Clinical and subjective oral health status of care home residents in Europe: a systematic review

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Running title: Oral health of care home residents: systematic review

Keywords: oral health, care home residents, systematic review

Funding: This research did not receive any funding from agencies in the public, commercial, or not-for-profit sectors.

Word count: abstract 300, main text 3781

Reference count: 107

Graphics count: 3

Brief summary:

A systematic review was performed on clinical and subjective oral health outcomes of care home residents in Europe, showing a high prevalence of oral health problems in care home settings in Europe, irrespective of the country or healthcare system.

Abstract

Objective: Several studies demonstrated the poor oral health of care home residents in Europe but there is no systematic overview of the relevant literature. The objective of this study was to systematically review the evidence on the clinical and subjective oral health outcomes of care home residents in Europe.

Design: The study design is a systematic review.

Methods and participants: All included publications presented data on clinical and/or subjective oral health outcomes in care home residents in Europe with no restrictions for language or study design. MEDLINE, Embase and CINAHL, were searched, including publications from January 2010 onwards. Data extraction and quality assessment (Qualsyst tool) was performed by two researchers independently. Findings were synthesized narratively, lack in data homogeneity restricted the relevance of a meta-analysis.

Results: Eighty-three papers from 18 countries were included in the systematic review, with a sample size ranging from 39 to 92,827 participants. Their mean age was over 80 years. The residents had few natural teeth, with less than a third a functional natural dentition. Removable dentures were present in half to 80% of residents. A high prevalence of dental caries was reported. Oral hygiene was insufficient, for both natural teeth and removable dentures. Few residents had a healthy periodontium. Clinical treatment needs were found in the majority of residents. Perceived treatment needs were high with at least one third of care home residents reporting a need for care due to poor oral health. A fifth to half of the residents reported negative impacts of their oral condition on their everyday lives.

Conclusion and implications: This systematic review clearly highlights the poor oral health and high burden of oral conditions among care home residents across Europe, irrespective of country or healthcare system. There is need for substantial policy actions to improve oral health in care homes.

Funding: The authors confirm that they received no specific funding for this work.

Introduction

The oral health of care home residents is an increasingly important public health concern.[1–5] Oral Health, as defined by WHO, is the state of the mouth, teeth and orofacial structures that enables individuals to perform essential functions, such as eating, breathing and speaking, and encompasses psychosocial dimensions, such as self-confidence, well- being and the ability to socialize and work without pain, discomfort and embarrassment. Oral health varies over the life course from early life to old age, is integral to general health and supports individuals in participating in society and achieving their potential.[6] As society ages, the number of frail care-dependent older people at risk for poor oral health increases.[7] Poor oral health negatively impacts on the quality of life of older people, affecting their ability to eat, speak and interact socially, and is a risk factor for several systemic diseases such as aspiration pneumonia.[8–15]

In the last decade, several epidemiologic studies were published on the oral health status of care home residents in Europe and across the world. In 2019, Wong et al. published a worldwide systematic review on oral health of care home residents, in which epidemiological data was searched for in combination (Boolean operator AND) with oral health determinants. As the presence of oral health determinants in the publication was used as an inclusion criterion, the majority of the relevant literature on epidemiologic data from Europe was not included in the above mentioned review. [16] Moreover, the relevant studies are quite heterogenous in their methodological features, while the organization and characteristics of care homes, including aspects of oral healthcare provision, vary considerably according to context. Therefore, there is a need for a systematic review focusing on oral health outcomes that includes all relevant evidence and provides a comprehensive picture on the oral health status of care home residents in a European context. This would provide essential background information for health and social care policy makers to inform future policies and interventions for this vulnerable group of older adults. The aim of this systematic review is to give a broad overview of clinical and subjective oral health outcomes of care home residents in Europe.

Methods

This systematic review followed the Preferred Reporting Items of the Systematic Review and Meta-Analysis (PRISMA) guidelines.[17] The protocol was registered and published on PROSPERO (CRD42021226842) and the search strategy was developed by the first author in collaboration with the Knowledge Center for Health at XXXX university (XXXX)[18] and reviewed by the second and last authors (EP, BJ). Relevant search term identification was performed using thesauri MeSH (PubMed), Emtree (Embase) and Yale MeSH Analyzer. Pubmed PubReminer was used as a text mining tool to identify extra possible search terms. The search strategy was manually adapted for each database and can be found in supplementary file 1. The search was carried out in MEDLINE (via PubMed interface), Embase (via embase.com interface) and CINAHL (via EBCSOhost interface), including publications from January 2010 onwards. The last update was run in December 2022. References of included papers were hand-searched. Subsequently, grey literature was also searched using Mednar, Opengrey and Open Access Theses and Dissertations. Also, conference abstracts were included in the search. In addition, in order to identify all possible regional or national data, an email request for reports or unpublished data was sent to all European Chief Dental Officers in November 2020, followed by a final reminder in September 2021.

Inclusion and exclusion criteria

All included publications presented data on clinical and/or subjective oral health outcomes in care home residents in Europe without restrictions for language or study design. Care home residents were defined as residents living in long-term care facilities for older adults. Studies in psychiatric facilities and facilities for persons with disabilities were excluded. Only study samples with a mean age above 65 years were included.

Study selection, data extraction and quality assessment

First, title and abstract of the identified publications were screened for potential inclusion by the first reviewer (LJ). The software program Endnote was used for deduplication. Second, all abstracts were imported into the web application Rayyan.[19] The full-text articles of these potentially eligible studies were assessed by two independent reviewers (LJ and EP). The

reason for exclusion was recorded using a fixed order of exclusion criteria. If the text was in a language not known to any of the authors, support of online translation was used to assess eligibility. Conflicts were resolved by consensus, including the expertise of a third reviewer (BJ) when needed. The inter-rater agreement for study selection was k=0.62, which represents a substantial agreement.[20]

The data was extracted by two independent reviewers (LJ and EP) using a pre-piloted extraction form. All outcomes are listed in Table 1. Initial discrepancies were discussed between the two reviewers and were all resolved by consensus. When possible and beneficial, the primary investigators were contacted for clarification by e-mail.

The same two independent reviewers performed the quality assessment of each study using the QualSyst tool for quantitative studies. Qualsyst was chosen as a quality assessment tool as it was developed to be applicable for a range of study designs (Supplementary file 2). [21] The tool consists of 14 items evaluating a range of methodological outcomes and enabling the reviewers to assign a numerical score to each paper, with a higher score denoting higher quality. In all stages, discrepancies were resolved by discussion. Given the data collection difficulties frequently occurring in residential care settings, all authors agreed not to penalize studies for suboptimal sampling strategies and representativeness if sufficient information on the selection process was available.

Results

Characteristics of included studies and participants

The flow-diagram of the study selection can be found in Figure 1. A total of 83 reports, collated into 68 studies, originating from 18 different European countries were included: Austria (2), Belgium (4), Croatia (2), Finland (5), Spain (5), United Kingdom (7), France (2), Germany (15), Italy (6), Lithuania (1), Sweden (3), The Netherlands (7), Poland (3), Portugal (1), Slovenia (1), Switzerland (2), Norway (1) and Iceland (1). Most studies were conducted in care homes (60), others in a combination of assisted nursing facilities and a care home (4), assisted nursing

facilities (1), or geriatric residences (3). Most study designs were cross-sectional (59), six were RCTs and three cohort reports were also included. The total number of participants in this systematic review exceeds 150,000, with a large sample size range of 39 to 92,827 residents among the included studies. The mean age of the combined participants is over 80, with a range of 21 to 109 years. It was not possible to calculate the exact mean age of all included participants due to some studies not reporting the mean age, or only reporting the mean age of different groups within the study. Participants diagnosed with dementia or mild cognitive impairment were included in the majority of the reports (45/83), they were excluded in 8 studies, while in 29 studies it was unclear whether the sample included those residents.

An overview of the excluded studies can be found in supplementary Table 1.

Quality Assessment

Qualsyst total score ranged from 27.0-100.0%. The included studies performed poorly on the quality of the outcome measures, sampling, analytic methods, variance, controlling for confounding and reporting results in sufficient detail (see Table 2 and supplementary Table 2).

Narrative synthesis of the oral health data

Clinical oral health

There was large variation in the proportion of edentulous residents between the studies (19.0-80.5%) but in the majority of studies (34/54) it ranged from 40.0% to 60.0%.[4,5,8,9,22–50] Outliers could be seen in The Netherlands, where the prevalence of edentulousness ranged between 73.0% and 80.0%.[51–54] In contrast, studies from Sweden, Norway and Switzerland reported respective prevalences of around 20.0%.[2,55–59]

Removable dentures were present in 40.0-85.0% of the residents. [4,9,22–24,26,28,29,32,34,42–44,47,51,53,55,57,60–69] The proportion of residents wearing complete dentures, both in the upper and lower jaw, varied from 33.0% to 46.0% whereas removable partial dentures were present in 16.0% to 41.0% of the residents. [4,9,23,24,62,63,67,67]

The proportion of residents with a functional dentition (more than 20 natural teeth) ranged from 6.0% to 34.0%.[4,24,38,39,41,41,45,56,60,61,70–72] The mean number of remaining natural teeth among

the dentate residents (those with natural teeth) ranged from 9.8 to 20.0 teeth per person. [4,5,22,24,31,33,45,50,51,54,66,73]

Dental plaque levels were reported in 26 studies, using seven different methods or indices. Eight out of 26 studies reported on oral hygiene without the use of a validated index or methodology. Irrespective of the method used, oral hygiene was generally poor. The Sillness & Loë index [74] was used in six studies and varied from 1.47 to 2.43 (for reference, the index score ranges from 0 to 3, with higher scores denoting worse oral hygiene) . [24,49,54,60,63,72]

For the assessment of denture plaque levels, ten studies reported the Denture Hygiene index (DHI), and three studies used the Augsburger and Elahi index.[75,76] All studies reported high levels of plaque on the removable dentures. [24,28,29,29,32–34,54,63,77–79]

The proportion of dentate residents with untreated dental caries ranged from 23% to 82% with the majority (15 out of 17 studies) reporting caries activity in more than half of dentate residents. [4,5,8,9,30,44,45,49–52,55,56,58,60,61,64,80] The average number of decayed teeth varied from 0.53 to 5.0 per person. [4,5,8,30,35,40,42,45,48,49,49,55–58,60,61,64,67,70,71,77,79,81] The mean number of filled teeth per person varied from 0.2 to 9.2. [4,8,40,48,48,55,58,61,64,67,70,71,79] Finally, an average of 0.9 to 3.5 residual roots per resident was found.[4,42,48,49,56,57] Two studies reported the prevalence of dental abscess (through the PUFA index: pulpal involvement, ulceration, fistulae or abscesses) to be 15-26%.[5,45]

Few residents were seen with a healthy periodontium, but there was considerable variation in the prevalence of periodontal conditions. [3,32–34,40,62,77] Gingivitis was prevalent in 51.0% to 78.0% of dentate residents, [30,45,57] while bleeding on probing was seen in 46.0% to 76.0% of residents.[5,44,58]. Overall, periodontal diseases indices were very heterogenous, with some studies using the Community Periodontal Index[40,71,82], or its predecessor the Community Periodontal Index of Treatment Needs[32,34,60], others using the Periodontal Screening index[35,48], the Basic Periodontal Examination[83], while others reported tooth mobility[8,84]or periodontal health in general without using a validated instrument[5,22,44,57,58].

Few studies assessed dry mouth clinically. A mean salivary flow rate of 0.20-0.29 ml/min was found by Van der Putten et al. and Brukiene et al, which is considered within the range of a normal salivary flow.[85,86] However, Van der Putten et al. noted hyposalivation in resting state

in 24.0% and in chewing-stimulated saliva in 60.0% of residents. Glazar et al. saw a reduced salivary flow rate in 47.8% of residents, with 27.2% presenting hyposalivation.[64] Two studies estimated dry mouth by the 'adhesiveness of dental mirror on the mucosa' and found 46.0-54% of the residents experiencing moderate ('slip resistance') and 11.0-14% severe hyposalivation ('mirror trapped in mucosa').[57,87]

Very few studies reported on the prevalence of denture stomatitis. Three publications stated 10.0-15.0% of denture wearers were suffering from denture stomatitis.[69,82,88] Pressure ulcers or traumatic ulcers because of dentures were seen in 1.5% to 18.0% of older people.[4,23,49,64,72]

Subjective oral health

Two studies reported poor self-rated oral health in 35.0-45.0% of residents [44,71] and 16.0% to 61.2% of residents described at least one problem with their teeth or mouth.[8,10,30,60,61] Prevalence data on oral pain or discomfort ranged between 6.0% and 40.5%.[5,22,25,45,46,49,58,61,79,87] Considering the impact oral conditions had on the everyday lives of residents, 20.0-50.0% of residents reported their Oral Health Related Quality of Life (OHRQoL) was affected[8,41,46–48,66.]Several studies reported only a mean score for the OHRQoL instrument applied[9,26,27,36,61,62,71,73,79,89].

Proportions of older people reporting eating difficulties ranged from 5 to 55%.[10,25,43,45,65,87,90,91] One study reported differences in the prevalence of eating difficulties between dentate and edentate residents; 16.9% and 29.1% respectively.[(8)] Chewing problems led to adapting the food structure (cutting their food in smaller pieces, pureed food) in 10.0% to 35.8% of residents.[30,79] In three studies from Finland, 11.0-20.0% of the residents reported swallowing problems[25,50,87,91] while in the United Kingdom, the self-reported swallowing quality was 'good' for 73.0%, 'moderate' for 22.5% and 'bad' for 4.5% of the residents.[79] The prevalence of xerostomia (subjective feeling of a dry mouth) in care home residents varied between 15.0%[5,25,65,91] and 59.0%[64], with the majority of studies reporting 35.0-50.0%.[8,60,92–94]

Treatment needs

Clinical treatment needs, as determined by a dentist, were detected in the majority of residents. Prosthetic treatment needs, such as repair, rebasing or renewal of dentures, were

seen in 37.0-81.0% of residents.[4,22,27,30,39,44,45,53,62] The need for extractions varied from 30.0% to up to 68.0% of dentate residents [22,30,39,44,45,] with a Belgian study stating a mean of 3.0 (SD 4.3) extractions necessary per dentate resident.[4] These findings are similar to Dutch studies, where in 13.0-34.0% of dentate residents, an extraction was deemed necessary.[52,53] Periodontal treatment needs were found in the vast majority of dentate residents (56.0-79.0%), covering the need for debridement or periodontal surgery.[30,35,39,44,53] Last, restorative treatment needs varied greatly, from 3.5% in Poland to 50.0% in The Netherlands.[4,30,39,44,53] Only one study reported the need for acute interventions (severe pain and/or suspected life-threatening inflammation), being necessary in only 2.4% (n = 22) of the residents.[51]

Oral health assessment instruments have been used as a needs assessment instrument for intramural care for older people, but also by researchers as a tool for data collection. Nine studies reported oral health outcomes using the OHAT (Oral Health Assessment Tool)[26,28,47,67], the ROAG (Revised Oral Assessment Guide)[2,27,29,80], and the RAI.MDS 2.0[43], which adds the option of nursing staff collecting data. In the studies using OHAT, 20 to 46.8% of residents were having a 'healthy mouth' and 16.7 to 28% an unhealthy oral status. In a Swedish study using ROAG-J (Jönköping), 74% of Swedish residents presented with two or more problems.[2]

Perceived (subjective) treatment needs, determined by the residents, were described by ten studies[5,8,9,22,30,39,45,60,61,90] and varied between 27.0% of residents in a Polish study reporting being aware of dental treatment needs, to 39.9% of institutionalized older people in an Italian study perceiving need for oral care.[39,61] Perceived prosthetic treatment needs varied between 6.4% and 34.4% depending on the outcome measure.[8,22]

Not all outcomes were narratively described, more details can be found in the tables with the summary of findings, see supplementary Tables 3.1-3.5.

Conflicts of interest

There are no conflicts of interest to disclose.

Discussion

The aim of this systematic review was to give a broad overview of clinical and subjective oral health outcomes of care home residents in Europe. The literature contained studies of variable quality and methodological limitations were encountered. Overall, care home residents presented with few natural teeth, and high prevalence of dental caries. Oral hygiene was insufficient, both for the natural teeth and for removable dentures and few residents were seen with a healthy periodontium. Perceived treatment needs were high, with at least a third of care home residents reporting poor oral health. The Global Burden of Disease 2019 Study stated that oral disorders are one of the main drivers of disability among adults aged 70 years and older.[95] Care home residents have poorer oral health than community-dwelling older persons [11,96] and especially compared to the overall population.[97–99] Moreover, cognitive impairment and even dementia are very common among care home residents and the majority of studies in this review included such residents; this is a further risk factor for oral health and complicates the provision of care to this vulnerable population[100]. In this context, the current body of evidence shows a heavy burden of oral health problems in care home settings across Europe, irrespective of differences in health care systems, organization of long-term care for older care-dependent people, and number of care home beds in proportion to their general population.[101,102]

As outlined in the introduction, Wong et al. (2019) conducted a systematic review on the oral health of care home residents worldwide, including studies that reported both on epidemiologic data and oral health determinants. Because of the inclusion criterion of determinants in their search strategy, this yielded just 11 studies from Europe; therefore, a major part of relevant European literature was not included in that review. The aim of this systematic review was to give a broad overview of all the available evidence on oral health outcomes of care home residents in Europe, thus including 83 publications, which was a strength as it covered the relevant literature comprehensively.

This review has focused only on studies originating from Europe. It is well acknowledged that there are different care characteristics, including staffing and provision, for institutionalized older adults between the different European countries, as long-term care and oral health are organized nationally or even regionally. However, there are also similarities in the overall context and policy formulation at European level. The European Pillar of Social Rights on long-

term care is calling for the “right to affordable long-term care services of good quality, in particular home-care and community-based services”, while public health is also within the policy remit at the European Union level.[103] The recent WHO Oral Health Action plan that also focuses on ageing and vulnerable groups will need to be tailored for Europe through cooperation of European countries (and institutions) with the WHO Regional Office for Europe and this presents an excellent opportunity for collaboration and action[104]. Within that context, it makes sense to focus on Europe rather than specific countries or even globally, and this review can help as a background for discussion on policies to improve the oral health of older adults in care homes in Europe, while also considering the local context.

As stated in the methods, residents from psychiatric facilities and persons with disabilities were excluded. Although these residents are also clearly vulnerable and at risk for poor oral health, the organization and provision of care in these facilities is fundamentally different than in a care home setting. For example, there is generally less focus on personal hygiene in psychiatric facilities, the age range of residents for both psychiatric and disability care is wider with also younger people cared for, and as such the risk profile is also different than in a care home population. Moreover, in the aforementioned institutions care is provided by a different range of professionals, and the social network surrounding residents with disabilities is also different, thereby also precluding the grouping of these distinct vulnerable population groups in the same category.

As is the case with most systematic reviews, there was considerable variation in quality between the included studies. This was partly due to the more relaxed threshold for inclusion of studies in this review. If the Qualsyst tool suggested quality threshold of 60% was followed, 17.0% of the studies would have been excluded from the present review. As the data for some countries was very limited and the scope of this systematic review was to give a broad overview of the oral health of care home residents, including as many countries (and studies) as possible, some lower quality studies were included in the synthesis, most coming from countries underrepresented in the relevant literature (e.g. Iceland, Poland, Croatia, Lithuania). However, when comparing the overall results from the lower quality studies with the studies of acceptable quality, the outcomes within the same range and would not impact on our conclusions. Poor quality was most evident in the sampling strategy, where several studies used a convenience sample or failed to report adequately on the sampling methodology. Due

to the lack of representativeness of the majority of the samples used, inferences from the results of this systematic review to the wider target populations should be done carefully and acknowledging the methodological limitations. Moreover, measurement tools and methods varied across the different studies, therefore hindering comparisons between them. The employed measurement tools were often not validated, raising concerns about the usefulness of the collected information.

This systematic review did not contain a meta-analysis. For most outcome measures, a meta-analysis was impossible due to the large methodological variation in data collection. For some outcomes (e.g. edentulousness, number of natural teeth, untreated dental caries), there was an appropriate amount of data to allow for meta-analysis, but due to the limited representativeness of the samples from their respective countries and the over-representation of certain countries, a meta-analysis of these outcomes wouldn't have led to a useful summary measure for the European region.

The vast majority of studies reported on clinical measures, while there was generally a scarcity of subjective outcome measures. Patient Reported Outcome Measures (PROMs) are equally relevant for all age groups, and it could be argued that this is particularly the case for the older, care-dependent adults. However, including PROMs among a population with high prevalence of cognitive decline is also not without limitations. As this review demonstrated, a core outcome set would be beneficial for future research in order to compare and aggregate data of different countries. A set of standardized patient-centered outcome measures for oral health in care-dependent older people is currently being developed.[105]

Nevertheless, these results are the best estimates extracted from the available literature and they provide an overall picture of the oral health of care home residents that has considerable implications for public health and health and social care services. The findings of this review showed a need for substantial policy action to maintain good oral health across the life span, especially when becoming care-dependent and to assure access to oral health services for care home residents. First steps have been taken by United Nations, including dental care in the action area "integrated care", thus incorporating oral health in "the decade of healthy ageing (2021-2030)" policy.[106] This, and the current WHO Global Oral Health Strategy and Draft Action Plan on oral health should be an urgent call to action for policy makers, whose

work is needed to make oral health a structural part of person-centered integrated care for frail older adults.[99] The roll-out of comprehensive oral health promotion interventions should be supported by the European Union and its governments, where oral health care could be improved through the integration of oral health into broader system initiatives and the collaboration of different health and social care professionals. The workforce needed to integrate oral health in the care for dependent older persons, goes beyond oral health professionals, and will need a multidisciplinary approach including but not limited to nursing care staff, general practitioners, geriatricians, occupational therapists, speech therapists, nutritionists and social care workers. The role of potentially upskilled informal community caregivers will also be increasingly important in preventive care. [107]

Conclusion

There is a high prevalence of oral conditions and burden of oral health problems among care home residents across Europe, irrespective of the country or health and social care system. This evidence shows that oral health care needs should be seen as a priority for substantial policy action to promote oral health across the lifespan and improve oral healthcare provision in care homes through integrated care.

Supplementary files

Supplementary file 1: Search strategy

Supplementary file 2: Qualsyst Tool for Quantitative studies: blanco

Supplementary table 1: Table of excluded studies

Supplementary table 2: Details of quality assessment with Qualsyst tool of included publications

Supplementary table 3.1-3.5: Summary of findings

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Tables & figures

Legend

Table 1: Oral health outcomes used in data extraction form

Table 2: Results of Qualsyst quality assessment of included publications

Figure 1: PRISMA 2020 Flow-diagram of study selection

Table 1 Oral health outcomes used in data extraction form

Study details	Author Author contact details Bibliographic reference Country Study design Year of publication
Information on participants	Mean age Age range Setting Number of participants % of participants with dementia or MCI* Number of care homes Sex
Clinical oral health outcomes	% dentate Mean number natural teeth % edentulous % removable denture Oral hygiene: dental plaque Oral hygiene: denture plaque Oral hygiene: tongue plaque Oral debris DMFT † Caries (root caries) Retained roots Periodontal disease Gingival bleeding Calculus Denture stomatitis (candidiasis) Dry mouth Other oral pathologies Clinical treatment needs Aggregate measures Other clinical findings
Subjective oral health outcomes	Self-rated oral health OHRQoL‡ Perceived (subjective) treatment needs Xerostomia Oral pain or discomfort Oral hygiene habits Dental attendance patterns Chewings problems Swallowing problems Other subjective findings

*Mild Cognitive Impairment

† Decayed, Missing, Filled Teeth

‡Oral Health Related Quality of Life

Table 2 Results of Qualsyst quality assessment of included publications

	QUALSYST CRITERIA	YES (2)	PARTIAL (1)	NO (0)	N/A
1	Question / objective sufficiently described?	96%	2%	2%	
2	Study design evident and appropriate?	88%	8%	4%	
3	Method of subject/comparison group selection or source of information/input variables described and appropriate?	77%	13%	10%	
4	Subject and comparison group (if applicable) characteristics sufficiently described?	69%	24%	7%	
5	If interventional and random allocation was possible, was it reported?	6%	2%	1%	91%
6	If interventional and blinding of investigators was possible, was it reported?	5%	0%	6%	89%
7	If interventional and blinding of subjects was possible, was it reported?	1%	1%	6%	92%
8	Outcome and (if applicable) exposure measure(s) well defined and robust to measurement / misclassification bias? Means of assessment reported?	64%	31%	5%	
9	Sample size appropriate?	59%	28%	13%	
10	Analytic methods described/justified and appropriate?	67%	27%	6%	
11	Some estimate of variance is reported for the main results?	69%	16%	15%	
12	Controlling for confounding?	35%	8%	57%	
13	Results reported in sufficient detail?	62%	30%	8%	
14	Conclusion supported by the results?	77%	18%	5%	