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How value-based healthcare evolved: fifteen years of value-based healthcare research, a scoping review.

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Keywords

Value-based healthcare (VBHC); Integrated Practice Units; Outcome measurement; Bundled payments; Information Platforms; Implementation

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Abstract

Objectives:

We aimed to systematically map the extent, range and nature of research activity on value-based healthcare (VBHC), and to identify research gaps.

Methods:

A scoping review with an additional cited reference search was conducted. Eligible articles mentioned VBHC or value with reference to the work of Porter or provided a definition of VBHC or value. The strategic agenda of Porter and Lee, consisting of six agenda items for implementing a high-value healthcare delivery system, was used to categorize the included articles.

Results:

The searches yielded a total of 27.931 articles, of which 1.242 articles were analyzed. Most articles were published in North America. Most articles described an application of VBHC by measuring outcomes and costs (agenda item 2). The other agenda items were far less frequently described or implemented. Most of these articles were conceptual, meaning that nothing was actually changed or implemented.

Conclusion:

The number of publications increased steadily after the introduction of VBHC in 2006. Almost one fifth of the articles could not be categorized in one of the items of the strategic agenda, which may lead to the conclusion that the current strategic agenda could be extended. In addition, a practical roadmap or guideline to implement VBHC is still lacking. Future research could fill this gap by specifically studying the effectiveness of VBHC in day-to-day clinical practice.

Article Summary

Strengths and limitations of this study

- This is the first scoping review that mapped the entire extent, range and nature of the research activity on value-based healthcare; its broad scope resulted in a comprehensive overview.
- With this scoping review, a database was created that can contribute to more in-depth systematic reviews to further explore what is known within each of the agenda items.

- This review exposed the gap in research regarding the effectiveness of value-based healthcare in daily practice.

Introduction

In 2006, value-based healthcare (VBHC) was introduced as a way to reform healthcare.[1] Rising costs, mounting quality issues and an increasing healthcare demand prompted the development of the VBHC concept by Michael E. Porter and Elizabeth Olmsted Teisberg.[1] According to them, improving value for the patient should be the overarching goal in healthcare, with value defined as the health outcomes achieved per dollar spent.[1] To improve patient value, healthcare delivery should be organized around medical conditions over the full cycle of care. Universal measurement of value (outcomes and costs) is an important element in monitoring improvement.[2]

Strategic Agenda for value transformation

In 2013, a strategic agenda was published, consisting of six agenda items for implementing a high-value healthcare delivery system (Box 1).[3] The agenda items were intended to support healthcare providers in the transition from a focus on volume, i.e. being organized around functionally organized departments and specialties, to a focus on value, i.e. being organized around what matters to patients with a specific medical condition.

Box 1: the six agenda items of the strategic agenda.[3]

1	Organize into integrated practice units (IPUs) around the patient's medical condition.
2	Measure outcomes and costs for every patient.
3	Move to bundled payments for care cycles.
4	Integrate care delivery across separate facilities.
5	Expand excellent services across geography.
6	Build an enabling information technology platform.

Implementation of VBHC

The implementation of VBHC requires a major transition at both the level of healthcare providers, as well as at the level of (national) healthcare systems. Healthcare providers, such as hospitals, are typically (vertically) organized around functional departments and specialties. Transitioning towards an organization that is based on medical condition (horizontal) (agenda item 1) requires a fundamental reorganization of hospitals and their collaborating care-chain partners (agenda item 4). Measuring outcomes over the full cycle of care for a certain medical condition (agenda item 2) also requires further major change. When VBHC was introduced in

2006, healthcare quality systems were aimed at monitoring providers' compliance to (international) quality guidelines and norms. At the time, quality indicators were primarily focused on process optimization and safety. Health outcomes were hardly available and not measured at the level of medical conditions. Moreover, costs should be measured over the full cycle of care taking the true costs of care delivery into account. This requires a different approach for most healthcare providers (agenda item 2). The reimbursement of healthcare providers should move to payment for value, which not only requires major changes for healthcare providers, but also for health insurance companies and healthcare industry, such as pharmaceutical companies (agenda item 3). The expansion of excellent care across geography (agenda item 5) is challenging, because it arises from the progress on the other agenda items. Finally, building an enabling IT-platform (agenda item 6) is essential for the value transition. The availability of high-quality data and IT-infrastructure is named one of the main cornerstones to move forward with VBHC.[4]

The maturity of VBHC

Value-based healthcare has become a popular vision for healthcare organizations. Since the introduction of VBHC in the United States, the concept has spread around the world, and an increasing number of healthcare providers are adopting VBHC principles in order to continuously improve care. The article "What is value in health care?"[5] has since been cited over 4500 times.[6] However, few details have been published on how to practically implement VBHC. The strategic agenda proposed the major themes that need to be addressed in healthcare, but how to actually implement these items is hardly described. VBHC has been introduced as a strong vision for healthcare, but a practical guideline or scientific proof for the success of the proposed strategic agenda is lacking. As a result, various aspects of VBHC are only superficially understood and interpreted in different ways.[7] Scientific output on VBHC is important since the healthcare sector, perhaps more than in economics or management, uses an evidence-based paradigm. Healthcare professionals are used to consider the scientific evidence before implementing an organizational reform such as VBHC.

In order to support organizations in the implementation of VBHC, it is important to understand how the VBHC concept and strategic agenda have been used in different contexts and have evolved over time. Therefore, the aim of this scoping review was to systematically map the

extent, range and nature of research activity on VBHC over the last fifteen years, and to identify potential research gaps.

Methods

This scoping review was guided by the Joanna Briggs Institute (JBI) methodology for conducting scoping reviews,[8] to answer the main research question: "What are the extent, range and nature of research activities on VBHC over the last fifteen years, and what are the research gaps?"

Patient and Public Involvement

Patients and the public were not involved in this study's design, conduct or dissemination plans.

Eligibility criteria

The first eligibility criterium was that the article had to discuss or refer to VBHC. This criterium was met if the article 1) mentioned VBHC or value with reference to the work of Porter[1 3 5 9-11], or 2) provided a definition of VBHC or value in line with Porter's definition. If VBHC or value was only mentioned as a suggestion for further research, the article was not included.

The second criterium was that the context of the article had to be healthcare related. No restrictions were made with regard to the type of participants, type of study design or the outcomes measured. Only peer-reviewed articles were included.

Information sources and search strategy

The three-step search strategy from the Joanna Briggs Institute was used.[8] First, an initial limited search was performed in PubMed. The title, abstract and index terms of the retrieved articles were analyzed to provide keywords for the final search. Second, the final search was carried out using the identified keywords from step 1. This search was undertaken in PubMed, Embase and Web of Science (Supplementary File I). Third, the reference lists of all the retrieved articles were examined for additional articles. Additionally, a cited reference search for the article "What is value in health care?" was conducted.[5] In perspective with Porter's other references on VBHC, this is his most cited article.

Only articles published in English were included. The search was limited to publications between 1 January 2006 and 7 June 2021 (the day of the search), because of the introduction of VBHC in 2006.[1]

Selection process

All search results were uploaded to EndNote. Duplicates were removed before screening. Titles, abstracts and full texts were independently assessed for eligibility by pairs of reviewers (JV, KD, GS, PN, MG). Reviewers did not screen articles they had written themselves. Discrepancies between reviewers were resolved in consensus meetings. If necessary, a third reviewer made the final decision. For the selection process, the application Rayyan was used.[12]

Data extraction

Data were independently extracted using a data-extraction form in REDCap (Research Electronic Data Capture) which was specifically developed and pilot tested for this review.[13 14] Extraction questions were aimed at the article's main characteristics, references to VBHC, design, measured outcomes and the implemented elements of the strategic agenda. For each article, the reviewers (JV, KD, GS, PN, MG) indicated which items of the strategic agenda were reported, and had the possibility to write down potential new agenda items.

Data from 10% of the articles (at random) was double extracted by two independent reviewers. Discrepancies in the extracted data were discussed and resolved by a set of reviewers. Thereafter, data extraction of the remaining 90% was performed by one reviewer (JV, KD, GS, MG) and checked by a second.

Analysis and presentation of results

The PRISMA flowchart was used to summarize the review decision process.[15] The extracted data were summarized quantitatively. The categorical data were expressed as frequencies. The statistical analysis was performed with use of Mathematica software (Wolfram Research, Inc., Mathematica, Version 12.1.1, Champaign, IL (2021).

Results

Selection

The search yielded a total of 27.931 articles, of which 2.218 articles were found by the cited reference search (**Error! Reference source not found.**). After duplicate removal, 12.909 potentially relevant articles remained. Title and abstract screening resulted in 8.078 articles to be excluded. Ten articles were excluded because no full text was available. The remaining 4.821 articles were assessed for eligibility in a full text screening, of which 74 articles were excluded because they were not peer-reviewed and 3.501 articles were excluded because they did not discuss or refer to VBHC. In total, 1.246 articles were included in this review. Four of these articles were not included in the analysis because they were written by Porter and described elements of the VBHC theory (source reports). Finally, 1.242 articles were analysed.[2 10 11 16] The full dataset with included articles and collected outcomes can be found in Supplemental File II.

Review findings

General

From 2006 to 2011 less than 10 articles were published per year (**Error! Reference source not found.**). The number of articles increased yearly, with the exception of 2018. North American centers published 72% (n=894) of the articles and published all the included articles up to the year 2009. In Europe, the first articles on VBHC were published in 2009. South America, Oceania, Asia and Africa together published 5% of the included articles (n=70).

Most articles were original articles (n=627, 50%), followed by narrative reviews, perspectives, opinion papers, and short report (n=506, 41%). Six percent of the articles were systematic or scoping literature reviews (n=69). Case studies accounted for 3% of the included articles (n=36) and methodologies for less than 1% (n=4) (Table 1).

Most of the original articles had an observational study design (n=561, 89%); 7% of the articles had an experimental design (n=42). In 76% of the original articles quantitative research methods were used (n=474). A small part of the articles used a qualitative method (n=72, 11%). Of the 561 observational articles, the majority collected the data retrospectively (n=337, 60%).

The effect measures or endpoints in the original articles were clinical outcomes (n=359, 57%), costs (n=291, 46%), patient reported outcome measures (PROMs) (n=125, 20%), patient reported experience measures (PREMs) (n=31, 5%), no outcomes (n=73, 12%), or were indicated not applicable (NA) (n=47, 8%). Four articles measured all the above effect measures (clinical outcomes, costs, PROMs and PREMs). Twenty-four percent of the articles that measured PROMs measured generic PROMs (n=30), 33% measured condition-specific PROMs (n=41) and 31% measured both (n=39). In 12% of the articles that measured PROMs (n=15), it was unknown which PROMs were used.

When comparing the two continents that published the most articles (North America and Europe), a difference in measured endpoints was noted. In North America, the emphasis was on measuring clinical outcomes and costs (resp. n=274, 62% and n=243, 55%). While in Europe, the emphasis was on measuring clinical outcomes and PROMs (resp. n=67, 47% and n=46, 32%). Costs were measured less frequently as endpoint in Europe (n=35, 24%).

Most original articles reported on patients (n=463, 74%), some on healthcare professionals (n=116, 19%) (Table 3).

Medical context

More than 50% of the articles reported on hospital care (Table 1). The most often studied medical specialty was orthopedic surgery (n=182, 15%) (Table 2).

Table 1: Characteristics of included articles.

Characteristics	N (%)
Type of article	
Original article	627 (50)
Short report / Brief communications / Perspective / Commentary / Opinion paper / Narrative review	506 (41)
Literature review (scoping or systematic)	69 (6)
Case study	36 (3)
Methodology	4 (<1)
Study design	
Observational design	561 (89)
Experimental design	42 (7)
Both designs	4 (1)
Unknown	5 (1)
Not applicable	15 (2)

Research method	
Quantitative method	474 (76)
Qualitative method	72 (11)
Both methods	67 (11)
Unknown	8 (1)
Not applicable	6 (1)
Data collection	
Retrospective	337 (60)
Cross-sectional	113 (20)
Prospective	86 (15)
Mix of retrospective and prospective	14 (3)
Unknown	5(1)
Not applicable	6 (1)
Type of organization[#]	
Hospital	687 (55)
Public / Preventive care organization	27 (2)
University	12 (1)
General practitioner	11 (1)
Pharmaceutical organization	8 (1)
Health insurer	3 (<1)
Other*	56 (5)
Unknown	77 (6)
Not applicable	378 (30)

*[#]Total is more than 100% because multiple answers could be selected. *For example: ambulatory care organizations, databases, dental care organizations, companies, focus clinics, government, home care facilities, NGOs, primary healthcare, rehabilitation facilities.*

Table 2: Medical specialties studied in the included articles.

Medical specialty[§]	N (%)
Orthopedic surgery	182 (15)
Internal medicine^	178 (14)
Surgery^	111 (9)
Radiology^	61 (5)
Pediatrics^	50 (4)
Anesthesiology	38 (3)
Urology	32 (3)
Plastic surgery	31 (2)
Thoracic surgery	31 (2)
Otolaryngology	29 (2)
Obstetrics and gynecology	26 (2)
Neurological surgery	22 (2)
Colon and rectal surgery	20 (2)
Neurology	20 (2)
Physical medicine and rehabilitation	20 (2)

Neurological surgery and orthopedic surgery	18 (1)
Psychiatry	16 (1)
Ophthalmology	12 (1)
Emergency medicine	10 (1)
Dermatology	9 (1)
Family medicine	4 (<1)
Allergy and immunology	2 (<1)
Pathology	2 (<1)
NA	248 (20)
Multiple	18 (1)
Other^	52 (4)

§List of specialties according to the American Board of Medical Specialties.[17] ^Subspecialties are displayed in Supplementary File III.

Table 3: Population of original articles.

Study population (n=627)		N (%)
Type of population#	Patients	463 (74)
	Healthcare professionals	116 (19)
	Other	52 (8)
	Not applicable	52 (8)
Median size of patient population		565 (min: 3, max: 18.474.860)
Median size of healthcare professional population		40 (min: 3, max: 185.075)

#Total is more than 100% because multiple answers could be selected.

Value-based healthcare

All included articles were rated for their extent to which VBHC played a role in the article. From highest to lowest VBHC rating, the categories were: 1. describing or implementing multiple agenda items and/or using the whole VBHC theory (n=171, 14%); 2. describing or implementing one of the agenda items (n=395, 32%); 3. discussing or using value in the article with Porter's definition, but not discussing or implementing any agenda items (n=373, 30%); 4. mentioning VBHC only as a motivation or context in the article (n=290, 23%) (Table 4). Furthermore, the type of article was registered. Most articles were either conceptual or with an application. Conceptual articles are solely descriptive, whereas articles with an application researched a topic in daily practice. Only 11% of the included articles were development studies, meaning that an innovation or initiative was developed but not implemented.

Most of the articles (n=953, 77%) referred to Porter's article "What is value in health care"[5] (Supplementary File IV). Articles that contained multiple sections (n=735) mostly

referred to a paper of Porter in the introduction section (n=564, 77%), or the discussion section (n=233, 32%) (Supplementary File IV).

Table 4: Overview of each article's relation to VBHC.

Extent to which VBHC played a role in the article (as rated by extractors)	N (%)
1. Describe or implement multiple agenda items (highest rating)	171 (14)
2. Describe or implement a specific part of VBHC or the strategic agenda	395 (32)
3. Discuss how to improve value or measure value, with value defined	373 (30)
4. VBHC is context or motivation for the study (lowest rating)	290 (23)
Other^	13 (1)
Type of article #	N (%)
Conceptual article	528 (43)
Article with a development	138 (11)
Article with an application &	579 (47)

^For example: discussed VBHC as one of the possible approaches or description of a new interpretation of VBHC. #Total was more than 100% because multiple answers could be selected. $ 58% (n=721) of the articles had one Porter reference, 36% of the articles had two or more references (mean: 2.6, range: 2-6). &For example: research into an implementation or retrospective research into two different patient groups.

Implementation in general

In 288 articles (23%), the effect of an implementation was measured. The definition of an implementation article was that the article described a new process or technique implemented in daily work and presented the results. Two hundred seven of these articles (79%) reported that the implementation was a success. Forty-five articles (16%) had no statements regarding the effectiveness of implementation and 16 articles (5%) reported that the implementation was not a success.

Items of the strategic agenda

The most frequently found agenda item was measuring outcomes and/or costs (n=941, 76%). All other agenda items were found in less than 10% of the articles (Table 5). Five articles discussed or implemented all the agenda items.

For 228 articles, no agenda item could be selected. The six most mentioned 'new' agenda items were 'other type of contracting' (n=29), 'quality improvement' (n=23), 'VBHC culture' (n=11), 'education' (n=10), 'shared decision making' (n=8) and 'care delivery value chain' (n=5). Table 6 shows the number of agenda items selected per article. For most articles only one agenda item was selected (n=868, 70%). All the agenda items are discussed separately in the next sections.

Table 5: Reported agenda items.

Agenda item [#]	N (%)
1. Organize into integrated practice units (IPUs) around the patient's medical condition.	71 (6)
2. Measure outcomes and costs for every patient.	941 (76)
3. Move to bundled payments for care cycles.	84 (7)
4. Integrate care delivery across separate facilities.	22 (2)
5. Expand excellent services across geography.	13 (1)
6. Build an enabling information technology platform.	83 (7)
No item selected	228 (18)

[#]Total is more than 100% because multiple answers could be selected.

Table 6: Number of agenda items selected per article.

Number of selected agenda items	N (%)
0	228 (18)
1	868 (70)
2	115 (9)
3	19 (2)
4	6 (<1)
5	1 (<1)
6	5 (<1)

Agenda item 1: Organizing into IPU

Although 71 articles discussed an IPU, only three of them reported on the actual implementation of an IPU (4%). In most articles, the IPU was focused on one medical condition (n=32, 45%) and involved a multidisciplinary team (n=43, 61%) (Table 7).

Most of the articles that discussed an IPU were conceptual (n=41, 58%). Thirty-four percent (n=24) of the articles that discussed an IPU implemented some sort of a (medical) intervention or did a comparative study. Two articles (n=2, 3%) described the development of an IPU. Four articles combined these three phases.

Agenda item 2: Measuring outcomes and costs

Of 941 articles reporting on outcomes and costs, most articles compared outcomes between treatments or interventions (n=155, 16%). A quarter of the articles did not compare outcomes (n=238, 25%). Of the 554 original articles in this category, 30% (n=168) reported solely on outcomes (clinical, PROMs or PREMs), 16% (n=87) reported solely on costs and 36% (n=201)

reported on both outcomes and costs. Eighteen percent (n=98) reported on other type of end points.

Different types of costs were measured. Direct costs were reported in 274 articles (29%); 40 articles reported direct and indirect costs (4%). Sixty-six articles measured the costs along the entire chain (20%). No distinction was made between whether the entire care chain was located inside or outside the hospital. Sixty-three articles (7%) developed a standard outcome set and thirteen articles (1%) a PROM (Table 7).

Half of the articles that discussed outcomes and costs reported an application (n=486, 52%), a third of the articles were conceptual (n=308, 33%) and 10% reported on a development (n=95, 10%). Fifty-two articles reported on a combination of the three categories (n=52, 5%).

Agenda item 3: Moving to bundled payments

There were 84 articles that discussed a form of bundled payments (Table 7). Most of the articles were conceptual (n=55, 65%), followed by articles with an application (n=26, 31%) and articles with a development (n=2, 2%). One article described a combination of the three categories.

Besides bundled payments, 'other forms of contracting' were frequently discussed. For example, pay for performance bonuses was discussed in 48 of all included articles (4%) and population-based payments in 8 articles (1%).

Agenda item 4: Integrating across separate facilities

Of the 22 articles in this category, eleven articles reported on a collaboration between healthcare providers or hospitals (50%). One article described the collaboration between a healthcare provider and an insurance company (5%). Another article discussed the collaboration between a healthcare provider and a university (5%). For the other nine articles, the question was not applicable (41%).

Fifty percent of the articles were conceptual (n=11, 50%), followed by articles with an application (n=8, 36%) and articles with a development (n=2, 9%). One article was a combination of the three categories (n=1, 5%).

Agenda item 5: Expanding across geography

Thirteen articles reported on a spread of best practices across geography. Six of these articles reported on a spread within the country (national) (n=6, 46%). Seven articles reported on a spread across geography (n=7, 54%), but it remained unknown in which way. There were no articles that reported on a spread of best practices between countries (international).

Most of the articles were conceptual (n=7, 54%), followed by articles with an application (n=4, 31%) and one article reported on a development (n=1, 8%). One article was a combination of the three categories (n=1, 8%).

Agenda item 6: Building an information platform

A total of 83 articles reported on information platforms. A majority of the platform users were healthcare providers (n=47, 57%), followed by patients (n=25, 30%). Ten percent of the articles reported the use of real-time outcome information (n=8, 10%) (Table 7). Thirteen articles reported on telemedicine (16%), ten on e-health (12%) and eight on telehealth (10%).

Most of the articles were conceptual (n=50, 60%), followed by articles with an application (n=23, 28%) and articles with a development (n=5, 6%). Five articles were a combination of the three categories (n=5, 6%).

Table 7: In-depth information regarding the strategic agenda items.

Agenda item 1: Organizing into IPU (n=71)		N (%)
Phase of IPU[#]	Design	15 (21)
	Implementation	3 (4)
	Evaluation of implementation	25 (35)
	Other	7 (10)
	Not applicable	23 (32)
Scale in organization	In the whole organization	3 (4)
	Around one disease	32 (45)
	Other	7 (10)
	Not applicable	26 (37)
	Unknown	3 (4)
Team	Yes, the team is multidisciplinary	43 (61)
	No, the team has one discipline/specialty	1 (1)
	Not applicable	19 (27)
	Unknown	8 (11)
Agenda item 2: Measuring outcomes/costs (n=941)		N (%)
Outcome set developed	Yes	63 (7)
PROM developed	Yes	13 (1)
Types of costs measured	Direct costing *	274 (29)

	Indirect costing $	2 (<1)
	Direct and indirect costing	40 (4)
	Other	14 (1)
	None / Not applicable	596 (63)
	Unknown	15 (2)
Entire chain	Yes	66 (20)
Agenda item 3: Moving to bundled payments (n=84)		N (%)
Type of contracting#	Pay-for-performance bonuses	26 (31)
	Bundled payments	66 (79)
	Population-based payments	7 (8)
	Other	17 (20)
Agenda item 6: Building an information platforms (n=83)		N (%)
User of platform#	Healthcare professionals	47 (57)
	Patients	25 (30)
	Management	9 (11)
	Administrative department	7 (8)
	Financial department	4 (5)
	Other	7 (8)
	Not applicable	24 (29)
	Unknown	5 (6)
Real time	Yes	8 (10)
Telemedicine/telehealth/e-health#	Telemedicine^	13 (16)
	E-health^	10 (12)
	Telehealth^	8 (10)
	Other	15 (18)
	None	37 (45)
	Unknown	2 (2)

#Total is more than 100% because multiple answers could be selected. *The definition of direct costing used: "the costs associated with medical resource utilization, which include the consumption of in-patient, out-patient, and pharmaceutical services within the health care delivery system."[18] $The definition of indirect costing used: "the expenses incurred from the cessation or reduction of work productivity as a result of the morbidity and mortality associated with a given disease."[18] ^*Telemedicine*: the provision of medical care with the use of communication technologies to connect healthcare providers and patients who are in different locations.[19] *Telehealth*: broader scope and includes patient education, public health and in-service training for healthcare professionals.[19] *e-Health*: applications in which internet technology is used to offer information, products and/or services in healthcare.[19]

Discussion

Main findings

This review showed that the extent, range and nature of VBHC research is large and still increasing; over the last fifteen years more than 1200 articles reported on VBHC. They described (the implementation of) the strategic agenda items within various specialties. The number of published articles increased each year, especially since 2013, with the exception of 2018. Most articles were published in the United States/North America, followed by Europe.

The majority of articles described the measurement of outcomes and costs. Other agenda items were far less frequently described or implemented. Most of the articles were conceptual, meaning that nothing was actually changed or implemented. When looking at the role that VBHC played in the articles, almost half of the articles discussed or implemented one or more agenda items; only five articles described or implemented all agenda items. Most articles were published from surgical specialties. Four main observations on these results are highlighted in the following paragraphs.

First, research on VBHC focused primarily on the agenda item "measuring outcomes and costs". Furthermore, this agenda item had a relatively high ratio (52%) of application articles, meaning that outcomes and costs were actually measured. All other agenda items were reported on in a more conceptual way, without actually implementing or applying anything. The predominant focus on outcomes and costs might be explained by the formulation of the value definition, in which outcomes and costs are both specifically mentioned. Furthermore, it seems relatively difficult to implement other agenda items such as bundled payments of IPUs without measuring outcomes and costs (value). The importance of measuring outcomes and costs has also been recognized in other quality of care concepts such as the Donabedian model.[20] Another explanation for the popularity of measuring outcomes and cost could be the clarity of this agenda item; this item is the least susceptible to interpretation differences. Additionally, Porter stated that measuring outcomes is the most import step and he dedicated a practical article on standard outcome sets,[5] which further facilitates the focus on measuring outcomes and costs. The types of outcomes and costs that were measured differed between continents. North America more often measured costs than Europe. Moreover, in the United States, VBHC was often used in the context of health care funding laws that place emphasis on curbing cost growth such as the Affordable Care Act (ACA). One of the goals of ACA was to expand healthcare coverage and to make healthcare

affordable to more citizens.[21] This focus on costs and payment methods might explain the higher number of articles measuring costs in North America.

Second, the current strategic agenda seemed to be incomplete. In 18% of the included articles, none of the current agenda items were discussed. Based on the issues that were addressed in these articles, we proposed four new agenda items: 'quality improvement', 'VBHC culture', 'shared decision making', and 'education'. These four agenda items matched the new agenda items that were recently suggested.[22] It is important to note that some of the new agenda items, such as shared-decision making, were discussed in many of the included articles. However, in our methods, a new agenda item was only suggested by the reviewers when none of the current agenda items were checked in the data-extraction form. Thus, the number of articles with new agenda items were underreported.

Third, there was a scarcity of articles on implementation of agenda items. Only a quarter of the included articles described an implementation. The majority of these articles focused on one agenda item. Few articles described implementation of multiple agenda items. The lack of implementation articles was in line with other research in hospital settings; Reitblat et al. concluded that the implementation and investigation of the strategic agenda in urology was limited[23] and another scoping review specifically focusing on VBHC implementation in hospital settings showed the same scarcity.[24] One reason for the lack of implementation articles might be the absence of a practical implementation guide for VBHC. The need for a road map that addresses the required steps for organizational changes has been acknowledged before.[10] Currently, this road map with practical steps is still missing and the available VBHC theory is interpreted in various ways.[25] This could lead to an inadequate implementation, as an ill-defined management intervention is often implemented in different ways.[26] Furthermore, it was argued that a low level of understanding might result in a dilution of the concept.[7] Therefore, it seems especially important to describe and observe different implementation initiatives around the world, to ultimately create a guideline for each healthcare contexts.

Finally, it was striking that many of the included articles were focused on surgical specialties. A possible explanation is that these specialties have a longer history of quality registries (including outcome measures) and generally perform intervention-driven studies. Intervention-driven studies often compare health outcomes between interventions or patient groups. As a result, surgical articles focused more on health outcomes and linked this to the

VBHC concept and the definition of value; outcomes compared to costs. Another reason could be that VBHC principles are easier to implement in surgery as there is a more direct relation between intervention and outcomes.

Strengths and limitations

Some limitations need to be considered when interpreting the results of this study. First, the search strategy did not specifically include search terms for each agenda item, which could have resulted in selection bias. Second, using the article "What is value in health care?"[5] for the cited reference search, might have resulted in the overrepresentation of articles focusing on measuring value, outcomes or costs. Though, the representation of "What is value in health care" and other references to Porter found in our study is similar to the representation found in PubMed. Finally, inherent to the design of a scoping review, the included articles were not assessed for its research quality.

A major strength of this review is its broad scope. The present study provides a comprehensive overview including items such as medical specialties, countries and all strategic agenda items (including potential new ones) (Supplementary File II). In addition, the study's exclusion criteria deliberately generated a broad picture of the current state of research on VBHC. This has resulted in a complete picture of the current state of research on VBHC. The broad scope of this study was especially important in light of the different interpretations of the VBHC concept. Finally, to date, hardly any reviews on VBHC have been published, and existing reviews focusing on for example articles with an implementation of VBHC.[24]

Implications for clinical practice and/or research

With the exception of measuring outcomes and costs, few articles have implemented and researched the implementation of strategic agenda items. There is a need for studies that evaluate the implementation of the different strategic agenda items within different medical specialties. Insight in practical implementation is needed in order to work towards a roadmap for step-by-step implementation of VBHC. It is important to collect evidence from daily practice to serve the evidence-based paradigm of the healthcare sector. To contribute to more evidence, our database (Supplementary File II) can be used for in-depth systematic reviews to further explore what is known within each of the agenda items.

Conclusion

This study showed that the number of publications steadily increased after the introduction of VBHC in 2006. The largest output came from North America, followed by Europe. There was a predominant focus on measuring outcomes and costs. In addition, almost one fifth of the articles could not be categorized in one of the items of the strategic agenda, which may lead to the conclusion that the current strategic agenda could be extended. Topics such as 'quality improvement', 'VBHC culture', 'shared decision making', and 'education' were proposed as potential new agenda items. Furthermore, there was a scarcity of articles with a practical implementation, leading to the conclusion that a practical roadmap or guideline to implement VBHC is still lacking. And last, many of the included articles were focused on surgical specialties. Future research could fill the gap by specifically researching the evidence on VBHC's effectiveness in day-to-day clinical practice.

Acknowledgements

First, we would like to thank Nienke van der Werf, information specialist at the Antonius Academy, for her help in setting up the search strategy for the three databases. In addition, we would like to thank Oscar van Staveren of the Antonius Academy for his help in finding the articles we wanted to screen full-text.

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Competing interests

None declared.

Author Contributions

Design of the review: JRGV, KD, MMG, MBVRVDV, DHB, WJWB, FVM, PBVDN

Data collection: JRGV, KD, GS, MMG, PBVDN

Data analysis and interpretation: JRGV, KD, MMG

Drafting the article: JRGV, KD, GS, MMG, PBVDN

Critical revision of the article: All authors

Final approval of the version to be published: All authors

Patient consent

None required.

Data sharing statement

There is no additional unpublished data from this review.

References

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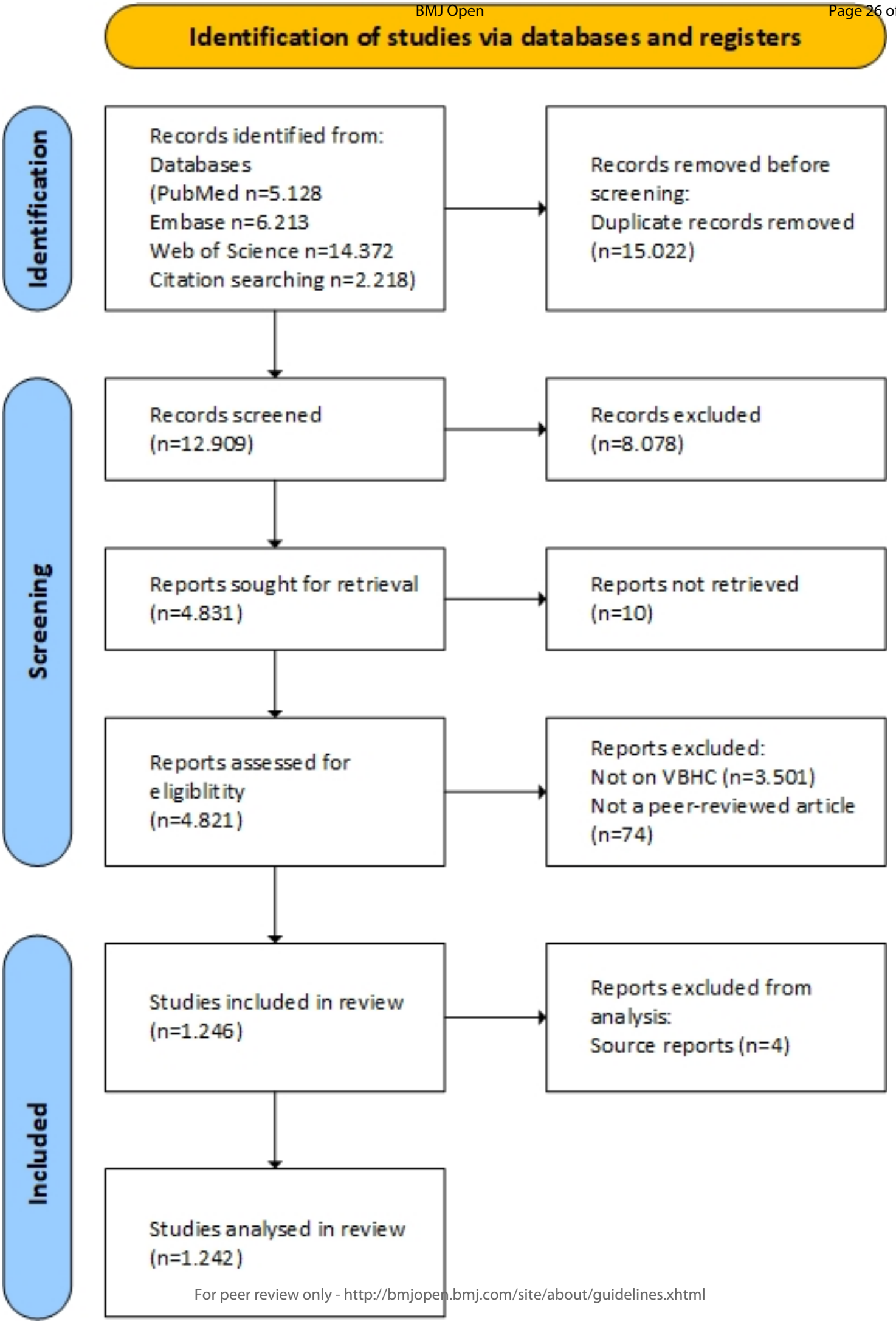
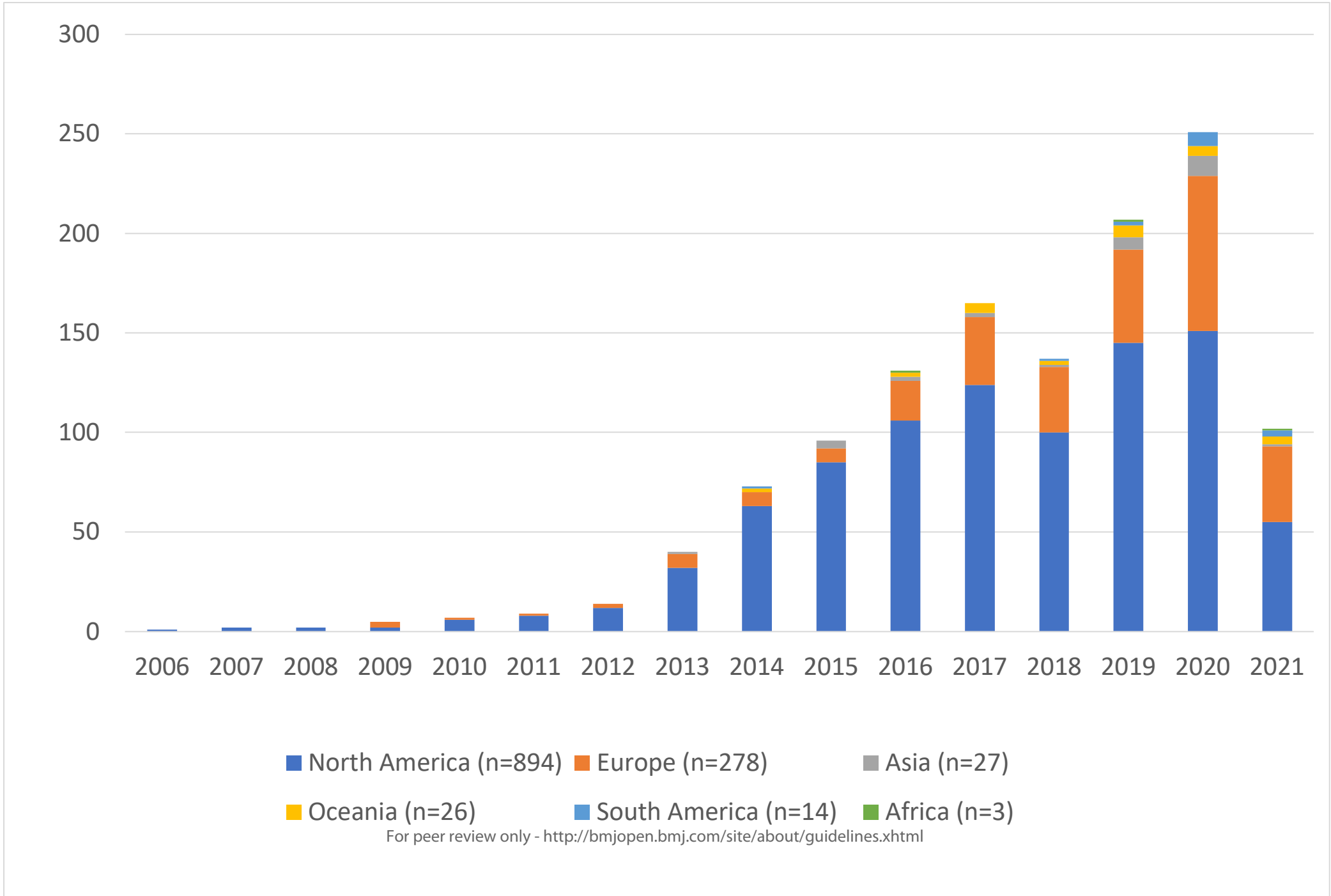
Figure legends

Figure 1: Flowchart with review decision process.

Figure 2: Bar chart with number of publications over the years. NB: the search was conducted in June 2021.


Identification of studies via databases and registers
Identification
Records identified from:
Databases
(PubMed n=5.128
Embase n=6.213
Web of Science n=14.372
Citation searching n=2.218)
Records removed before screening:
Duplicate records removed
(n=15.022)
Screening
Records screened
(n=12.909)
Records excluded
(n=8.078)
Reports sought for retrieval
(n=4.831)
Reports not retrieved
(n=10)
Reports assessed for eligiblitity
(n=4.821)
Reports excluded:
Not on VBHC (n=3.501)
Not a peer-reviewed article
(n=74)
Included
Studies included in review
(n=1.246)
Reports excluded from analysis:
Source reports (n=4)
Studies analysed in review
(n=1.242)



Supplementary file I

The electronic search strategy used for PubMed.

("VBHC"[tiab] OR "value-added care"[tiab] OR "value added care"[tiab] OR "value-added healthcare"[tiab] OR "value added healthcare"[tiab]

OR

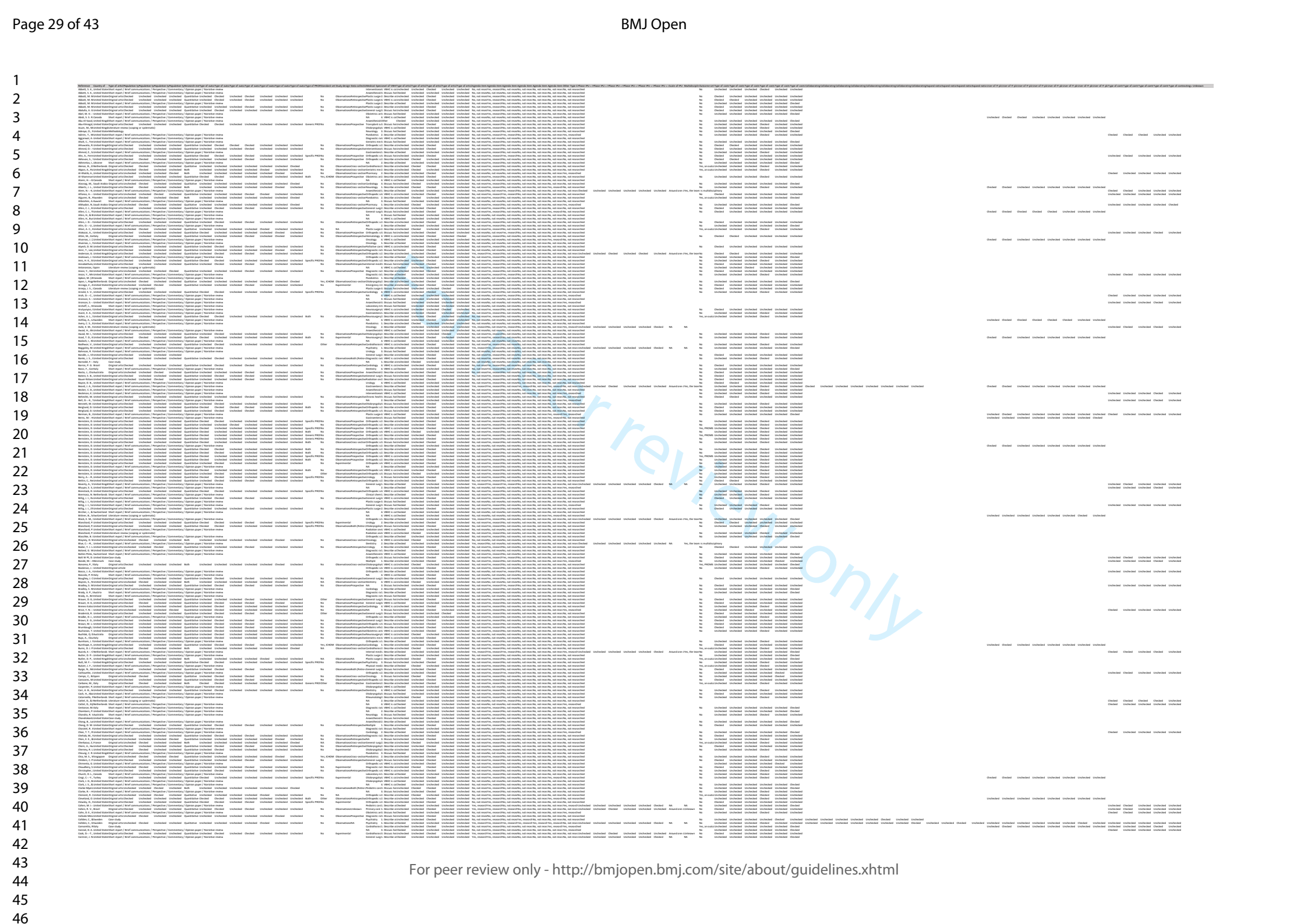
(("Delivery of Health Care"[Mesh] OR "Health Care"[tiab] OR "healthcare"[tiab] OR "care"[tiab] OR "Costs and Cost Analysis"[Mesh] OR "cost"[tiab] OR "costs"[tiab] OR "pricing"[tiab] OR "payment"[tiab] OR "payments"[tiab] OR "purchasing"[tiab] OR "expenditure"[tiab] OR "expenditures"[tiab] OR "economic"[tiab] OR "economics"[tiab] OR "insurance"[tiab] OR "Quality of Health Care"[Mesh] OR "outcome"[tiab] OR "outcomes"[tiab] OR "PROMS"[ti] OR "indicator"[tiab] OR "indicators"[tiab] OR "benchmark"[tiab] OR "benchmarking"[tiab] OR "best practice"[tiab] OR "best practices"[tiab] OR "Integrated Practice units"[tiab] OR "IPU"[ti] OR "lean"[tiab] OR "six sigma"[tiab] OR "six sigmas"[tiab] OR "management"[tiab] OR "organisation"[tiab] OR "organization"[tiab] OR "Contracts"[Mesh] OR "contracting"[tiab] OR "contract"[tiab] OR "contracts"[tiab])

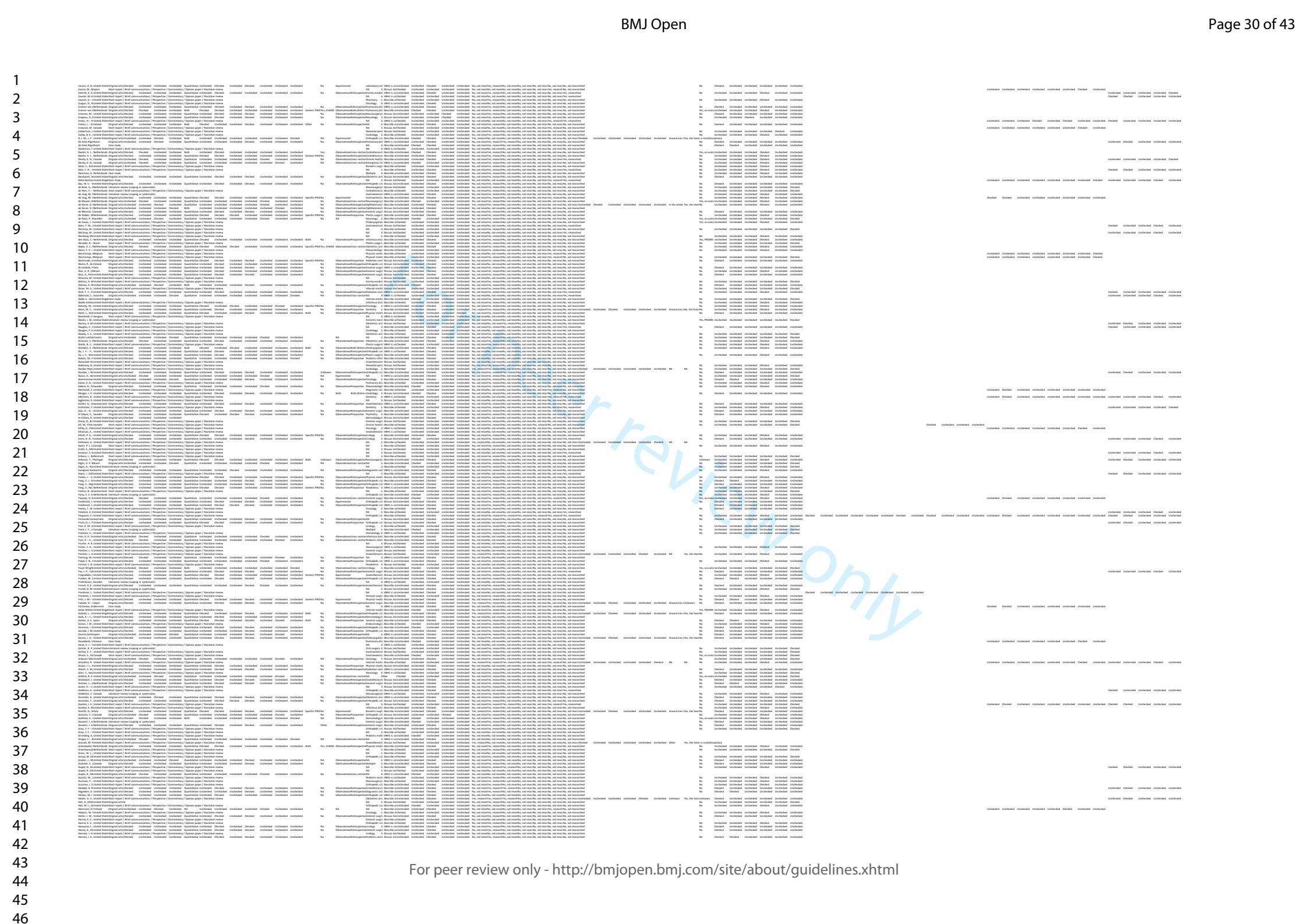
AND

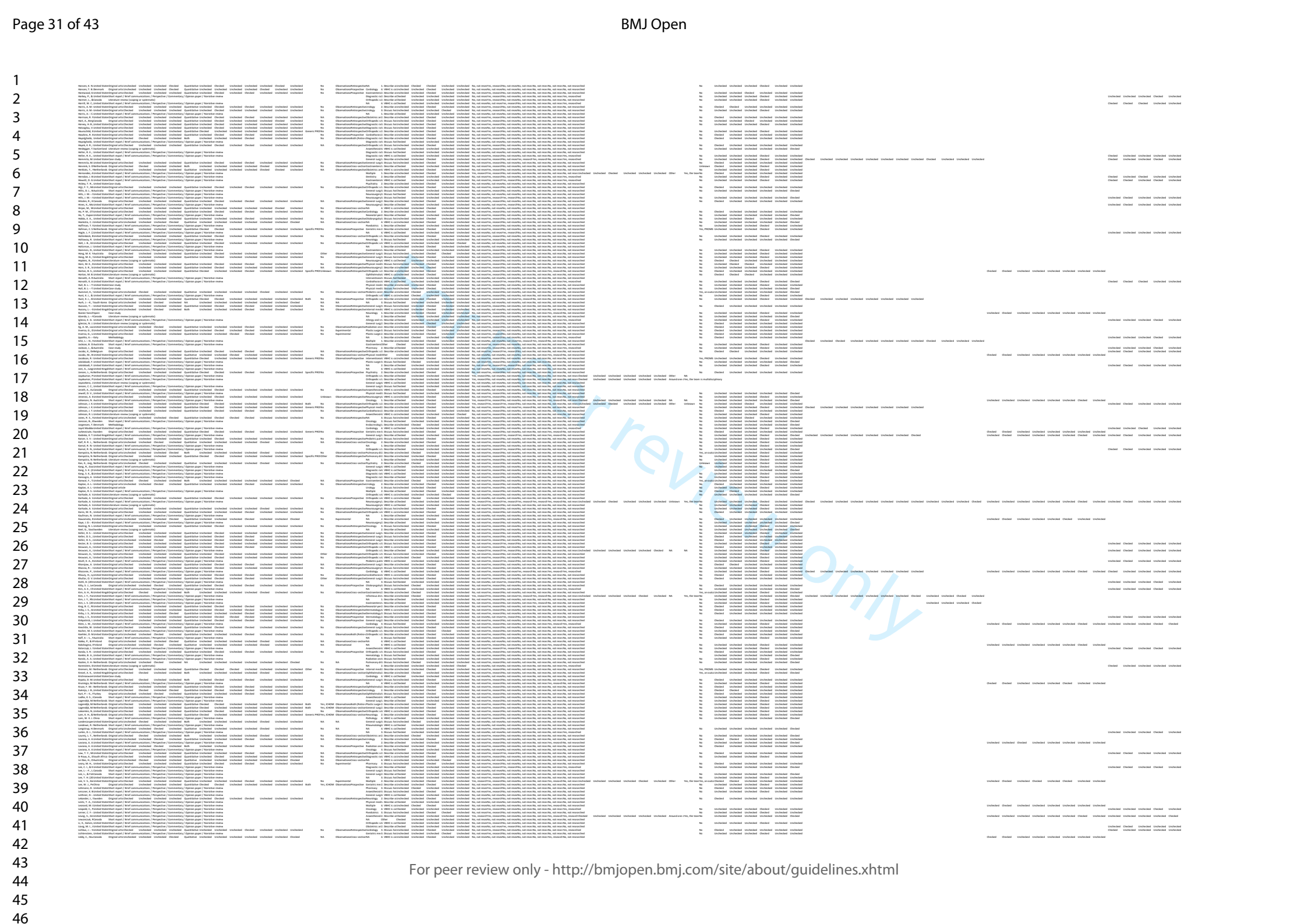
("value-based"[tiab] OR "value based"[tiab])))

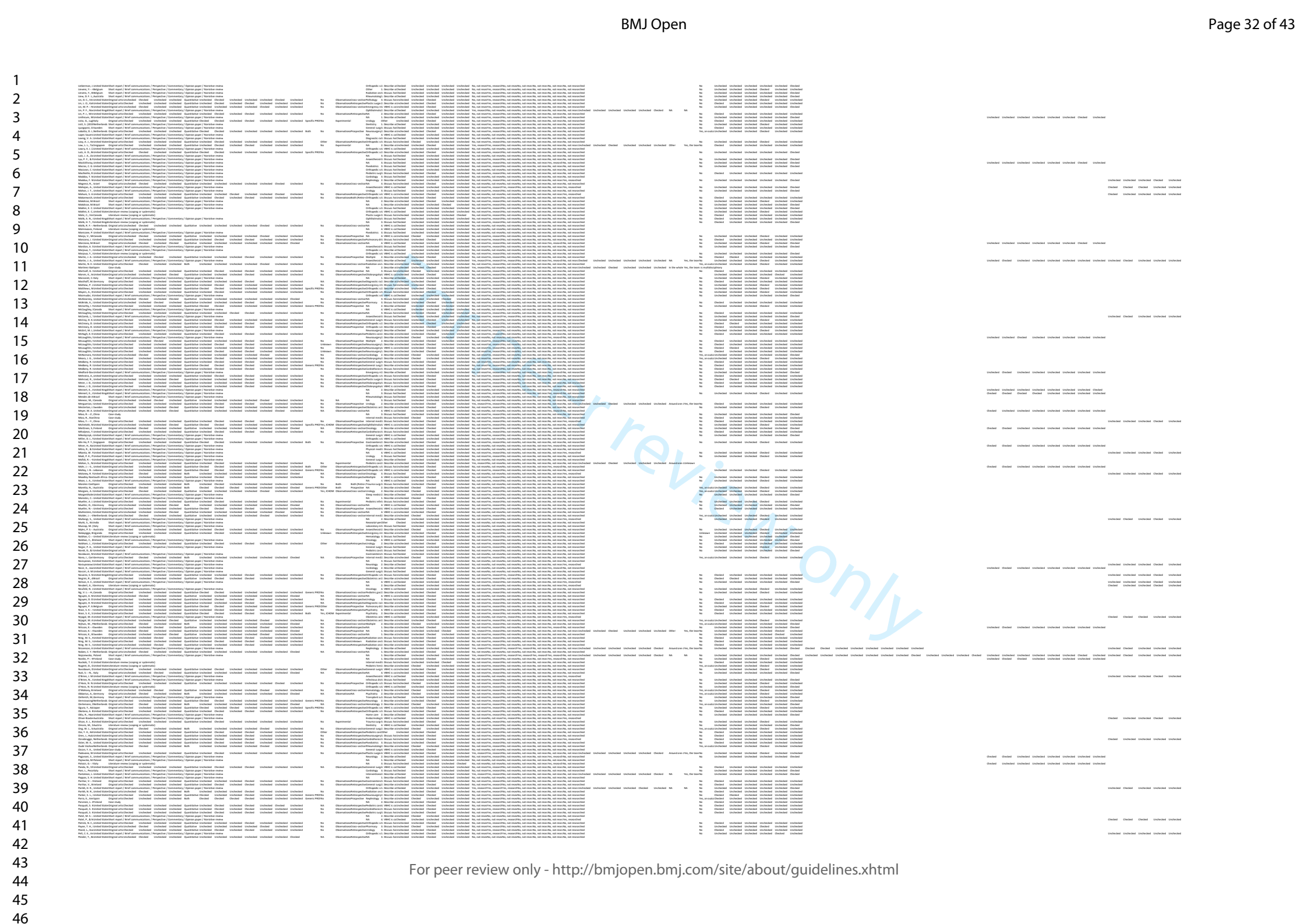
AND

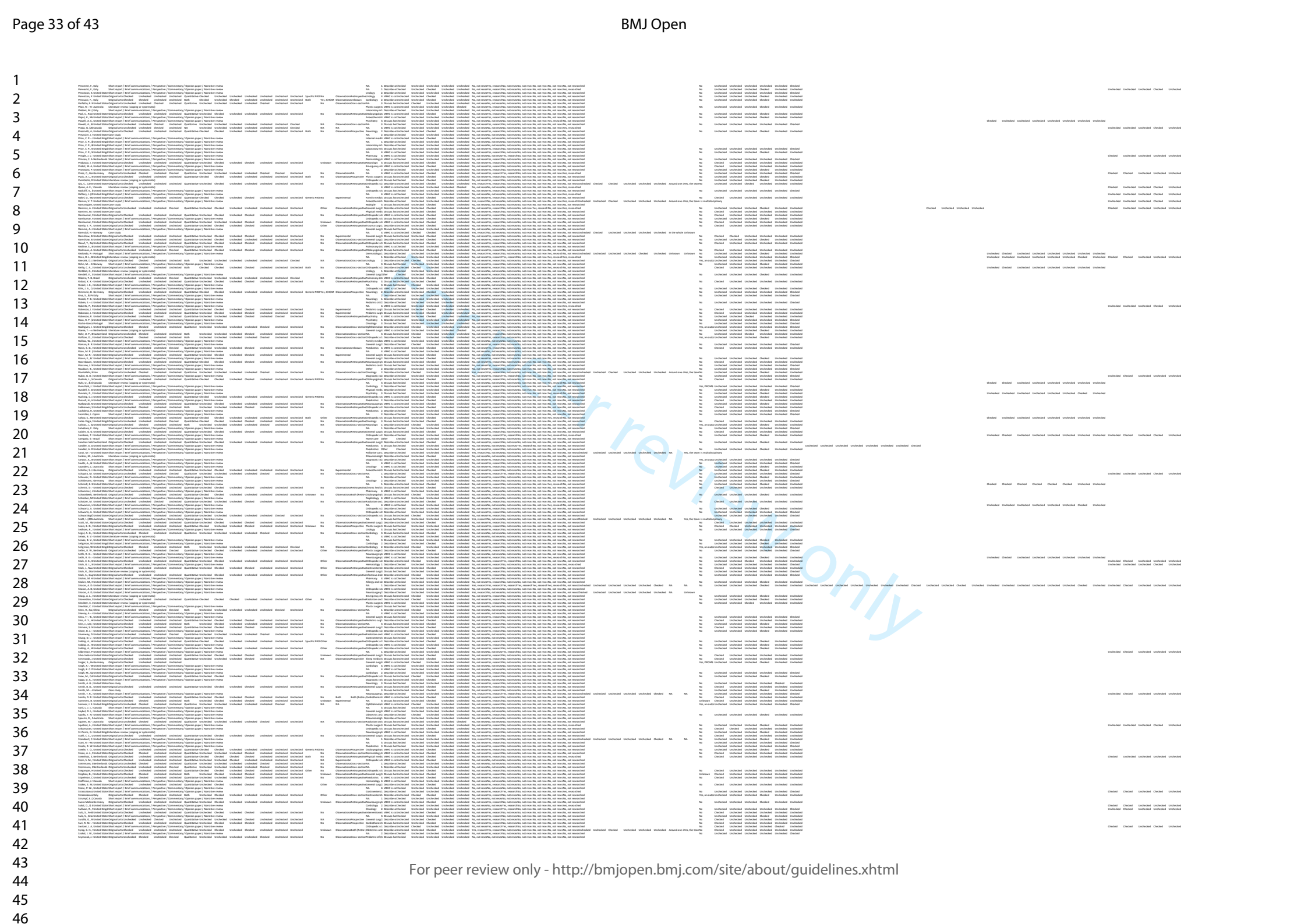
(("2006/01/01"[PDat]: "2030/12/31"[PDat]))

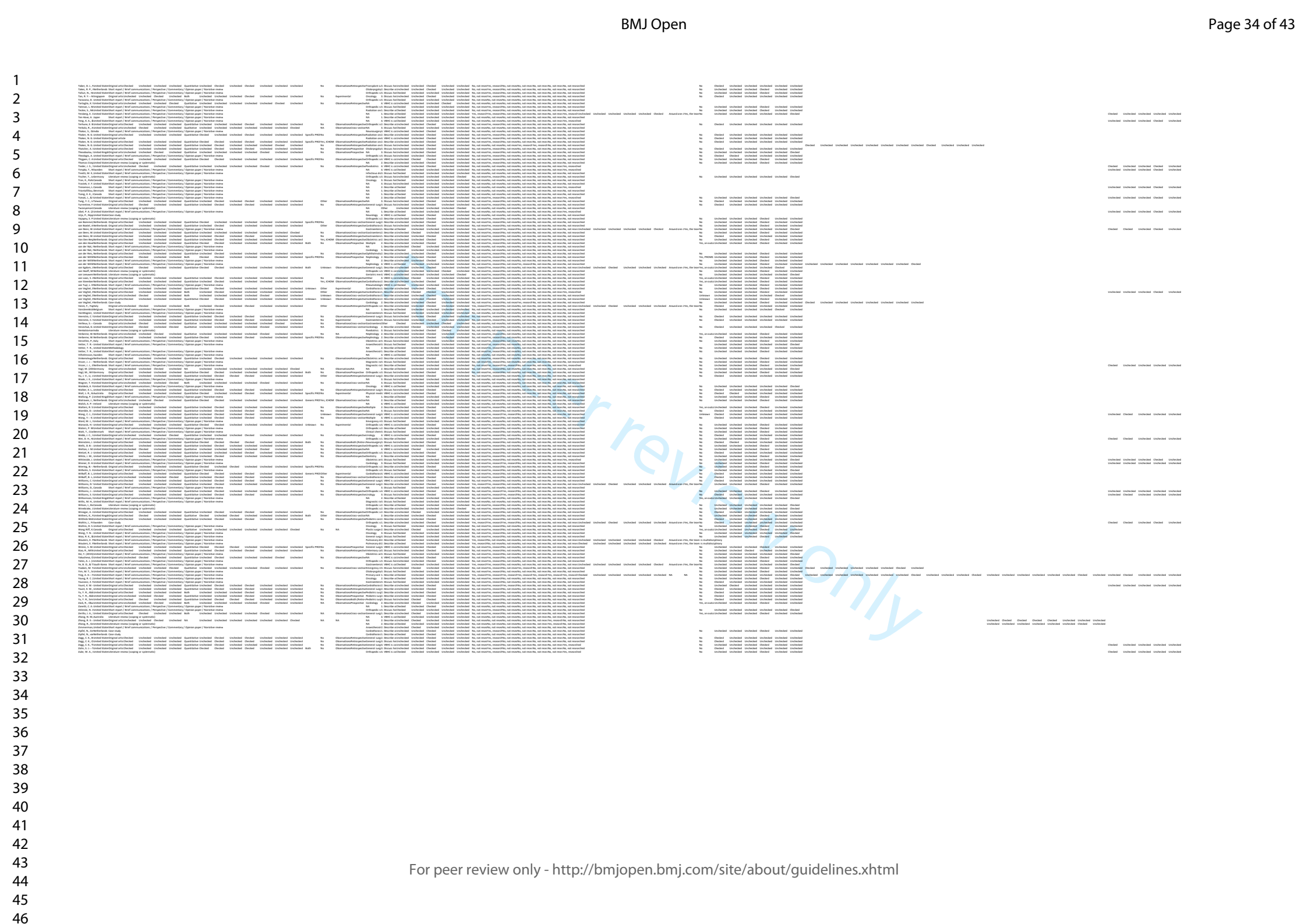












Variable	Field label	Options
Country of origin of the article	What was the country of origin of the article?	*dropdown, Required*
Type of article	What type of article was written?	*radio, Required:* Original article Literature review (scoping or systematic) Short report / Brief communications / Perspective / Commentary / Opinion paper / Narrative review Case study Methodology Other
Population type researched Show the field ONLY if: [method]="1" AND [type_article]= original article	What population did the article research?	*checkbox, Required:* Patients Healthcare professionals Not applicable Other
Research method Show the field ONLY if: [method]="1" AND [type_article]= original article	Was the research method of the article qualitative or quantitative?	*radio, Required:* Quantitative Qualitative Both NA Unknown
Type of outcome measured Show the field ONLY if: [method]="1" AND [type_article]= original article	What type of outcomes were measured in the article?	*checkbox, Required:* Patient-reported outcome measures (PROMs) (including questionnaires on disease symptoms, functional ability, quality of life) Clinician reported outcomes (clinical outcomes) Patient-reported experience measures (PREMs) Costs None Other NA
Type of PROMs Show the field ONLY if: [type_of_outcomes(1)] = PROMs	Which PROMS were measured?	*radio, Required:* Generic PROMS Specific PROMS Both Other Unknown NA
Standard set used Show the field ONLY if: [method]="1" AND [type_article]= original article	Was a standard set used to measure outcomes?	*radio, Required:* Yes, ICHOM Yes, COMET Other No Unknown NA
Study design Show the field ONLY if: [method]="1" AND [type_article]= original article	Was the design of the article observational or experimental?	*radio, Required:* Observational Experimental Both NA Unknown
Data collection Show the field ONLY if: [study_design] = observational OR [study_design] = both	Was the date collection of the article retrospective or prospective?	*radio, Required:* Retrospective Prospective

		Both (Retro+pro) NA Unknown Cross-sectional
Medical specialty	Which medical specialty was mainly researched in the article?	*text, Required*
Level of VBHC	On what level did the article report on VBHC?	*radio, Required:* 1. Describe or implement multiple agenda items (highest extent) 2. Describe or implement a specific part of VBHC or the strategic agenda 3. Discuss how to improve value or measure value, with value defined 4. VBHC is context or motivation for the study (lowest extent) Other
Type of article 2 (concept/development/application)	Was it a conceptual article or an development article or an application article?	*checkbox, Required:* Conceptual article Development of application (not applicated, but developed) Article with an application Other NA
Agenda item = IPU	Section Header: *Were the agenda items researched?* Organize into integrated practice units (IPUs) around the patient's medical condition.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Agenda item = Outcomes and Costs	Measure outcomes and costs for every patient.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Agenda item = Bundled Payments	Move to bundled payments for care cycles.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Agenda item = Across Separate Facilities	Integrate care delivery across separate facilities.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Agenda item = Across Geography	Expand excellent services across geography.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Agenda item = Information Platform	Build an enabling information technology platform.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Other type of contracting	Was other type of contracting researched?	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Phase IPU Show the field ONLY if: [ipu] = Yes, researched	What was the phase of the IPU researched?	*checkbox, Required:* Design Implementation Evaluation of implementation Unknown Other

		NA
Scale of IPU Show the field ONLY if: [ipu] = Yes, researched	On which scale in the organization was the IPU implemented?	*radio, Required:* In the whole organization Around one disease Other Unknown NA
Multidisciplinary of team Show the field ONLY if: [ipu] = Yes, researched	Was the team in the IPU multidisciplinary?	*radio, Required:* Yes, the team is multidisciplinary No, the team has one discipline/specialty Other Unknown NA
Outcome set or PROMS developed Show the field ONLY if: [outcomes_costs] = Yes, researched	Was an outcome set or PROMS developed?	*radio, Required:* Yes, an outcome set Yes, PROMs No Unknown
Type of costs Show the field ONLY if: [outcomes_costs] = Yes, researched	What type of costs were measured?	*checkbox, Required:* Direct cost Indirect cost Other None Unknown NA
Collaborating facility Show the field ONLY if: [across_separate_facilities] = Yes, researched	Which parties collaborated across the separate facilities?	*checkbox, Required:* Healthcare provider / hospital Insurance company University Research center Pharmaceutical company Other Unknown NA
Expand national or international Show the field ONLY if: [across_geography] = Yes, researched	Did the organization expand national or international?	*checkbox, Required:* National expansion International expansion Unknown
User of IT platform Show the field ONLY if: [information_platform] = Yes, researched	Who was the user of the information platform?	*checkbox, Required:* Patients Healthcare professionals Management Administrative department Financial department Other NA Unknown
Type of contracting Show the field ONLY if: [other_type_of_contracting] = Yes, researched OR [bundled_payments] = Yes, researched	What type of contracting was discussed/used?	*checkbox, Required:* Pay-for-performance bonuses Bundled payments Population-based payments

		Other Unknown

Supplementary file III

Medical specialty		N (%)
Allergy and immunology		2 (<1)
Anesthesiology		38 (3)
Colon and rectal surgery		20 (2)
Dermatology		9 (1)
Emergency medicine		10 (1)
Family medicine		4 (<1)
Internal medicine		
	Cardiology	35 (3)
	Endocrinology	3 (<1)
	Gastroenterology	33 (3)
	Geriatric medicine	9 (1)
	Hematology	8 (1)
	Infectious disease	8 (1)
	Internal medicine general	14 (1)
	Nephrology	8 (1)
	Oncology	34 (3)
	Pulmonary disease	14 (1)
	Rheumatology	10 (1)
	Sleep medicine	2 (<1)
Neurological surgery		22 (2)
Neurological surgery and orthopedic surgery		18 (1)
Neurology		20 (2)
Obstetrics and gynecology		26 (2)
Ophthalmology		12 (1)
Orthopedic surgery		182 (15)
Otolaryngology		29 (2)
Pathology		2 (<1)
Pediatrics		
	Neonatal-perinatal medicine	5 (<1)
	Pediatric cardiology	12 (1)
	Pediatric critical care medicine	1 (<1)
	Pediatric endocrinology	1 (<1)
	Pediatric gastroenterology	1 (<1)
	Pediatrics general	22 (2)
	Pediatric hematology-oncology	1 (<1)
	Pediatric infectious diseases	5 (<1)
	Pediatric pulmonology	2 (<1)
Physical medicine and rehabilitation		20 (2)
Plastic surgery		31 (2)
Psychiatry		16 (1)
Radiology		
	Diagnostic radiology	37 (3)

	Radiation oncology	24 (2)
Surgery		
	Bariatric surgery	3 (<1)
	General surgery	93 (7)
	Oral surgery	1 (<1)
	Pediatric surgery	8 (1)
	Transplant surgery	3 (<1)
	Trauma surgery	3 (<1)
Thoracic surgery		31 (2)
Urology		32 (3)
NA		248 (20)
Multiple		18 (1)
Other		
	Other	3 (<1)
	Chronic health conditions	4 (<1)
	Clinical chemistry	2 (<1)
	Dentistry	11 (1)
	Home care	2 (<1)
	Interventional radiology	7 (1)
	Laboratory medicine	7 (1)
	Palliative care	2 (<1)
	Pharmacy	11 (1)
	Primary care	2 (<1)
	Veterinary care	1 (<1)

Supplementary file IV

Reference to Porter #,$	
Porter, M. E. (2010). What is value in health care. *N Engl J Med*, *363*(26), 2477-2481.	953 (77)
Porter, M. E., & Teisberg, E. O. (2006). *Redefining health care: creating value-based competition on results*. Harvard business press.	208 (17)
Porter, M. E. (2009). A strategy for health care reform—toward a value-based system. *N Engl J Med*, *361*(2), 109-112.	150 (12)
Kaplan, R. S., & Porter, M. E. (2011). How to solve the cost crisis in health care. *Harv Bus Rev*, *89*(9), 46-52.	127 (10)
Porter, M. E., & Lee, T. H. (2013). The strategy that will fix health care. *Harvard business review*, *91*(12), 24-24.	113 (9)
Porter, M. E., Larsson, S., & Lee, T. H. (2016). Standardizing patient outcomes measurement. *N Engl J Med*, *374*(6), 504-506.	70 (6)
Porter, M. E. (2008). Value-based health care delivery. *Annals of surgery*, *248*(4), 503-509.	51 (4)
Porter, M. E., & Teisberg, E. O. (2007). How physicians can change the future of health care. *Jama*, *297*(10), 1103-1111.	40 (3)
Porter, M. E., & Teisberg, E. O. (2004). Redefining competition in health care. *Harvard business review*, 64-77.	33 (3)
Porter, M. E., Pabo, E. A., & Lee, T. H. (2013). Redesigning primary care: a strategic vision to improve value by organizing around patients' needs. *Health Affairs*, *32*(3), 516-525.	30 (2)
Porter, M. E., & Lee, T. H. (2016). From volume to value in health care: the work begins. *Jama*, *316*(10), 1047-1048.	21 (2)
Porter, M. E., & Kaplan, R. S. (2016). How to pay for health care. *Harv Bus Rev*, *94*(7-8), 88-98.	13 (1)
Porter, M. E., & Lee, T. H. (2015). Why strategy matters now. *N Engl J Med*, *372*(18), 1681-1684.	12 (1)
Porter, M. E. (1985). Competitive Advantage: Creating and Sustaining Superior Performance. New York: The Free Press. 557 p.	8 (1)
Porter, M. E. (2008, August). Defining and introducing value in health care. In *Evidence-based medicine and the changing nature of health care: 2007 IOM annual meeting summary* (pp. 161-72). National Academies Press, Washington (DC).	8 (1)
Other articles*	101 (8)
No ref	76 (6)
Part of article with reference to Porter #,§	
Introduction	564 (77)
Method	62 (8)
Results	35 (5)
Discussion	233 (32)
Conclusion	26 (4)
Other	14 (2)

[#]Total is more than 100% because multiple answers could be selected. [$]58% (n=721) of the articles had one Porter reference, 36% of the articles had two or more references (mean: 2.6, range: 2-6). *This category contains 53 articles cited less than 8 times. [§]N=736, this question includes the articles with multiple section.

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4 - 5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5 - 6
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	NA
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary file I
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6 - 7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page 7 and Supplementary file II
Critical appraisal of individual	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe	NA

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
sources of evidence§		the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Pages 8 - 10 and Table 1
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	NA
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Supplementary file II
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8 - 16
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	17
Limitations	20	Discuss the limitations of the scoping review process.	19
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	20
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	20

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

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How value-based healthcare evolved: fifteen years of value-based healthcare research, a scoping review.

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Value-based healthcare (VBHC); Integrated Practice Units; Outcome measurement; Bundled payments; Information Platforms; Implementation

Word count

4142 words

Abstract

Objectives:

We aimed to systematically map the extent, range and nature of research activity on value-based healthcare (VBHC), and to identify research gaps.

Design:

A scoping review with an additional cited reference search was conducted, guided by the Joanna Briggs Institute (JBI) methodology.

Data Sources:

The search was undertaken in PubMed, Embase and Web of Science.

Eligibility Criteria:

Eligible articles mentioned VBHC or value with reference to the work of Porter or provided a definition of VBHC or value.

Data extraction and synthesis:

Data was independently extracted using a data-extraction form. Two independent reviewers double extracted data from 10% of the articles. Data of the remaining articles (90%) was extracted by one reviewer and checked by a second. The strategic agenda of Porter and Lee was used to categorize the included articles.

Results:

The searches yielded a total of 27.931 articles, of which 1.242 articles were analyzed. Most articles were published in North America. Most articles described an application of VBHC by measuring outcomes and costs (agenda item 2). The other agenda items were far less frequently described or implemented. Most of these articles were conceptual, meaning that nothing was actually changed or implemented.

Conclusion:

The number of publications increased steadily after the introduction of VBHC in 2006. Almost one fifth of the articles could not be categorized in one of the items of the strategic agenda, which may lead to the conclusion that the current strategic agenda could be extended. In addition, a practical roadmap or guideline to implement VBHC is still lacking. Future research could fill this gap by specifically studying the effectiveness of VBHC in day-to-day clinical practice.

Article Summary

Strengths and limitations of this study

- The search method of this scoping review was comprehensive: it includes a large set of articles from a long period of time (2006-present) with all peer-reviewed study designs.
- This review shows the extent, range and nature of research activity on VBHC and identifies gaps in knowledge on VBHC for future research.
- With this scoping review, a database was created that can contribute to more in-depth systematic reviews to further explore what is known within each of the agenda items.
- Practical VBHC improvement initiatives might be underrepresented in this study because gray literature and non-peer-reviewed articles were not included.
- The included articles have not been assessed for quality because of the scoping nature of this review.

Introduction

In 2006, value-based healthcare (VBHC) was introduced in the United States as a way to reform healthcare.[1] Rising costs, mounting quality issues and an increasing healthcare demand prompted the development of the VBHC concept by Michael E. Porter and Elizabeth Olmsted Teisberg.[1] According to them, improving value for the patient should be the overarching goal in healthcare. In healthcare, there are different approaches of defining and measuring value. In VBHC, value is defined as the health outcomes achieved per dollar spent.[1] To improve patient value, healthcare delivery should be organized around medical conditions over the full cycle of care. Universal measurement of value (outcomes and costs) is an important element in monitoring improvement.[2]

Strategic Agenda for value transformation

In 2013, a strategic agenda was published, consisting of six agenda items for implementing a high-value healthcare delivery system (Box 1).[3] The agenda items were intended to support healthcare providers in the transition from a focus on volume, i.e. being organized around functionally organized departments and specialties, to a focus on value, i.e. being organized around what matters to patients with a specific medical condition.

Box 1: the six agenda items of the strategic agenda.[3]

1	Organize into integrated practice units (IPUs) around the patient's medical condition.
2	Measure outcomes and costs for every patient.
3	Move to bundled payments for care cycles.
4	Integrate care delivery across separate facilities.
5	Expand excellent services across geography.
6	Build an enabling information technology platform.

Implementation of VBHC

The implementation of VBHC requires a major transition at both the level of healthcare providers, as well as at the level of (national) healthcare systems. Healthcare providers, such as hospitals, are typically (vertically) organized around functional departments and specialties. Transitioning towards an organization that is based on medical condition (horizontal) (agenda item 1) requires a fundamental reorganization of hospitals and their collaborating care-chain partners (agenda item 4). Measuring outcomes over the full cycle of care for a certain medical

condition (agenda item 2) also requires further major change. When VBHC was introduced in 2006, healthcare quality systems were aimed at monitoring providers' compliance to (international) quality guidelines and norms. At the time, quality indicators were primarily focused on process optimization and safety. Health outcomes were hardly available and not measured at the level of medical conditions. Moreover, costs should be measured over the full cycle of care taking the true costs of care delivery into account. This requires a different approach for most healthcare providers (agenda item 2). The reimbursement of healthcare providers should move to payment for value, which not only requires major changes for healthcare providers, but also for health insurance companies and healthcare industry, such as pharmaceutical companies (agenda item 3). The expansion of excellent care across geography (agenda item 5) is challenging, because it arises from the progress on the other agenda items. Finally, building an enabling IT-platform (agenda item 6) is essential for the value transition. The availability of high-quality data and IT-infrastructure is named one of the main cornerstones to move forward with VBHC.[4]

The maturity of VBHC

Value-based healthcare has become a popular vision for healthcare organizations. Since the introduction of VBHC in the United States, the concept has spread around the world, and an increasing number of healthcare providers are adopting VBHC principles in order to continuously improve care. The article "What is value in health care?"[5] has since been cited over 4500 times.[6] However, few details have been published on how to practically implement VBHC. The strategic agenda proposed the major themes that need to be addressed in healthcare, but how to actually implement these items is hardly described. VBHC has been introduced as a strong vision for healthcare, but a practical guideline or scientific proof for the success of the proposed strategic agenda is lacking. As a result, various aspects of VBHC are only superficially understood and interpreted in different ways.[7] Scientific output on VBHC is important since the healthcare sector, perhaps more than in economics or management, uses an evidence-based paradigm. Healthcare professionals are used to consider the scientific evidence before implementing an organizational reform such as VBHC.

In order to support organizations in the implementation of VBHC, it is important to understand how the VBHC concept and strategic agenda have been used in different contexts and have

evolved over time. Therefore, the aim of this scoping review was to systematically map the extent, range and nature of research activity on VBHC over the last fifteen years, and to identify potential research gaps. As this is a scoping review, the quality of the included articles was not assessed.

Methods

This scoping review was guided by the Joanna Briggs Institute (JBI) methodology for conducting scoping reviews,[8] to answer the main research question: "What are the extent, range and nature of research activities on VBHC over the last fifteen years, and what are the research gaps?"

Patient and Public Involvement

Patients and the public were not involved in this study's design, conduct or dissemination plans.

Eligibility criteria

The first eligibility criterium was that the article had to discuss or refer to VBHC. This criterium was met if the article 1) mentioned VBHC or value with reference to the work of Porter[1, 3, 5, 9-11], or 2) provided a definition of VBHC or value in line with Porter's definition. The purpose of these criteria was to be inclusive towards all interpretations of VBHC. If VBHC or value was only mentioned as a suggestion for further research, the article was not included.

The second criterium was that the context of the article had to be healthcare related. No restrictions were made with regard to the type of participants, type of study design or the outcomes measured. Only peer-reviewed articles were included.

Information sources and search strategy

The three-step search strategy from the Joanna Briggs Institute was used.[8] First, an initial limited search was performed in PubMed. The title, abstract and index terms of the retrieved articles were analyzed to provide keywords for the final search. Second, the final search was carried out using the identified keywords from step 1. This search was undertaken in PubMed, Embase and Web of Science (Supplementary File 1). Third, the reference lists of all the retrieved articles were examined for additional articles. Additionally, a cited reference search

for the article “What is value in health care?” was conducted.[5] In perspective with Porter's other references on VBHC, this is his most cited article.

Only articles published in English were included. The search was limited to publications between 1 January 2006 and 7 June 2021 (the day of the search), because of the introduction of VBHC in 2006.[1]

Selection process

All search results were uploaded to EndNote. Duplicates were removed before screening. Titles, abstracts and full texts were independently assessed for eligibility by pairs of reviewers (JV, KD, GS, PN, MG). Reviewers did not screen articles they had written themselves. Discrepancies between reviewers were resolved in consensus meetings. If necessary, a third reviewer made the final decision. For the selection process, the application Rayyan was used.[12]

Data extraction

Data were independently extracted using a data-extraction form in REDCap (Research Electronic Data Capture) which was specifically developed and pilot tested for this review.[13, 14] Extraction questions were aimed at the article’s main characteristics, references to VBHC, design, measured outcomes and the implemented elements of the strategic agenda. For each article, the reviewers (JV, KD, GS, PN, MG) indicated which items of the strategic agenda were reported, and had the possibility to write down potential new agenda items.

Data from 10% of the articles (at random) was double extracted by two independent reviewers. Discrepancies in the extracted data were discussed and resolved by a set of reviewers. Thereafter, data extraction of the remaining 90% was performed by one reviewer (JV, KD, GS, MG) and checked by a second.

Analysis and presentation of results

The PRISMA flowchart was used to summarize the review decision process.[15] The extracted data were summarized quantitatively. The categorical data were expressed as frequencies. The statistical analysis was performed with use of Mathematica software (Wolfram Research, Inc., Mathematica, Version 12.1.1, Champaign, IL (2021).

Results

Selection

The search yielded a total of 27.931 records, of which 2.218 records were found by the cited reference search (Figure 1). After duplicate removal, 12.909 potentially relevant articles remained. Title and abstract screening resulted in 8.078 articles to be excluded. Ten articles were excluded because no full text was available. The remaining 4.821 articles were assessed for eligibility in a full text screening, of which 74 articles were excluded because they were not peer-reviewed and 3.501 articles were excluded because they did not discuss or refer to VBHC. In total, 1.246 articles were included in this review. Four of these articles were not included in the analysis because they were written by Porter and described elements of the VBHC theory (source reports). Finally, 1.242 articles were analyzed.[2, 10, 11, 16] The full dataset with included articles and collected outcomes can be found in Supplemental File 2.

Review findings

General

From 2006 to 2011 fewer than 10 articles were published per year (Figure 2). The number of articles increased yearly, with the exception of 2018. North American centers published 72% (n=894) of the articles and published all the included articles up to the year 2009. In Europe, the first articles on VBHC were published in 2009. South America, Oceania, Asia and Africa together published 5% of the included articles (n=70). The location of the articles was based on the affiliation of the first author.

Most articles were original articles (n=627, 50%), followed by narrative reviews, perspectives, opinion papers, and short report (n=506, 41%). Six percent of the articles were systematic or scoping literature reviews (n=69). Case studies accounted for 3% of the included articles (n=36) and methodologies for less than 1% (n=4) (Table 1).

Most of the original articles had an observational study design (n=561, 89%); 7% of the articles had an experimental design (n=42). In 76% of the original articles quantitative research methods were used (n=474). A small part of the articles used a qualitative method (n=72, 11%). Of the 561 observational articles, the majority collected the data retrospectively (n=337, 60%).

The effect measures or endpoints in the original articles were clinical outcomes (n=359, 57%), costs (n=291, 46%), patient reported outcome measures (PROMs) (n=125, 20%), patient reported experience measures (PREMs) (n=31, 5%), no outcomes (n=73, 12%), or were indicated not applicable (NA) (n=47, 8%). Four articles measured all the above effect measures (clinical outcomes, costs, PROMs and PREMs). Twenty-four percent of the articles that measured PROMs measured generic PROMs (n=30), 33% measured condition-specific PROMs (n=41) and 31% measured both (n=39). In 12% of the articles that measured PROMs (n=15), it was unknown which PROMs were used.

When comparing the two continents that published the most articles (North America and Europe), a difference in measured endpoints was noted. In North America, the emphasis was on measuring clinical outcomes and costs (resp. n=274, 62% and n=243, 55%). While in Europe, the emphasis was on measuring clinical outcomes and PROMs (resp. n=67, 47% and n=46, 32%). Costs were measured less frequently as endpoint in Europe (n=35, 24%).

Most original articles reported on patients (n=463, 74%), some on healthcare professionals (n=116, 19%) (Table 2).

Medical context

More than 50% of the articles reported on hospital care (Table 1). The most often studied medical specialty was orthopedic surgery (n=182, 15%) (Table 3).

Table 1: Characteristics of included articles.

Characteristics	N (%)
Type of article	
Original article	627 (50)
Short report / Brief communications / Perspective / Commentary / Opinion paper / Narrative review	506 (41)
Literature review (scoping or systematic)	69 (6)
Case study	36 (3)
Methodology	4 (<1)
Study design	
Observational design	561 (89)
Experimental design	42 (7)
Both designs	4 (1)
Unknown	5 (1)
Not applicable	15 (2)

Research method	
Quantitative method	474 (76)
Qualitative method	72 (11)
Both methods	67 (11)
Unknown	8 (1)
Not applicable	6 (1)
Data collection	
Retrospective	337 (60)
Cross-sectional	113 (20)
Prospective	86 (15)
Mix of retrospective and prospective	14 (3)
Unknown	5(1)
Not applicable	6 (1)
Type of organization[#]	
Hospital	687 (55)
Public / Preventive care organization	27 (2)
University	12 (1)
General practitioner	11 (1)
Pharmaceutical organization	8 (1)
Health insurer	3 (<1)
Other*	56 (5)
Unknown	77 (6)
Not applicable	378 (30)

*[#]Total is more than 100% because multiple answers could be selected. *For example: ambulatory care organizations, databases, dental care organizations, companies, focus clinics, government, home care facilities, NGOs, primary healthcare, rehabilitation facilities.*

Table 2: Population of original articles.

Study population (n=627)		N (%)
Type of population[#]	Patients	463 (74)
	Healthcare professionals	116 (19)
	Other	52 (8)
	Not applicable	52 (8)
Median size of patient population		565 (min: 3, max: 18.474.860)
Median size of healthcare professional population		40 (min: 3, max: 185.075)

[#]Total is more than 100% because multiple answers could be selected.

Table 3: Medical specialties studied in the included articles.

Medical specialty[§]	N (%)
Orthopedic surgery	182 (15)
Internal medicine^	178 (14)
Surgery^	111 (9)
Radiology^	61 (5)
Pediatrics^	50 (4)

Anesthesiology	38 (3)
Urology	32 (3)
Plastic surgery	31 (2)
Thoracic surgery	31 (2)
Otolaryngology	29 (2)
Obstetrics and gynecology	26 (2)
Neurological surgery	22 (2)
Colon and rectal surgery	20 (2)
Neurology	20 (2)
Physical medicine and rehabilitation	20 (2)
Neurological surgery and orthopedic surgery	18 (1)
Psychiatry	16 (1)
Ophthalmology	12 (1)
Emergency medicine	10 (1)
Dermatology	9 (1)
Family medicine	4 (<1)
Allergy and immunology	2 (<1)
Pathology	2 (<1)
NA	248 (20)
Multiple	18 (1)
Other^	52 (4)

§List of specialties according to the American Board of Medical Specialties.[17] ^Subspecialties are displayed in Supplementary File 3.

Value-based healthcare

All included articles were rated for their extent to which VBHC played a role in the article. From highest to lowest VBHC rating, the categories were: 1. describing or implementing multiple agenda items and/or using the whole VBHC theory (n=171, 14%); 2. describing or implementing one of the agenda items (n=395, 32%); 3. discussing or using value in the article with Porter's definition, but not discussing or implementing any agenda items (n=373, 30%); 4. mentioning VBHC only as a motivation or context in the article (n=290, 23%) (Table 4). Furthermore, the type of article was registered. Most articles were either conceptual or with an application. Conceptual articles are solely descriptive, whereas articles with an application researched a topic in daily practice. Only 11% of the included articles were development studies, meaning that an innovation or initiative was developed but not implemented.

Most of the articles (n=953, 77%) referred to Porter's article “What is value in health care”[5] (Supplementary File 4). Articles that contained multiple sections (n=735) mostly referred to a paper of Porter in the introduction section (n=564, 77%), or the discussion section (n=233, 32%) (Supplementary File 4).

Table 4: Overview of each article's relation to VBHC.

Extent to which VBHC played a role in the article (as rated by extractors)	N (%)
1. Describe or implement multiple agenda items (highest rating)	171 (14)
2. Describe or implement a specific part of VBHC or the strategic agenda	395 (32)
3. Discuss how to improve value or measure value, with value defined	373 (30)
4. VBHC is context or motivation for the study (lowest rating)	290 (23)
Other^	13 (1)
Type of article #	N (%)
Conceptual article	528 (43)
Article with a development	138 (11)
Article with an application &	579 (47)

^For example: discussed VBHC as one of the possible approaches or description of a new interpretation of VBHC. #Total was more than 100% because multiple answers could be selected. $ 58% (n=721) of the articles had one Porter reference, 36% of the articles had two or more references (mean: 2.6, range: 2-6). &For example: research into an implementation or retrospective research into two different patient groups.

Implementation in general

In 288 articles (23%), the effect of an implementation was measured. The definition of an implementation article was that the article described a new process or technique implemented in daily work and presented the results. Two hundred seven of these articles (79%) reported that the implementation was a success. Implementation initiatives were considered successful if the authors indicated in the discussion and/or conclusion section that the implementation had led to improvement. Forty-five articles (16%) had no statements regarding the effectiveness of implementation and 16 articles (5%) reported that the implementation was not a success.

Items of the strategic agenda

The most frequently found agenda item was measuring outcomes and/or costs (n=941, 76%). All other agenda items were found in less than 10% of the articles (Table 5). Five articles discussed or implemented all the agenda items.

For 228 articles, no agenda item could be selected. The six most mentioned 'new' agenda items were 'other type of contracting' (n=29), 'quality improvement' (n=23), 'VBHC culture' (n=11), 'education' (n=10), 'shared decision making' (n=8) and 'care delivery value chain' (n=5). Table 6 shows the number of agenda items selected per article. For most articles only one agenda item was selected (n=868, 70%). All the agenda items are discussed separately in the next sections.

Table 5: Reported agenda items.

Agenda item [#]	N (%)
1. Organize into integrated practice units (IPUs) around the patient's medical condition.	71 (6)
2. Measure outcomes and costs for every patient.	941 (76)
3. Move to bundled payments for care cycles.	84 (7)
4. Integrate care delivery across separate facilities.	22 (2)
5. Expand excellent services across geography.	13 (1)
6. Build an enabling information technology platform.	83 (7)
No item selected	228 (18)

[#]Total is more than 100% because multiple answers could be selected.

Table 6: Number of agenda items selected per article.

Number of selected agenda items	N (%)
0	228 (18)
1	868 (70)
2	115 (9)
3	19 (2)
4	6 (<1)
5	1 (<1)
6	5 (<1)

Agenda item 1: Organizing into integrated practice units

Although 71 articles discussed an integrated practice unit (IPU), only three of them reported on the actual implementation of an IPU (4%). In most articles, the IPU was focused on one medical condition (n=32, 45%) and involved a multidisciplinary team (n=43, 61%) (Table 7).

Most of the articles that discussed an IPU were conceptual (n=41, 58%). Thirty-four percent (n=24) of the articles that discussed an IPU implemented some sort of a (medical) intervention or did a comparative study. Two articles (n=2, 3%) described the development of an IPU. Four articles combined these three phases.

Agenda item 2: Measuring outcomes and costs

Of 941 articles reporting on outcomes and costs, most articles compared outcomes between treatments or interventions (n=155, 16%). A quarter of the articles did not compare outcomes (n=238, 25%). Of the 554 original articles in this category, 30% (n=168) reported solely on outcomes (clinical, PROMs or PREMs), 16% (n=87) reported solely on costs and 36% (n=201)

reported on both outcomes and costs. Eighteen percent (n=98) reported on other type of end points.

Different types of costs were measured. Direct costs were reported in 274 articles (29%); 40 articles reported direct and indirect costs (4%). Sixty-six articles measured the costs along the entire chain (20%). No distinction was made between whether the entire care chain was located inside or outside the hospital. Sixty-three articles (7%) developed a standard outcome set and thirteen articles (1%) a PROM (Table 7).

Half of the articles that discussed outcomes and costs reported an application (n=486, 52%), a third of the articles were conceptual (n=308, 33%) and 10% reported on a development (n=95, 10%). Fifty-two articles reported on a combination of the three categories (n=52, 5%).

Agenda item 3: Moving to bundled payments

There were 84 articles that discussed a form of bundled payments (Table 7). Most of the articles were conceptual (n=55, 65%), followed by articles with an application (n=26, 31%) and articles with a development (n=2, 2%). One article described a combination of the three categories.

Besides bundled payments, 'other forms of contracting' were frequently discussed. For example, pay for performance bonuses was discussed in 48 of all included articles (4%) and population-based payments in 8 articles (1%).

Agenda item 4: Integrating across separate facilities

Of the 22 articles in this category, eleven articles reported on a collaboration between healthcare providers or hospitals (50%). One article described the collaboration between a healthcare provider and an insurance company (5%). Another article discussed the collaboration between a healthcare provider and a university (5%). For the other nine articles, the question was not applicable (41%).

Fifty percent of the articles were conceptual (n=11, 50%), followed by articles with an application (n=8, 36%) and articles with a development (n=2, 9%). One article was a combination of the three categories (n=1, 5%).

Agenda item 5: Expanding across geography

Thirteen articles reported on a spread of best practices across geography. Six of these articles reported on a spread within the country (national) (n=6, 46%). Seven articles reported on a spread across geography (n=7, 54%), but it remained unknown in which way. There were no articles that reported on a spread of best practices between countries (international).

Most of the articles were conceptual (n=7, 54%), followed by articles with an application (n=4, 31%) and one article reported on a development (n=1, 8%). One article was a combination of the three categories (n=1, 8%).

Agenda item 6: Building an information platform

A total of 83 articles reported on information platforms. A majority of the platform users were healthcare providers (n=47, 57%), followed by patients (n=25, 30%). Ten percent of the articles reported the use of real-time outcome information (n=8, 10%) (Table 7). Thirteen articles reported on telemedicine (16%), ten on e-health (12%) and eight on telehealth (10%). Telemedicine was defined as the provision of medical care with the use of communication technologies to connect healthcare providers and patients who are in different locations.[18] e-Health are the applications in which internet technology is used to offer information, products and/or services in healthcare.[18] Telehealth includes patient education, public health and in-service training for healthcare professionals.[18]

Most of the articles were conceptual (n=50, 60%), followed by articles with an application (n=23, 28%) and articles with a development (n=5, 6%). Five articles were a combination of the three categories (n=5, 6%).

Table 7: In-depth information regarding the strategic agenda items.

Agenda item 1: Organizing into integrated practice units (IPUs) (n=71)		N (%)
Phase of IPU[#]	Design	15 (21)
	Implementation	3 (4)
	Evaluation of implementation	25 (35)
	Other	7 (10)
	Not applicable	23 (32)
Scale in organization	In the whole organization	3 (4)
	Around one disease	32 (45)
	Other	7 (10)
	Not applicable	26 (37)
	Unknown	3 (4)
Team	Yes, the team is multidisciplinary	43 (61)

	No, the team has one discipline/specialty	1 (1)
	Not applicable	19 (27)
	Unknown	8 (11)
Agenda item 2: Measuring outcomes/costs (n=941)		N (%)
Outcome set developed	Yes	63 (7)
PROM developed	Yes	13 (1)
Types of costs measured	Direct costing *	274 (29)
	Indirect costing $	2 (<1)
	Direct and indirect costing	40 (4)
	Other	14 (1)
	None / Not applicable	596 (63)
	Unknown	15 (2)
Entire chain	Yes	66 (20)
Agenda item 3: Moving to bundled payments (n=84)		N (%)
Type of contracting#	Pay-for-performance bonuses	26 (31)
	Bundled payments	66 (79)
	Population-based payments	7 (8)
	Other	17 (20)
Agenda item 6: Building an information platform (n=83)		N (%)
User of platform#	Healthcare professionals	47 (57)
	Patients	25 (30)
	Management	9 (11)
	Administrative department	7 (8)
	Financial department	4 (5)
	Other	7 (8)
	Not applicable	24 (29)
	Unknown	5 (6)
Real time	Yes	8 (10)
Telemedicine/telehealth/e-health#	Telemedicine^	13 (16)
	E-health^	10 (12)
	Telehealth^	8 (10)
	Other	15 (18)
	None	37 (45)
	Unknown	2 (2)

#Total is more than 100% because multiple answers could be selected. *The definition of direct costing used: "the costs associated with medical resource utilization, which include the consumption of in-patient, out-patient, and pharmaceutical services within the health care delivery system."[19] $The definition of indirect costing used: "the expenses incurred from the cessation or reduction of work productivity as a result of the morbidity and mortality associated with a given disease."[19] ^*Telemedicine*: the provision of medical care with the use of communication technologies to connect healthcare providers and patients who are in different locations.[18] *Telehealth*: broader scope and includes patient education, public health and in-service training for healthcare professionals.[18] *e-Health*: applications in which internet technology is used to offer information, products and/or services in healthcare.[18]

Discussion

Main findings

This review showed that the extent, range and nature of VBHC research is large and still increasing; over the last fifteen years more than 1200 articles reported on VBHC. They described (the implementation of) the strategic agenda items within various specialties. The number of published articles increased each year, especially since 2013, with the exception of 2018. Most articles were published in the United States/North America, followed by Europe.

The majority of articles described the measurement of outcomes and costs. Other agenda items were far less frequently described or implemented. Most of the articles were conceptual, meaning that nothing was actually changed or implemented. When looking at the role that VBHC played in the articles, almost half of the articles discussed or implemented one or more agenda items; only five articles described or implemented all agenda items. Most articles were published from surgical specialties. Four main observations on these results are highlighted in the following paragraphs.

First, research on VBHC focused primarily on the agenda item "measuring outcomes and costs". Furthermore, this agenda item had a relatively high ratio (52%) of application articles, meaning that outcomes and costs were actually measured. All other agenda items were reported on in a more conceptual way, without actually implementing or applying anything. The predominant focus on outcomes and costs might be explained by the formulation of the value definition, in which outcomes and costs are both specifically mentioned. Furthermore, it seems relatively difficult to implement other agenda items such as bundled payments of IPUs without measuring outcomes and costs (value). The importance of measuring outcomes and costs has also been recognized in other quality of care concepts such as the Donabedian model.[20] Another explanation for the popularity of measuring outcomes and cost could be the clarity of this agenda item; this item is the least susceptible to interpretation differences. Additionally, Porter stated that measuring outcomes is the most import step and he dedicated a practical article on standard outcome sets,[5] which further facilitates the focus on measuring outcomes and costs. The types of outcomes and costs that were measured differed between continents. North America more often measured costs than Europe. Moreover, in the United States, VBHC was often used in the context of health care funding laws that place emphasis on curbing cost growth such as the Affordable Care Act (ACA). One of the goals of ACA was to expand healthcare coverage and to make healthcare

affordable to more citizens.[21] This focus on costs and payment methods might explain the higher number of articles measuring costs in North America.

Second, the current strategic agenda seemed to be incomplete. In 18% of the included articles, none of the current agenda items were discussed. Based on the issues that were addressed in these articles, we proposed four new agenda items: 'quality improvement', 'VBHC culture', 'shared decision making', and 'education'. These four agenda items matched the new agenda items that were recently suggested.[22] It is important to note that some of the new agenda items, such as shared-decision making, were discussed in many of the included articles. However, in our methods, a new agenda item was only suggested by the reviewers when none of the current agenda items were checked in the data-extraction form. Thus, the number of articles with new agenda items were underreported.

Third, there was a scarcity of articles on implementation of agenda items. Only a quarter of the included articles described an implementation. The majority of these articles focused on one agenda item. Few articles described implementation of multiple agenda items. The lack of implementation articles was in line with other research in hospital settings; Reitblat et al. concluded that the implementation and investigation of the strategic agenda in urology was limited[23] and another scoping review specifically focusing on VBHC implementation in hospital settings showed the same scarcity.[24] One reason for the lack of implementation articles might be the absence of a practical implementation guide for VBHC. The need for a road map that addresses the required steps for organizational changes has been acknowledged before.[10] Currently, this road map with practical steps is still missing and the available VBHC theory is interpreted in various ways.[25] This could lead to an inadequate implementation, as an ill-defined management intervention is often implemented in different ways.[26] Furthermore, it was argued that a low level of understanding might result in a dilution of the concept.[7] Therefore, it seems especially important to describe and observe different implementation initiatives around the world, to ultimately create a guideline for each healthcare contexts.

Finally, it was striking that many of the included articles were focused on surgical specialties. A possible explanation is that these specialties have a longer history of quality registries (including outcome measures) and generally perform intervention-driven studies. Intervention-driven studies often compare health outcomes between interventions or patient groups. As a result, surgical articles focused more on health outcomes and linked this to the

VBHC concept and the definition of value; outcomes compared to costs. Another reason could be that VBHC principles are easier to implement in surgery as there is a more direct relation between intervention and outcomes.

Strengths and limitations

Some limitations need to be considered when interpreting the results of this study. First, the search strategy did not specifically include search terms for each agenda item, which could have resulted in selection bias. Second, using the article "What is value in health care?"[5] for the cited reference search, might have resulted in the overrepresentation of articles focusing on measuring value, outcomes or costs. Though, the representation of "What is value in health care" and other references to Porter found in our study is similar to the representation found in PubMed. Third, the focus of this study was on scientific peer-reviewed articles. As a result, VBHC implementation initiatives published in 'gray literature' or published as non-peer-reviewed articles, have not been included in this study. This might have led to an underrepresentation of the actual number of VBHC implementations in practice. Finally, inherent to the design of a scoping review, the included articles were not assessed for their research quality.

A major strength of this review is its broad scope. The present study provides a comprehensive overview including items such as medical specialties, countries and all strategic agenda items (including potential new ones) (Supplementary File 2). In addition, the study's exclusion criteria deliberately generated a broad picture of the current state of research on VBHC. This has resulted in a complete picture of the current state of research on VBHC. The broad scope of this study was especially important in light of the different interpretations of the VBHC concept. Finally, to date, hardly any reviews on VBHC have been published, and existing reviews focusing on for example articles with an implementation of VBHC.[24]

Implications for clinical practice and/or research

With the exception of measuring outcomes and costs, few articles have implemented and researched the implementation of strategic agenda items. There is a need for studies that evaluate the implementation of the different strategic agenda items within different medical specialties. Insight in practical implementation is needed in order to work towards a roadmap

for step-by-step implementation of VBHC. It is important to collect evidence from daily practice to serve the evidence-based paradigm of the healthcare sector. To contribute to more evidence, our database (Supplementary File 2) can be used for in-depth systematic reviews to further explore what is known within each of the agenda items.

Conclusion

This study showed that the number of publications steadily increased after the introduction of VBHC in 2006. The largest output came from North America, followed by Europe. There was a predominant focus on measuring outcomes and costs. In addition, almost one fifth of the articles could not be categorized in one of the items of the strategic agenda, which may lead to the conclusion that the current strategic agenda could be extended. Topics such as 'quality improvement', 'VBHC culture', 'shared decision making', and 'education' were proposed as potential new agenda items. Furthermore, there was a scarcity of articles with a practical implementation, leading to the conclusion that a practical roadmap or guideline to implement VBHC is still lacking. And last, many of the included articles were focused on surgical specialties. Future research could fill the gap by specifically researching the evidence on VBHC's effectiveness in day-to-day clinical practice.

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Competing interests

None declared.

Author Contributions

JV, KD, MG, MRV, DB, WB, FM and PN designed the review. JV and KD conducted the literature search. JV, KD, GS, MG and PN screened articles for inclusion and extracted data from the included articles. JV, KD and MG analyzed and interpretated the data. JV, KD, GS, MG and PN drafted the manuscript. All authors critically reviewed the manuscript. All authors approved the final version of the manuscript.

Patient consent

None required.

Data sharing statement

There is no additional unpublished data from this review.

Ethics Approval

Ethics approval for this scoping review is not necessary under Dutch law (AVG) according to the Medical Research Involving Human Subjects act (WMO) because no human participants were involved.

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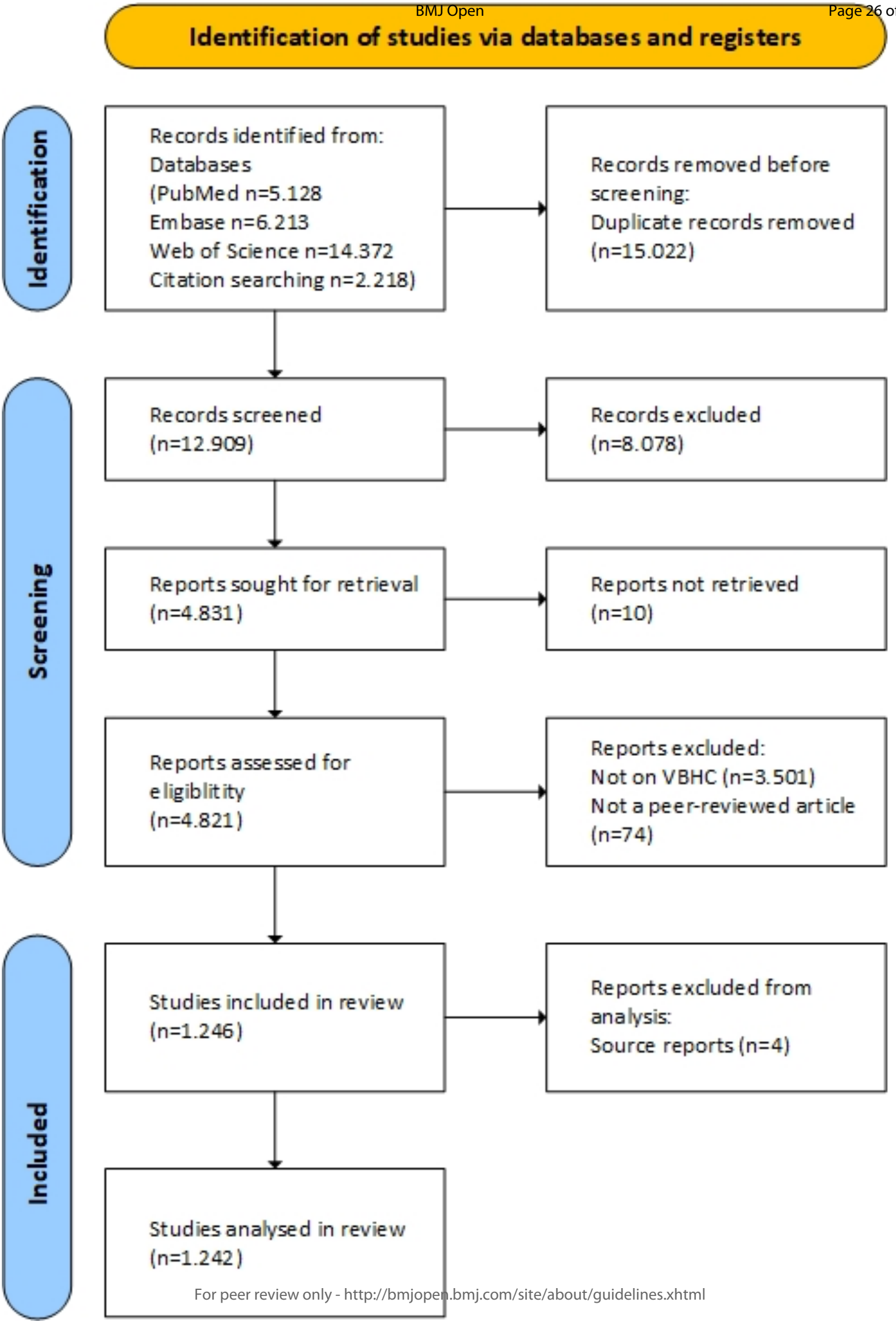
Figure legends

Figure 1: Flowchart with review decision process.

Figure 2: Bar chart with number of publications over the years. NB: the search was conducted in June 2021.


Identification of studies via databases and registers
Identification
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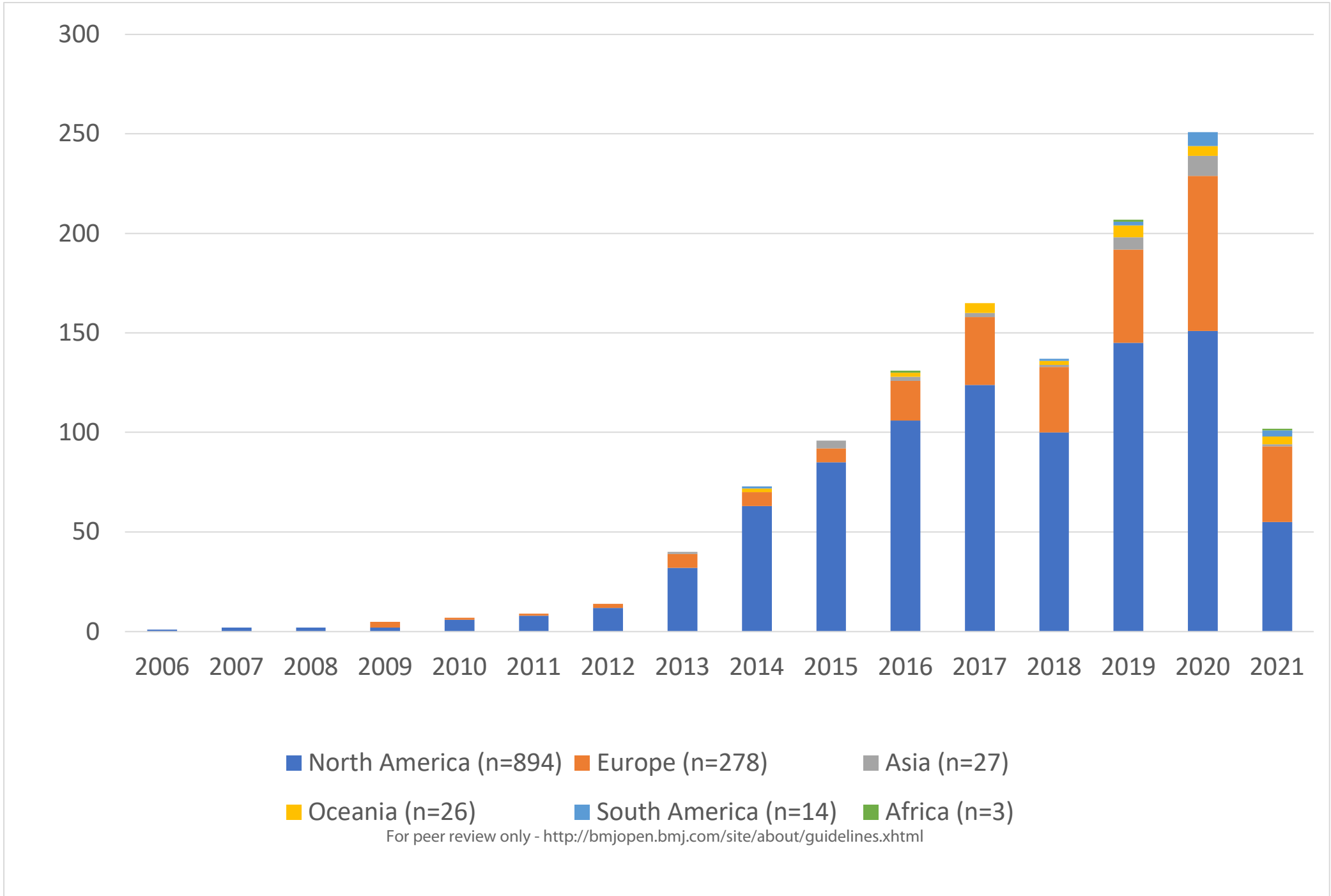
Web of Science n=14.372
Citation searching n=2.218)
Records removed before screening:
Duplicate records removed
(n=15.022)
Screening
Records screened
(n=12.909)
Records excluded
(n=8.078)
Reports sought for retrieval
(n=4.831)
Reports not retrieved
(n=10)
Reports assessed for eligiblitity
(n=4.821)
Reports excluded:
Not on VBHC (n=3.501)
Not a peer-reviewed article
(n=74)
Included
Studies included in review
(n=1.246)
Reports excluded from analysis:
Source reports (n=4)
Studies analysed in review
(n=1.242)



Supplementary File 1

The electronic search strategy used for PubMed.

("VBHC"[tiab] OR "value-added care"[tiab] OR "value added care"[tiab] OR "value-added healthcare"[tiab] OR "value added healthcare"[tiab]

OR

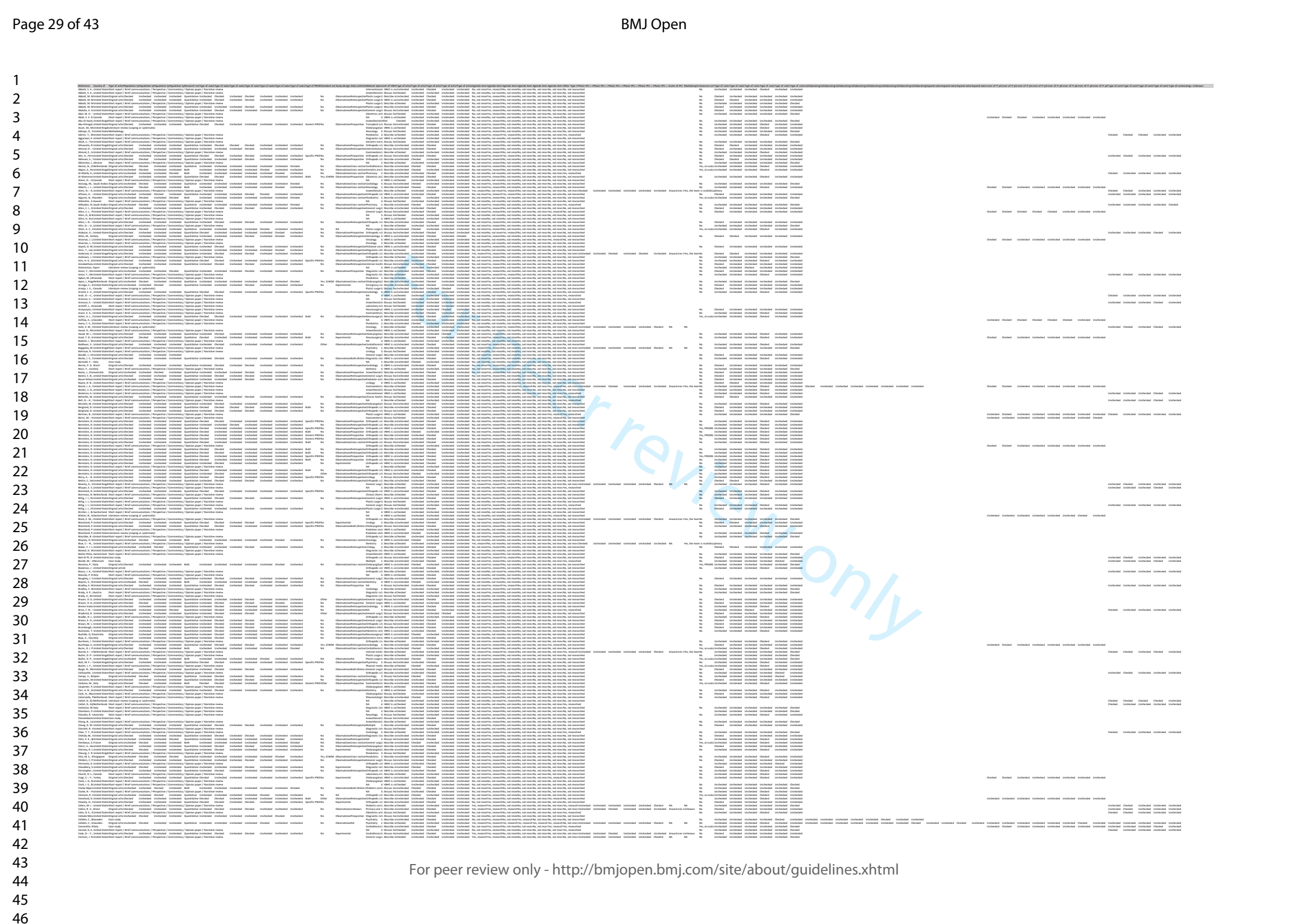
(("Delivery of Health Care"[Mesh] OR "Health Care"[tiab] OR "healthcare"[tiab] OR "care"[tiab] OR "Costs and Cost Analysis"[Mesh] OR "cost"[tiab] OR "costs"[tiab] OR "pricing"[tiab] OR "payment"[tiab] OR "payments"[tiab] OR "purchasing"[tiab] OR "expenditure"[tiab] OR "expenditures"[tiab] OR "economic"[tiab] OR "economics"[tiab] OR "insurance"[tiab] OR "Quality of Health Care"[Mesh] OR "outcome"[tiab] OR "outcomes"[tiab] OR "PROMS"[ti] OR "indicator"[tiab] OR "indicators"[tiab] OR "benchmark"[tiab] OR "benchmarking"[tiab] OR "best practice"[tiab] OR "best practices"[tiab] OR "Integrated Practice units"[tiab] OR "IPU"[ti] OR "lean"[tiab] OR "six sigma"[tiab] OR "six sigmas"[tiab] OR "management"[tiab] OR "organisation"[tiab] OR "organization"[tiab] OR "Contracts"[Mesh] OR "contracting"[tiab] OR "contract"[tiab] OR "contracts"[tiab])

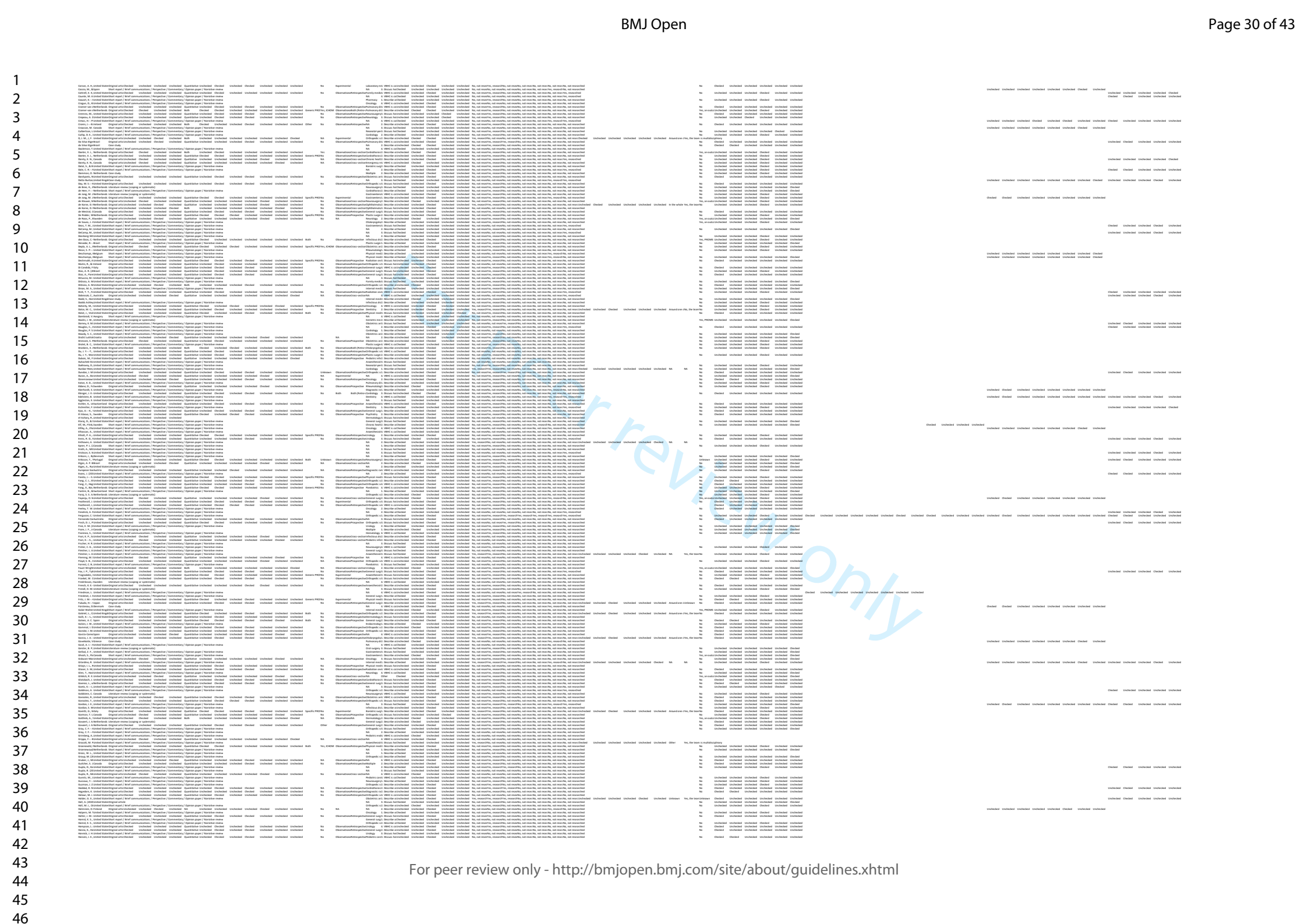
AND

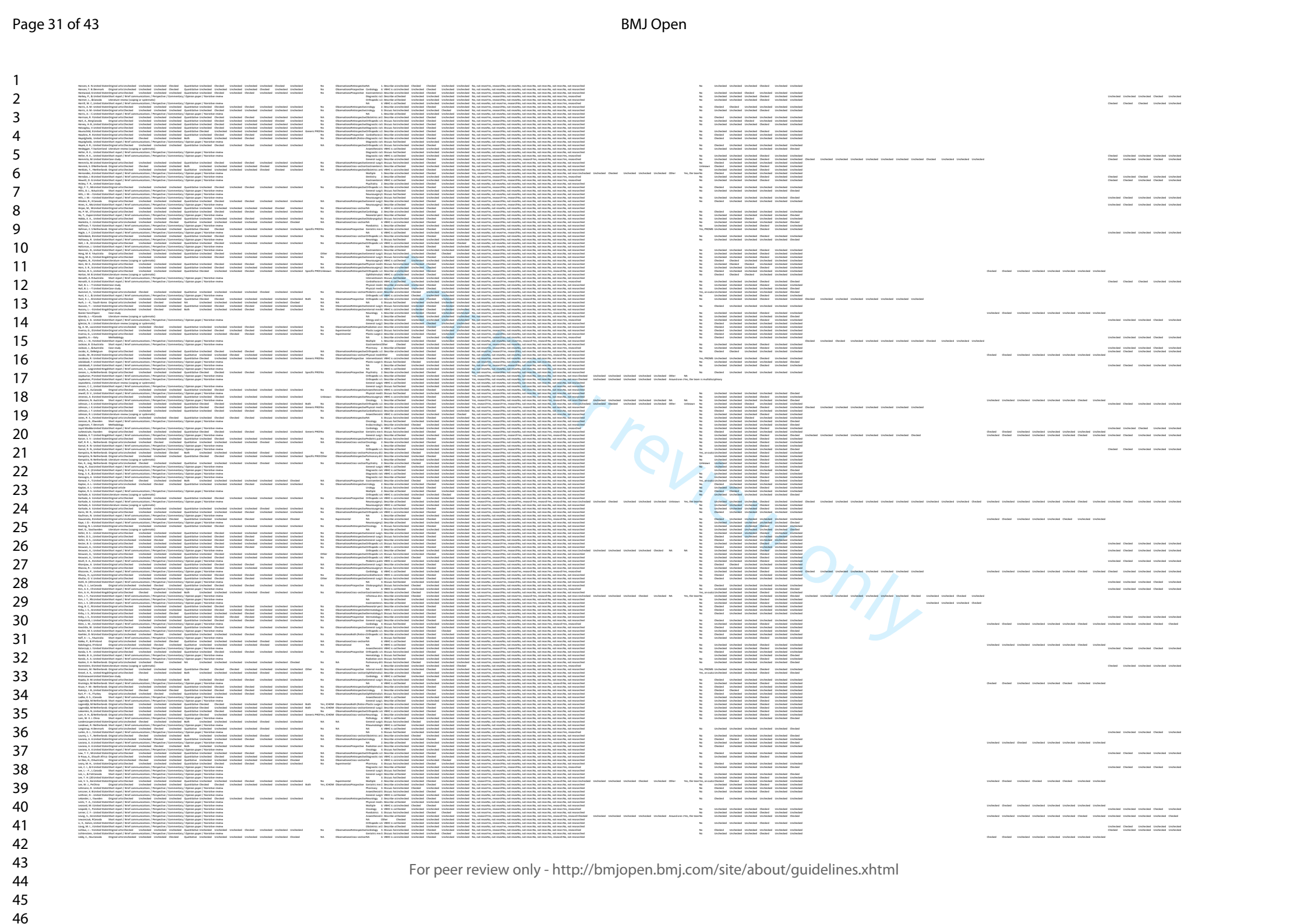
("value-based"[tiab] OR "value based"[tiab])))

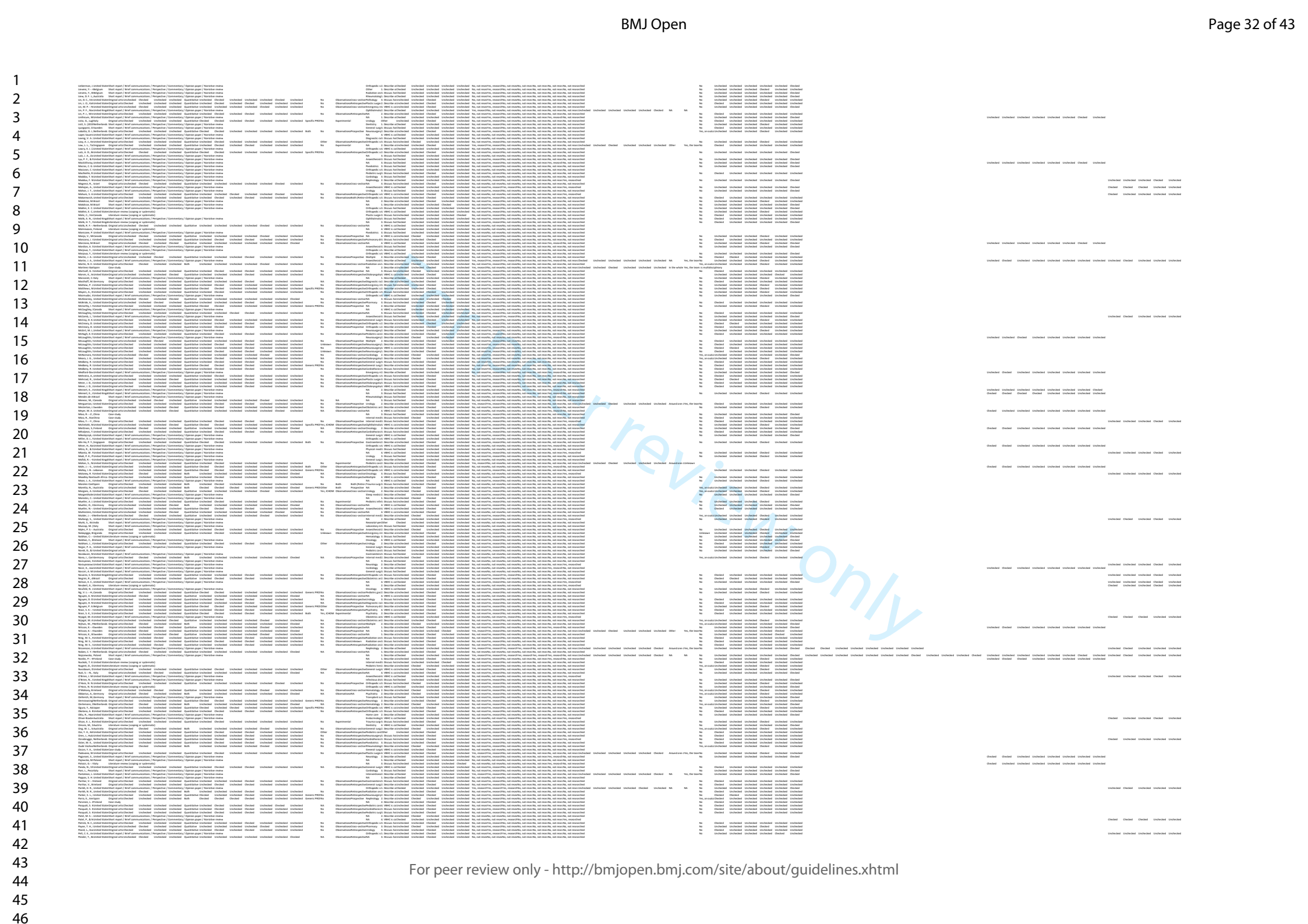
AND

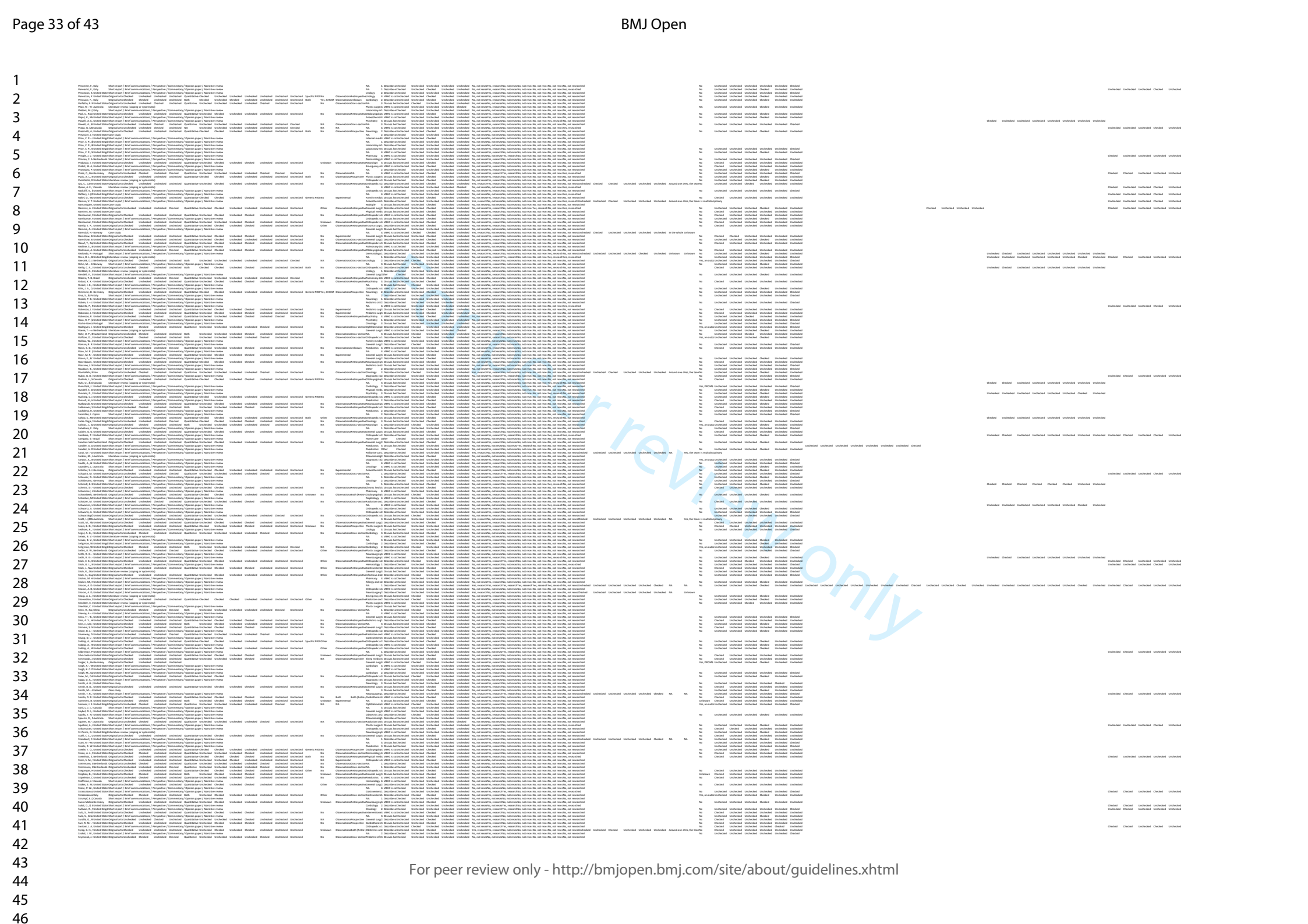
(("2006/01/01"[PDat]: "2030/12/31"[PDat]))

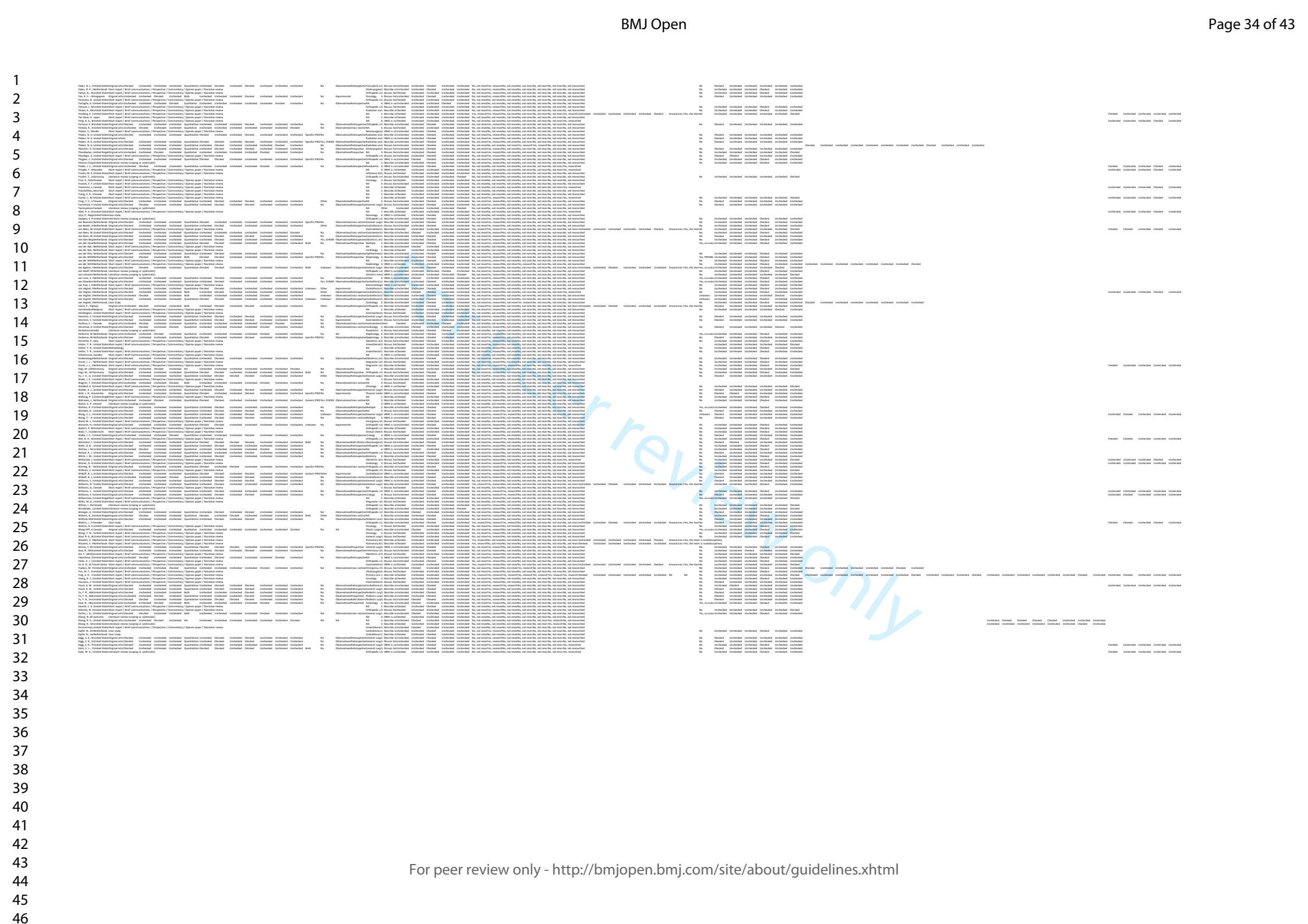












Variable	Field label	Options
Country of origin of the article	What was the country of origin of the article?	*dropdown, Required*
Type of article	What type of article was written?	*radio, Required:* Original article Literature review (scoping or systematic) Short report / Brief communications / Perspective / Commentary / Opinion paper / Narrative review Case study Methodology Other
Population type researched Show the field ONLY if: [method]="1" AND [type_article]= original article	What population did the article research?	*checkbox, Required:* Patients Healthcare professionals Not applicable Other
Research method Show the field ONLY if: [method]="1" AND [type_article]= original article	Was the research method of the article qualitative or quantitative?	*radio, Required:* Quantitative Qualitative Both NA Unknown
Type of outcome measured Show the field ONLY if: [method]="1" AND [type_article]= original article	What type of outcomes were measured in the article?	*checkbox, Required:* Patient-reported outcome measures (PROMs) (including questionnaires on disease symptoms, functional ability, quality of life) Clinician reported outcomes (clinical outcomes) Patient-reported experience measures (PREMs) Costs None Other NA
Type of PROMs Show the field ONLY if: [type_of_outcomes(1)] = PROMs	Which PROMS were measured?	*radio, Required:* Generic PROMS Specific PROMS Both Other Unknown NA
Standard set used Show the field ONLY if: [method]="1" AND [type_article]= original article	Was a standard set used to measure outcomes?	*radio, Required:* Yes, ICHOM Yes, COMET Other No Unknown NA
Study design Show the field ONLY if: [method]="1" AND [type_article]= original article	Was the design of the article observational or experimental?	*radio, Required:* Observational Experimental Both NA Unknown
Data collection Show the field ONLY if: [study_design] = observational OR [study_design] = both	Was the date collection of the article retrospective or prospective?	*radio, Required:* Retrospective Prospective

		Both (Retro+pro) NA Unknown Cross-sectional
Medical specialty	Which medical specialty was mainly researched in the article?	*text, Required*
Level of VBHC	On what level did the article report on VBHC?	*radio, Required:* 1. Describe or implement multiple agenda items (highest extent) 2. Describe or implement a specific part of VBHC or the strategic agenda 3. Discuss how to improve value or measure value, with value defined 4. VBHC is context or motivation for the study (lowest extent) Other
Type of article 2 (concept/development/application)	Was it a conceptual article or an development article or an application article?	*checkbox, Required:* Conceptual article Development of application (not applicated, but developed) Article with an application Other NA
Agenda item = IPU	Section Header: *Were the agenda items researched?* Organize into integrated practice units (IPUs) around the patient's medical condition.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Agenda item = Outcomes and Costs	Measure outcomes and costs for every patient.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Agenda item = Bundled Payments	Move to bundled payments for care cycles.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Agenda item = Across Separate Facilities	Integrate care delivery across separate facilities.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Agenda item = Across Geography	Expand excellent services across geography.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Agenda item = Information Platform	Build an enabling information technology platform.	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Other type of contracting	Was other type of contracting researched?	*radio (Matrix), Required:* Yes, researched No, not researched Unknown
Phase IPU Show the field ONLY if: [ipu] = Yes, researched	What was the phase of the IPU researched?	*checkbox, Required:* Design Implementation Evaluation of implementation Unknown Other

		NA
Scale of IPU Show the field ONLY if: [ipu] = Yes, researched	On which scale in the organization was the IPU implemented?	*radio, Required:* In the whole organization Around one disease Other Unknown NA
Multidisciplinary of team Show the field ONLY if: [ipu] = Yes, researched	Was the team in the IPU multidisciplinary?	*radio, Required:* Yes, the team is multidisciplinary No, the team has one discipline/specialty Other Unknown NA
Outcome set or PROMS developed Show the field ONLY if: [outcomes_costs] = Yes, researched	Was an outcome set or PROMS developed?	*radio, Required:* Yes, an outcome set Yes, PROMs No Unknown
Type of costs Show the field ONLY if: [outcomes_costs] = Yes, researched	What type of costs were measured?	*checkbox, Required:* Direct cost Indirect cost Other None Unknown NA
Collaborating facility Show the field ONLY if: [across_separate_facilities] = Yes, researched	Which parties collaborated across the separate facilities?	*checkbox, Required:* Healthcare provider / hospital Insurance company University Research center Pharmaceutical company Other Unknown NA
Expand national or international Show the field ONLY if: [across_geography] = Yes, researched	Did the organization expand national or international?	*checkbox, Required:* National expansion International expansion Unknown
User of IT platform Show the field ONLY if: [information_platform] = Yes, researched	Who was the user of the information platform?	*checkbox, Required:* Patients Healthcare professionals Management Administrative department Financial department Other NA Unknown
Type of contracting Show the field ONLY if: [other_type_of_contracting] = Yes, researched OR [bundled_payments] = Yes, researched	What type of contracting was discussed/used?	*checkbox, Required:* Pay-for-performance bonuses Bundled payments Population-based payments

		Other Unknown

Supplementary File 3

Medical specialty		N (%)
Allergy and immunology		2 (<1)
Anesthesiology		38 (3)
Colon and rectal surgery		20 (2)
Dermatology		9 (1)
Emergency medicine		10 (1)
Family medicine		4 (<1)
Internal medicine		
	Cardiology	35 (3)
	Endocrinology	3 (<1)
	Gastroenterology	33 (3)
	Geriatric medicine	9 (1)
	Hematology	8 (1)
	Infectious disease	8 (1)
	Internal medicine general	14 (1)
	Nephrology	8 (1)
	Oncology	34 (3)
	Pulmonary disease	14 (1)
	Rheumatology	10 (1)
	Sleep medicine	2 (<1)
Neurological surgery		22 (2)
Neurological surgery and orthopedic surgery		18 (1)
Neurology		20 (2)
Obstetrics and gynecology		26 (2)
Ophthalmology		12 (1)
Orthopedic surgery		182 (15)
Otolaryngology		29 (2)
Pathology		2 (<1)
Pediatrics		
	Neonatal-perinatal medicine	5 (<1)
	Pediatric cardiology	12 (1)
	Pediatric critical care medicine	1 (<1)
	Pediatric endocrinology	1 (<1)
	Pediatric gastroenterology	1 (<1)
	Pediatrics general	22 (2)
	Pediatric hematology-oncology	1 (<1)
	Pediatric infectious diseases	5 (<1)
	Pediatric pulmonology	2 (<1)
Physical medicine and rehabilitation		20 (2)
Plastic surgery		31 (2)
Psychiatry		16 (1)
Radiology		
	Diagnostic radiology	37 (3)

	Radiation oncology	24 (2)
Surgery		
	Bariatric surgery	3 (<1)
	General surgery	93 (7)
	Oral surgery	1 (<1)
	Pediatric surgery	8 (1)
	Transplant surgery	3 (<1)
	Trauma surgery	3 (<1)
Thoracic surgery		31 (2)
Urology		32 (3)
NA		248 (20)
Multiple		18 (1)
Other		
	Other	3 (<1)
	Chronic health conditions	4 (<1)
	Clinical chemistry	2 (<1)
	Dentistry	11 (1)
	Home care	2 (<1)
	Interventional radiology	7 (1)
	Laboratory medicine	7 (1)
	Palliative care	2 (<1)
	Pharmacy	11 (1)
	Primary care	2 (<1)
	Veterinary care	1 (<1)

Supplementary File 4

Reference to Porter #,$	
Porter, M. E. (2010). What is value in health care. *N Engl J Med*, *363*(26), 2477-2481.	953 (77)
Porter, M. E., & Teisberg, E. O. (2006). *Redefining health care: creating value-based competition on results*. Harvard business press.	208 (17)
Porter, M. E. (2009). A strategy for health care reform—toward a value-based system. *N Engl J Med*, *361*(2), 109-112.	150 (12)
Kaplan, R. S., & Porter, M. E. (2011). How to solve the cost crisis in health care. *Harv Bus Rev*, *89*(9), 46-52.	127 (10)
Porter, M. E., & Lee, T. H. (2013). The strategy that will fix health care. *Harvard business review*, *91*(12), 24-24.	113 (9)
Porter, M. E., Larsson, S., & Lee, T. H. (2016). Standardizing patient outcomes measurement. *N Engl J Med*, *374*(6), 504-506.	70 (6)
Porter, M. E. (2008). Value-based health care delivery. *Annals of surgery*, *248*(4), 503-509.	51 (4)
Porter, M. E., & Teisberg, E. O. (2007). How physicians can change the future of health care. *Jama*, *297*(10), 1103-1111.	40 (3)
Porter, M. E., & Teisberg, E. O. (2004). Redefining competition in health care. *Harvard business review*, 64-77.	33 (3)
Porter, M. E., Pabo, E. A., & Lee, T. H. (2013). Redesigning primary care: a strategic vision to improve value by organizing around patients' needs. *Health Affairs*, *32*(3), 516-525.	30 (2)
Porter, M. E., & Lee, T. H. (2016). From volume to value in health care: the work begins. *Jama*, *316*(10), 1047-1048.	21 (2)
Porter, M. E., & Kaplan, R. S. (2016). How to pay for health care. *Harv Bus Rev*, *94*(7-8), 88-98.	13 (1)
Porter, M. E., & Lee, T. H. (2015). Why strategy matters now. *N Engl J Med*, *372*(18), 1681-1684.	12 (1)
Porter, M. E. (1985). Competitive Advantage: Creating and Sustaining Superior Performance. New York: The Free Press. 557 p.	8 (1)
Porter, M. E. (2008, August). Defining and introducing value in health care. In *Evidence-based medicine and the changing nature of health care: 2007 IOM annual meeting summary* (pp. 161-72). National Academies Press, Washington (DC).	8 (1)
Other articles*	101 (8)
No ref	76 (6)
Part of article with reference to Porter #,§	
Introduction	564 (77)
Method	62 (8)
Results	35 (5)
Discussion	233 (32)
Conclusion	26 (4)
Other	14 (2)

[#]Total is more than 100% because multiple answers could be selected. [$]58% (n=721) of the articles had one Porter reference, 36% of the articles had two or more references (mean: 2.6, range: 2-6). *This category contains 53 articles cited less than 8 times. [§]N=736, this question includes the articles with multiple section.

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4 - 5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5 - 6
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	NA
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary file I
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6 - 7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page 7 and Supplementary file II
Critical appraisal of individual	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe	NA

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
sources of evidence§		the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Pages 8 - 10 and Table 1
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	NA
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Supplementary file II
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8 - 16
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	17
Limitations	20	Discuss the limitations of the scoping review process.	19
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	20
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	20

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.