.01). 24 D-PBRN were identified, a majority being based in the USA and 8 in Europe.

Conclusions: Although dental practice-based research has grown over the years, the number of D-PBRN worldwide remains low. Even if it requires some investment to produce research in dental offices, this type of networks helps to fill the gap between private practice and research and to improve knowledge on oral health.

Relevance: The mapping of all the dental PBRN together with the research topics studied throughout the world make the relevance of this article. The ways to improve practice-based research in dentistry are also discussed in the paper.

Introduction

In dentistry as in medicine, the vast majority of patients receive care in an ambulatory primary care setting, yet the majority of clinical research occurs in academic institutions [1]. This situation raises many problems, including the limited external validity of studies (e.g. selection bias regarding patient populations), the diverse nature of private dental care practice which is not taken into account, and the difference between efficacy and effectiveness which, from a public health perspective, is very important.

One of the main solutions to these well-known issues has been the implementation of practice-based research networks (PBRN). These networks strive to generate results that are relevant to both patients and clinicians, by comparing interventions among participants and representative settings of usual care [2].

As in medicine, dentistry has also experienced an increase in the development of dental-PBRN (D-PBRN) spread over several countries [3]. The first was created in the United States in 1976 (Clinical Research Associate, CRA) but most of them have appeared since the 2000's. These networks bring together practitioners working mainly in private, sometimes public structures, and who are voluntary to conduct studies within their practice. The protocols thus developed may include a greater number of subjects, from various geographical origins, and with closer profiles to the general population [4]. D-PBRN were initially thought to respond to private practitioners' demands to participate in research protocols [5] but also to increase knowledge on the daily practices of the majority of dentists [5,6]. D-PBRN have thus helped to structure research in private practice, however, no comprehensive review has yet analyzed the territorial mesh of these networks and their research activity as a whole. These elements are necessary for public decision-makers to adapt research and public health policies.

The aims of this study were thus to systematically explore the scientific production from dental private practices in general and to map and describe the D-PBRN activity worldwide.

Methods

Study design

Because of the exploratory nature of our research question, we chose a scoping review framework [7], as it is a useful way for answering broad questions in a systematic manner. The PRISMA-ScR guideline (PRISMA extension for Scoping Reviews) has been followed [8].

Eligibility criteria

Given the diversity of the requested information, we have considered any publication, scientific or not - including websites - as a potential source of information. We have restricted our search strategy to information published in English and French. We did not apply any time limit.

Information sources and search strategies

Two research procedures were carried out in parallel. The first concerned the D-PBRN themselves and their display on the Internet. The second concerned all biomedical publications regarding the oral cavity, indexed in PubMed, and that are related to practice-based research.

The search strategy for existing networks was conducted first using the Google Internet search engine and then by exploiting the content of articles that were found on PubMed. The search strategy was derived from iterative Google requests of the terms "dental + practice + research network + world", "dental PBRN" and "réseaux de recherche + dentistes" (French) in May 2020. The association of the different terms was prepared following the checklist edited for performing iterative requests on Google Trends® search engine [9].

The search strategy for publications indexed in the PubMed database was performed iteratively, last conducted on March 17th, 2020, and detailed in Supplemental Appendix 1.

Network and study selection

The requests performed on Google search engine enabled to specifically identify PBRN having developed at least one study in the field of dentistry, whether it implicated dental surgeons, hygienists, or physicians. Were excluded the networks that 1) ~~were not dealing~~ never dealt with oral medicine or dentistry, 2) were not dealing with private practices, 3) did not conduct the studies themselves. The results of this search were compared to those obtained by screening on PubMed.

The iterative requests on PubMed aimed to identify publications related to practice-based research in dentistry, including studies and reviews, and conducted by the networks themselves or independent teams and/or practitioners. Articles not dealing with dentistry, proceedings of international conferences unrelated to practice-based research, studies dealing with student training, publications unrelated to practice-based research, studies conducted exclusively in university hospitals, and articles published in languages other than English were excluded. Case reports and duplicate publications were also excluded (*i.e.* articles

published with the same full-text in two different journals and/or bearing on PubMed the mention "*republished from*" [10,11]). Publications presenting the same work using different point of views and outcomes were retained [12,13].

Data collection process

Websites of the different networks were analyzed by one evaluator (TC) to identify all usable information characterizing their activity in the field of dentistry. This included the date of foundation, the state of registration, eventually their main fields of interest, the number of studies carried out or still in progress, the number of publications it has generated and also their sources of funding.

All articles obtained during the search were first screened by two calibrated evaluators (TC and EFC) to evaluate inclusion criteria. Included publications were then assessed twice, and required data were collected using a data extraction form. The form comprised year of publication, country where the research took place, journal, network membership or not, type of study, number of participants, type of practice for the implicated practitioners, sources of funding, and research topics. The impact factors concerning the year the article was published were extracted from the Journal Citation Reports® (Clarivate Analytics, USA, version 2019), and the topic of the research was determined using MeSH ontology 2020 [14].

We did not conduct a critical appraisal of included sources of evidence because of the exploratory nature of our research.

Results

Network and study selection

PubMed search strategy retrieved 938 articles, of which 555 were rejected for meeting at least one exclusion criterion and 15 were found to be duplicates (Figure 1). Finally, 368 publications were included and analyzed: 201 were published by network members (87.6% were original studies, others were reviews or editorials) and 167 by independent teams (77.1% were original studies), see supplemental Appendix 2 for details about individual studies.

Iterative searches on Google yielded results indicating the existence of at least 18 networks in the world (Figure 1). Four were excluded, 3 because they did not include private practitioners (Réseau de Recherche en Santé Buccodentaire et Osseuse (Canada), Network for Canadian Oral Health and Research (Canada), Sociedad Española de Periodoncia y Osteointegración (Spain)) and 1 (American Association of Orthodontists PBRN) because it served as an advisor

for the National Dental Practice-Based Network (NDPBRN) and thus did not produce research itself. A link to the US-government website listing existing PBRN was present in the results (https://pbrn.ahrq.gov) and led to identify 3 additional networks in the USA (Practice-based Research in Oral Health Network (PROH), South Texas Oral Health Network (STOHN), and Network for Community Oral Health Research (NCOHR)). Articles analysis also highlighted 7 more networks (Ceramic Success Analysis (CSA, Germany) [15], Oral Rehabilitation Outcomes Network (ORONet, Italy) [16], Clinical Research Associate (CRA, USA)[17], Netherlands General Practice-Based Research Network (NGPBRN, Netherlands)[18], Community Research for Oral Wellness Network (CROWN, USA)[19], The Applied Research Group for Kids (TARGet Kids!, Canada)[20,21], and Arbeitskreis Zahnärztliche Therapie (Germany)[22]). A total of 24 D-PBRN were finally included.

Characteristics of networks and studies

The earliest article identified dates from 1981 [23]. In the publications clearly identifying a D-PBRN, the name of the network is mentioned in the title in 64.4% of cases (n = 130), as an author in 57.9% (n = 117), and/or in the authors' affiliations in 39.6% of cases (n = 80). The overall number of publications increased over time with 72 articles between 2000 and 2009 and 277 between 2010 and 2019. A peak is noted in 2013 with the creation of the NDPBRN. Since 2010, there is a growing number of clinical studies (Figure 2).

USA exhibit the largest amount of publications (57%, 210 articles), followed by UK (14%, 52), and Germany (7%, 25) (Figure 3). The European region overall accounts for more than a third of published articles (n = 125 in 13 countries). In Asia, Japan is the main country involved in dental practice-based research (n = 12).

Among all the included publications, 202 were published by members of a PBRN (54.9%), the majority of these articles (n = 177) being clinical studies (cross-sectional, prospective, retrospective, or trials).

When comparing articles published by networks with those written by independent teams, different elements appear, the results of which are presented in Table 1. Within networks, a higher number of diverse centers are involved in each study (59.06 ± 66.59 vs. 13.51 ± 31.58 for networks and independent teams, respectively; $p < 0.01$), but a greater number of patients are included in independent publications when clinical studies are conducted (2492 ± 3939 for network studies vs. 6646 ± 23029 for independent studies; $p < 0.01$). D-PBRN conduct more surveys for practitioners than independent teams (n = 94 vs. n = 58, p=0.03) and include more practitioners in these surveys (8341 ± 59418 vs. 773 ± 1288; $p < 0.01$). Journals in which the

articles of the networks' articles are published have a higher mean impact factor (2.44 ± 1.02 vs. 1.93 ± 1.03; p < 0.01,) Supplemental Appendix 3) and the type of publications differs between the two groups. Networks conduct a majority of incidence and descriptive studies about private practice care habits (n = 116 vs. n = 24; p < 0.01), while independent researchers conduct more clinical trials (n = 28 vs. n = 8; p < 0.01) and retrospective studies (n = 36 vs. n = 16; p < 0.01) compared to networks. By referring each article to an item of the MeSH classification, it appears that independent teams of dentists produce more publications regarding pediatric dentistry (n = 19 vs. n = 3; p < 0.01) and periodontology (n = 17 vs. n = 1; p < 0.01). Conversely, D-PBRN have a special interest in dental surgeons' practice patterns (n = 56 vs. n = 14; p < 0.01) and publish more on endodontics than independent teams (n = 15 vs. n = 4; p = 0.03).

Analysis of websites, brochures, lectures, and articles of all included networks found that twelve eleven D-PBRN do not show any proof of activity in 2020, *i.e.* meetings or recruiting studies. Eleven networks and one DPBRN region were composed of private care and university practitioners, while the others only involved private care dentists. Three reported the participation of dental hygienists [24]. All networks and their characteristics and activities are presented in Table 2.

The majority of these networks are based in the United States of America (Figure 4), including the NDPBRN which is considered as the biggest network in the world due to its presence throughout the USA and in Northern Europe, but also because it is the network that has included the most patients and involved the most practitioners since its creation in 2012 (Table 2) [25]. Studies that are performed on patients in the different regions deal with oral health and general diseases and the link between the two. Moreover, another main topic developed by NDPBRN researchers relates to practice patterns as it is particularly easy for them to send surveys to practitioners or to distribute them directly during annual meetings in order to evaluate their diagnosis and care habits. The objective of the NDPBRN when it was inaugurated was to build a big American D-PBRN [25] able to replace the CONDOR group, *i.e.* a set of three networks spread over the US territory. It gathered the Practitioners Engaged in Applied Research and Learning Network (PEARL, USA), the Northwest Practice-based REsearch Collaborative in Evidence-based DENTistry (Northwest PRECEDENT, USA) and the Dental Practice-Based Research network, (DPBRN, USA). Nowadays, the three are not active separately as they have been included in the NDPBRN in 2012 [25]. The NDPBRN also includes a Scandinavian branch with practitioners based in Denmark, Sweden, and

Norway [25]. These foreign-based offices from Northern Europe were originally part of the 500 centers of the DPBRN during its 9 years of existence between 2003 and 2012 [26–28].

The South Texas Oral Health Network (STOHN), founded in 2008, is the second network in terms of included patients but for instance, due to a smaller region of influence, it has developed less study than the NDPBRN.

The oldest group of practice-based researchers in the world, the CRA, is also located in the USA and was founded in 1976 by Gordon Christensen [17]. This network is specialized in dental biomaterials evaluation both clinically and *in vitro* [17].

The latest network in the USA among those still active is the specific network of the American Association of Oral and Maxillofacial Surgeons (AAOMS PBRN). Specialized in surgery, it is directly funded by the association itself, while the previous listed networks receive grants from external public and/or private structures.

There are five other US-networks that are not currently active. Among which the first to be created was the CROWN network, located in Ohio, and founded in 1998 [19]. The Evidence Based Dentistry PBRN (EBD-PBRN) was founded in 2011 with the aim of bringing together international data on general diseases and biomaterials in order to draw conclusions with a high level of evidence. It was partly funded by the American Dental Association. The Practice-based Research in Oral Health Network (PROH) was founded in 2013 and gathered more than 180 practitioners in seven studies dealing with oral health and dental materials. The remaining two are the Network for Community Oral Health Research (NCOHR) and the Orthodontic PBRN (OPBRN).

Three dental networks are located in the United-Kingdom (UK). The Product Research and Evaluation by Practitioners Panel (PREPP), founded in 1993, is the oldest and has performed 50 studies in the field of biomaterials [17,29,30]. The Scottish Dental PBRN (SDPBRN), also known as Glasgow Research Initiative in Dental Practice [17], is more diversified with fields of research in oral health, caries treatments, and care quality; 18 studies have been performed since its creation in 1998. The third is the Birmingham Research in Dental General PracticE Network (BRIDGE), based in Birmingham University [17]. Founded in 2000, research topics relate to radiology, caries treatments, fixed prosthesis, and job satisfaction [17].

Five more networks are based in other European Countries. Three of them are currently active: the ReCOL in France, the Arbeitskreis Zahnärztliche Therapie in Germany and the Ceramic Success Analysis (CSA), established in 1994. The latter is a web-based network involving dentists also living in France, Spain, Chile, and China in order to cumulate data on daily practices [15]. The final two (the NGDPBRN in Netherlands [18] and the ORONet in

Italy which was created in 1996 and grouped practitioners from Italy, France, Netherlands, Finland, Canada, and USA in studies specifically oriented in prosthodontics [16]) do not appear to be active anymore.

In the rest of the world, one network was collated in Japan, one in Australia, and one in New-Zealand. The Japanese one is called Dental PBRN Japan (JDPBRN) and was established in 2010 in order to pilot studies in Japan and studies in collaboration with the NDPBRN from the USA. The Australian group is named eviDent and was created in 2011. The last dental network is the Applied Research through Clinicians' Hands DPBRN (ARCH), located in New-Zealand.

Finally another identified network is based in Canada (TARGet Kids!) but is not specifically a dental PBRN because it is composed of medical doctors, essentially pediatricians, who have performed some studies on dental topics concerning, for instance, caries status in childhood [20,21].

Discussion

Results of this scoping review show a fast growing activity of D-PBRN. Independent private practitioners are also developing and conducting research projects. This review reveals the multicenter nature of many studies, mainly those conducted by well-identified networks, and the close collaboration that exists between working groups in different countries. The ramification of these networks is growing. The NDPBRN based in the USA also includes practitioners in Sweden, Denmark, and Norway, who were originally part of the DPBRN and continue to fully participate in the studies [10,31–33]. In addition, the Japanese network JDPBRN has also been involved in some studies in partnership with the American NDPBRN [34]. Over the 21 networks identified as specialized in dentistry since 1976, the Canadian pediatric medicine network TARGet Kids! has also conducted studies in the field of dentistry. These studies were included in our analysis because they are fully oriented toward dental research, especially in the field of epidemiology, to identify factors associated with tooth cavities development and dental care needs [20,21], and thus presented no argument for exclusion.

Even if the D-PBRN are numerous around the world, many of them have ceased their activity. Many reasons could explain this phenomenon. Managing such a network from its design to

the completion of research protocols is complex. A strong management team is needed to recruit and motivate for a long period practitioners willing to get involved in studies [25]. The NDPBRN have a complex organization with many entities, each one in charge of good functioning for practitioner recruitment, protocol conception, and any other network branch [25,28]. The increase in the number of dentists enrolled depends on the network's recognition, which is reflected by a large number of publications and concrete results on new topics. It was in part to grow these networks' reputation that several articles were duplicated and republished in other newspapers after their initial publication [35,36].

A PBRN must also have sufficient funding for developing and conducting protocols. In the United States, 142 studies were funded in whole or in part by the National Institute for Health (NIH) *via* its branch the National Institute of Dental and Craniofacial Research (NIDCR), making NIH the organization that allocated the most funds to dental PBRN. In other cases, grants and funding for studies come from other public structures or private companies. For example, some manufacturers fund their own studies in partnership with networks in order to clinically evaluate their materials [29,37–39]. The solution for acquiring financial and structural stability therefore requires supervision by an institution such as a university in the case of NDPBRN [25,28]. The network is thus managed from the parent structure and research is conducted entirely or partly externally in private practice. The additional inclusion of patients at the teaching hospital presents the advantage of offering an even more representative range of included subjects from the general population. However, the proportion of included patients in hospital centers cannot be too important as the organization of practice in terms of care time, operators, and equipment differ between hospital and dental offices. It has already been shown that dental surgeons in private practice present more characteristics in common with dental surgeons involved in D-PBRN than with academic ones [6], and that PBRN are a mirror of routine practice [5]. The management of protocols from parent institutions also facilitates the participation of dental surgeons [28], as it is difficult for them to combine the roles of study sponsor and operator while ensuring the proper conduct of their practice. Indeed, the important workload associated with managing a private practice can tend to frighten dentists and limit their participation in research studies.

Once networks are established and functional, maintenance is constant. Newsletters can be set up to keep dentists informed on the progress of research within the network and annual meetings organized to bring members together. Websites are concrete examples of the difficulty of maintaining alive a network because they require constant updating and stay still accessible even if the network has ceased its activities.

It is interesting to note that the number of practitioners engaged in research, the average number of included patients, and the duration of research is higher for studies developed outside a network. The higher number of included subjects can be explained by the fact that independent teams performed more studies based on the compilation of numerical data from very large samples. Practitioners who are network members are often considered as subjects themselves when they are asked to answer surveys on their daily practice. In these cases, no follow-up is established over time.

An important point when considering the validity of research conducted within private practice is the ability for dentists and dental staff to deliver consents, cares, and assessments in a calibrated manner [5]. Although few articles mention the matter of calibration among practitioners, some networks such as NDPBRN are highly concerned about their evaluators' calibration [40]. However, it is easy to understand how difficult it would be for each network to bring dentists from several regions of the world or a nation together for calibration sessions. Therefore, this must be taken into account when interpreting the results of practice-based research and when compiling data for eventual future meta-analyses.

This study has some limitations ~~which~~ that need to be considered. There may be ~~a small bias~~ some approximations in the geographical places where studies were conducted because data on the origin of the main structure involved in the protocol were not always available, ~~and~~ in these cases we had to arbitrarily define the location as the country of origin of the first author. Another limitation is that there is also a large number of articles on PubMed that have been produced without the frame of a clearly identified PBRN. Our strategy for selecting networks and primary studies was guided by the sole concern of the reproducibility of our research. Thus, we proceeded to a two-step search, using a *forward* approach: first we searched for networks, then we searched for primary studies. We did not conduct a *backward* search (which would have led to the retro-identification of the networks from articles) for the main analysis. The reason is that this would have led, in too many situations, to subjectively affiliate a study to a network, with no certainty (and no reproducibility). This argues in favor of a need for a better identification concerning the work produced by networks. The AZT in Germany for example seems to have an important activity; however it does not appear clearly in our network analysis. In a society where the visibility of scientific data is crucial, improving the visibility of research helps accelerate the dissemination of scientific messages

[41]. Membership in a research network, which is also recognized, is a value that may be perceived as a guarantee of quality and scientific integrity and collective intelligence.

Case reports have been excluded from this review. Although the value of publishing case reports is undeniable, the present work did not consider them because they do not constitute studies based on well-established research protocols [42], they are not population-based studies, and they do not permit to sufficiently shed light on care practices in dental offices.

The search strategy herein considered the contents of the articles obtained on PubMed as well as the contents of the networks' websites, with the risk that these had not been updated recently. It has been noted that many included articles in the analysis are not published on the sites of their own networks, and conversely some articles may be posted on websites without being accessible on the Internet (articles published in national journals).

Conclusion

Practice-based research has been growing over the years and will continue to acquire results from private offices as these are applicable to daily practice. There is a need for D-PBRN to diversify their topics of interest in order to improve knowledge on oral health. Collaboration between several teams in different countries enables to increase the quality and power of performed studies. Nowadays, with the development of many networks around the world, it has become relatively easy for interested dentists to join a structure by going directly to these groups' websites and filling out membership forms. Even if it requires some investment to produce research in dental offices, this type of initiative helps to fill the gap between private practice and research and should be widely encouraged.

Funding

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Table 1: *main characteristics of articles extracted from PubMed query on March 17th, 2020.*

Characteristics studied	Networks' articles n = 202	Independent articles n = 166	p
Oldest article found	2005	1981	
Mean impact factor	2.44 ± 1.02	1,96 ± 1.07	**< 0.01**
Mean number of implicated centers	59.06 ± 66.59	13.51 ± 31.58	**< 0.01**
Mean number of implicated practitioners	112.14 ± 93.6	109.06 ± 466.8	0.95
Mean number of included patients	2492 ± 3939 (n = 79)	6646 ± 23029 (n = 64)	**< 0.01**
Mean number of included practitioners	8341 ± 59418 (n = 94)	773 ± 1288 (n = 58)	**< 0.01**
Article types (%)			
Commentaries	1 (0.5%)	4 (2.41%)	0.18
Editorials	3 (1.49%)	4 (2.41%)	0.71
Letter to the editor	2 (0.99%)	4 (2.41%)	0.42
Network presentation	7 (3.47%)	0 (0%)	**0.02**
Data compilations	0 (0%)	2 (1.2%)	0.2
Review	10 (4.95%)	22 (13.25%)	**< 0.01**
Prospective study	33 (16.34%)	34 (20.48%)	0.34
Retrospective study	16 (7.92%)	36 (21.69%)	**< 0.01**
Narrative study	0 (0%)	1 (0.6%)	0.45
Descriptive studies	116 (57.43%)	24 (14.46%)	**< 0.01**
Clinical Trials	8 (3.96%)	28 (16.87%)	**< 0.01**
Proportion of registered trials	62.5%	30.77%	
Mean study duration (months)	29.79 ± 45.44	77.76 ± 87.67	**< 0.01**
Simplified MeSH classification (%)			
Delivery of health care	2 (0.99%)	1 (0.6%)	> 0.99
Demography	1 (0.5%)	0 (0%)	> 0.99
Dental health services	1 (0.5%)	0 (0%)	> 0.99
Dental heath surveys	4 (1.98%)	0 (0%)	0.13
Dental research	0 (0%)	1 (0.6%)	0.45
Dental staff	5 (2.48%)	2 (1.2%)	0.46
Dentists	2 (0.99%)	0 (0%)	0.5
Endodontics	15 (7.43%)	4 (2.41%)	0.03
Ethics, dental	1 (0.5%)	1 (0.6%)	> 0.99
Evidence-based dentistry	37 (18.32%)	32 (19.28%)	0.89
Fluoridation	1 (0.5%)	0 (0%)	> 0.99
General practice, dental	24 (11.88%)	37 (22.29%)	**0.01**
Geriatric assessment	0 (0%)	1 (0.6%)	0.45
Health education, dental	0 (0%)	1 (0.6%)	0.45
Health services	3 (1.49%)	0 (0%)	0.26
Health status	4 (1.98%)	0 (0%)	0.13
Health status disparities	2 (0.99%)	1 (0.6%)	> 0.99
Military dentistry	0 (0%)	1 (0.6%)	0.45
Oral medicine	0 (0%)	1 (0.6%)	0.45
Orthodontics	5 (2.48%)	4 (2.41%)	> 0.99
Pathology, oral	4 (1.98%)	0 (0%)	0.13
Pediatric dentistry	3 (1.49%)	19 (11.45%)	**< 0.01**
Periodontics	1 (0.5%)	17 (10.24%)	**< 0.01**
Practice patterns, dentists	56 (27.72%)	14 (8.43%)	**< 0.01**
Preventive dentistry	8 (3.96%)	5 (3.01%)	0.78
Prosthodontics	17 (8.42%)	15 (9.04%)	0.85
Public health dentistry	0 (0%)	4 (2.41%)	**0.04**
Radiology	0 (0%)	1 (0.6%)	0.45
Social determinants of health	3 (1.49%)	0 (0%)	0.26
Surgery, oral	3 (1.49%)	3 (1.81%)	> 0.99

Mean number of included patients and practitioners have been distinguished because there are studies dealing with oral care on patients and others dealing with dentists' practices during routine care. Quantitative variables are presented as mean ± standard deviation. Comparison between the two groups was performed using Student's t-test under the double hypothesis of normal distribution and variance equality of values. Otherwise, a non-parametric Man Whitney Wilcoxon test was preferred. Qualitative variables are presented as n and proportions. Comparison between groups was done using Fisher's exact test. Bold p-values represent statistical significance at the .05 level.

Table 2: *main characteristics and activities of identified network. All data have been collected directly from the network websites or in the publications presenting them.*

Networks	Year of creation	Country (region)	Foreign teams	Specialties	Practitioners involved	Patients included	Closed studies	Publi-cations	Funding
ACTIVE NETWORKS									
NDPBRN (regions) *Western* *Midwest* *Southwest* *South Central* *South Atlantic* *Northeast*	2012	USA (W) (MidW) (SW) (S central) (S Atl.) (NE)	Scandinavia		6500	15462	41	169	NIH, NIDCR
AAOMS		USA		Surgery					From the association
ARCH		New-Zealand							
Arbeitskreis Zahnärztliche therapie (AZT)		Germany						2	Studies are self-funded by authors
CRA	1976	USA		Biomaterials					
CSA	1994	Germany	France, Chile, China, Spain						
eviDent	2011	Australia					20	15	Donations, sponsors, associations, societies
JDPBRN	2010	Japan	Common studies with NDPBRN				5	11	Japan Society for Promotion of Science, Takeda Science Foundation
ReCOL	2018	France			392		3		Societies, associations
Scottish DPBRN	1998	UK					8	5	NHS Education for Scotland
STOHN	2008	USA (Texas)			37	10293	11	2	
TARGet Kids!	2006	Canada	(Medical network)			> 9000		70	Research grants & manufacturers
INACTIVE or UNDETERMINABLE NETWORKS									
BRIDGE	2000	UK			20				
CROWN	1998	USA (Ohio)		Prevention	160				
EBD-PBRN	2011	USA							NIH, American Dental Association
DPBRN*	2003	USA	Scandinavia		In 500 centers				
NCOHR	2015	USA			10				
NGDPBRN		Netherlands							
N. PRECEDENT*		USA (NW)							
OPBRN		USA (S. Antonio)		Orthodontics					
ORONet	1996	Italy	USA, Canada, France, Finland, Netherlands	Prosthodontics					
PREPP	1993	UK			35	33	50	57	Manufacturers
PROH	2013	USA			184	50	7		Oregon opportunity, Austin Clinical Research Endowment, OHSU Center of Excellence in Clinical Research
PEARL*	2005	USA			200				NIDCR, NY

* indicates the three network members of the CONDOR group. The "Publications" column groups international and national articles. NIH means National Institute of Health; NIDCR means National Institute of Dental and Craniofacial Research

Figure 2: *Graph presenting the growing number of publications in the field of dental practice-based research since the year 2000. The mention "studies" groups together prospective, retrospective, cross-sectional studies, and clinical trials. The mention "reports" groups together reviews, comments, and editorials. Data for 2020 only covers the January to June period.*

Figure 3: Geographic mapping of articles available on PubMed and dealing with practice-based research. Publications were distinguished between those conducted by networks (grey) and those conducted by independent teams (blue). Within these two groups, clinical studies (clear) have been distinguished from reviews, editorials and other reports (dotted).

Figure 4: Geographic mapping of dental practice-based research networks. Green icons represent active networks in 2018, while red icons represent networks that have not shown any recent activity. Pins' shape indicates the presence or absence of university professors among the network practitioners and their filling corresponds to the presence or absence of hygienists in the investigators. The network shown in blue is a physicians' one which has already conducted several studies in dentistry. The National Dental Practice-Based Research Network (NDPBRN) is composed of six regions (from the left to the right of the map: western, midwest, south-central (upper pins), northeast, south-atlantic, and southwest (lower pins)).
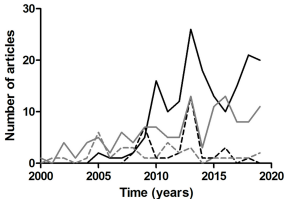
Legend:
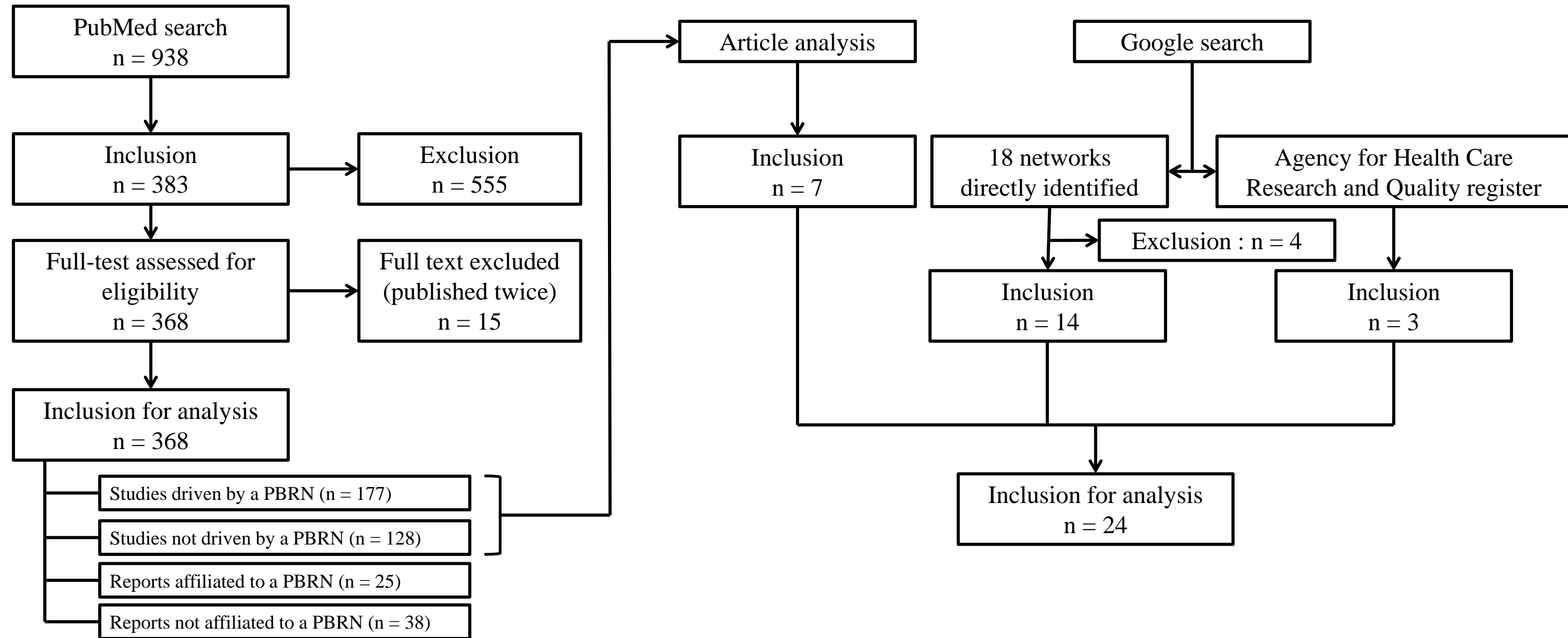
— Studies driven by a PBRN   — Studies not driven by a PBRN

- - - Reports driven by a PBRN   - - - Reports not driven by a PBRN

NETHERLANDS
NORWAY
SWEDEN

FINLAND
DENMARK
BELGIUM
SWITZERLAND
GREECE

INDIA

JAPAN

USA CANADA UK

BRAZIL

ITALY
FRANCE
GERMANY

SPAIN

AUSTRALIA

NEW-ZEALAND

| | Independent studies | | Networks' studies | | Networks' reports | | Independent reports |

Active networks

Inactive networks

Medical network

Networks pooling

With academic; with hygienists

With academic; w/o hygienists

W/o academic; with hygienists

W/o academic; w/o hygienists

Foreign team

Included in network

Link network – teams