A systematic review of the methodological and reporting quality of case series in surgery

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Abstract

Introduction

Case series are an important and common study type. No guideline exists for reporting case series and there is evidence of key data being missed from such reports. The first step in this process of developing a methodologically sound reporting guideline is a systematic review of literature relevant to the reporting deficiencies of case series.

Methods

A systematic review of methodological and reporting quality in surgical case series was performed. The electronic search strategy was developed by an information specialist and included MEDLINE, EMBASE, Cochrane Methods Register, Science Citation index and Conference Proceedings Citation index, from the start of indexing until 5th November 2014. Independent screening, eligibility assessments and data extraction was performed. Included articles were then analysed for five areas of deficiency: failure to use standardised definitions, missing or selective data (including the omission of whole cases or important variables), transparency or incomplete reporting, whether alternate study designs were considered and other issues.

Results

Database searching identified 2,205 records. Through the process of screening and eligibility assessments, 92 articles met inclusion criteria. Frequencies of methodological and reporting issues identified were: failure to use standardised definitions (57%), missing or selective data (66%), transparency or incomplete reporting (70%), whether alternate study designs were considered (11%) and other issues (52%).

Conclusion

The methodological and reporting quality of surgical case series needs improvement. The data indicate that evidence-based guidelines for the conduct and reporting of case series may be useful.

Introduction

A case series is an uncontrolled study that either samples participants with both a specific intervention (exposure) and a specific outcome, or samples participants with a specific outcome of interest regardless of their exposure status.[1] A series sampled only on exposure is a cohort study. Reports of case series are commonly a retrospective review of a string of patients with a unifying feature - be that exposure (including treatment) or outcome, or both. There has also been significant confusion between case series and a single group cohort study.[2] Case series are frequent within the healthcare literature but are also present within social sciences and the humanities.[1] As with case reports, their value has been debated.[3,4] In the age of evidence-based medicine (EBM), with the randomised controlled trial as the criterion standard to show the efficacy of a particular treatment, what is their role?

The use of a case series in the recognition of a new disease was exemplified in 1999 by the epidemic of West Nile encephalitis in New York.[5] Historically, case series were important in identifying the impact of maternal drinking and pregnancy outcome and the role of vitamin C in preventing scurvy.[6,7] More recently, a study by Albrecht et al of case series published in *The Lancet* found that a high proportion led to follow-up trials and that they were useful in establishing an early evidence base for treatments of rare diseases in which trials would not be feasible.[8] For some specialties, establishing control groups may be difficult, such as in accident and emergency medicine. In the social sciences, many social psychology studies have been case series, for example Yale psychologist Stanley Milgram's seminal work on obedience to authority figures.[9]

In a 2005 report, Dalziel et al found that case series were used in 30% of Health Technology Assessments (HTA) used in the provision and suitability of care.[10] Poor reporting in the case series included in their study, however, severely constrained their analysis and investigation of the hypothesis that findings in case series may be affected by methodological characteristics.[10] Readers need complete, transparent information in all reports of research. Poor reporting of case series undermines critical appraisal, assessment of external validity and whether, for instance, a surgeon should change their practice.

No standardised reporting criteria have been developed within a robust methodological framework for case series. The aim of the present study was to close this gap and produce

a reporting guideline for case series that is methodologically robust, easy to use and accepted internationally across a broad range of specialties and disciplines. Following guidance on guideline development, the early steps in this process require an analysis of previous literature to identify previous guidance (if any) and to analyse relevant evidence on the quality of reporting of published research articles within the domain of interest.[11] This phase of the study involves a systematic review of the reporting within published surgical case series.

Methodology

This systematic review was conducted according to the recommendations outlined in the Cochrane Handbook version 5.1.0 for Systematic Reviews and reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.[12,13] A protocol was developed and registered on the National Institute of Health Research (NIHR) – PROSPERO database (CRD42015016145).There were no deviations from the protocol during the conduct of this study.[14]

Criteria for selecting studies

The following search criteria were devised to locate studies specifically pertaining to the reporting quality of case series within surgery and to inform the development of recommendations for reporting such studies.

Types of studies/material

Research articles and systematic reviews which highlight reporting issues within case series.

Types of participants

Human participants undergoing surgery.

Types of interventions

Any surgical intervention.

Types of comparator

Typically case series will have no comparator or control group. Nothing was specified here within the search criteria.

Outcomes

Specified reporting deficiencies identified within the articles relating to case series and categorized under the following headings:

1. Failure to use standardised definitions (e.g. for outcomes and complications);
2. Missing or selective data (e.g. failing to document loss to follow-up and omitting whole cases or only presenting certain important variables and not others);
3. Lack of transparency or incomplete reporting (e.g. failure to describe the patient population, intervention or outcomes in sufficient detail);
4. Whether alternative study designs were considered
5. Other issues (any other reporting deficiencies of note that did not come under items 1-4 above).

Search methods for identification of studies

Electronic Searches

The following electronic databases were searched from their inception to 5th November 2014: MEDLINE, EMBASE, Cochrane Methods Register and Science Citation Index restricted to the English language. In addition, as part of the 'grey' literature search, the Conference Proceedings Citation Index was also searched.

Search terms and keywords

The search strategy was developed through consultation with an information specialist based at the Bodleian Library, University of Oxford. Its aim was to locate papers related specifically to the reporting quality of case series (*Table 1).* The search was performed on 24 September 2014 from inception of the database to this date. This search utilised English language keywords combined with Boolean logical operators. The search was restricted to the English Language and tailored to the idiosyncrasies of each database.

An example of a search strategy for the MEDLINE database is shown in *Table 1.*

Table1 ideally here

Identification and selection of articles

Studies identified by the electronic search strategy were listed. Results including citation, title and abstracts were populated into Microsoft Excel® Database (Microsoft, Redmond, WA, USA) and duplicates removed. Titles and abstracts were screened independently by two teams of authors for issues relating to the reporting quality of case series. Articles selected after title and abstract screening had their full text downloaded and a further assessment was made of eligibility. Once articles were selected for inclusion, data extraction took place. Any conflicts in either the eligibility of articles or the data extracted from them, not resolvable between the two teams were referred to a single senior author for resolution, selected on the basis of recent experience with multiple other published systematic reviews.

Data extraction and management

Data was extracted independently by two teams of authors using a standardised data extraction form. Disagreements were resolved by discussion. Where resolution was not achieved, the same senior author as in the preceding section made a final decision. Data were then entered into a Microsoft Excel ® 2011 database (Microsoft, Redmond, WA, USA).

Data Synthesis and statistical analysis

Outcomes were tabulated, with descriptive statistics used to determine frequently missing types of data within reports of case series.

Subgroup Analysis

A sensitivity analysis was performed whereby results from those studies whose primary aim was to assess the methodological and reporting quality of multiple case series (such as a research paper assessing reporting quality of case series), was looked at separately from those articles which simply mentioned an issue in passing in their discussion (such as a single case series or a systematic review related to a particular clinical condition/treatment).

Results

The searches identified 1,374 records. Through the process of screening and eligibility assessments 92 articles, published over the period 1990 to 2014, were selected for inclusion (*Figure 1*).

Figure 1. PRISMA flow diagram (adapted from Moher et al, 2010[13]), ideally here

Within the two independent reviewing teams there were discrepancies over whether 46 of the 274 papers (17%) should be included. Of these 46, there were 45 which were rejected and one was included in the final list to go forward into the qualitative synthesis. When it came to data extraction there were discrepancies over 105 of the 460 points (22.8%), that could not be resolved by discussion between the two teams and which were resolved as per protocol.

Results are summarized in *Table 2*.

Table2 ideally here

Subgroup Analysis

There were three systematic reviews and eight articles where the aim was to specifically investigate the methodological and reporting quality of case series. The results are summarised in *Table 3*.

Table3 ideally here

The main “other issues” identified in this cohort include failure to clearly define the patient population under investigation, selection bias insufficient follow-up time, need for validated outcomes (even if the ones used were well defined).

Discussion

The results show that surgical case series suffer from methodological and reporting issues. These can essentially be broken down along the five main lines of enquiry anticipated with high percentage frequencies across all areas studied. The other issues can be further segmented with sample size calculation, patient population definition, follow-up time length and whether outcomes are validated.

The value of case reports and case series has been questioned in the evidence-based medicine (EBM) era. Hoffman has stated that “more often than not”, new ideas from such work are not sustained on further research.[15] The focus of EBM is in finding the ‘best’ available research evidence to answer a given clinical question. The ‘best’ will have the least bias and is more likely to get us close to the truth of a given clinical question. However, is the poor reputation of the surgical case series the ‘fault’ of the concept, rather than its methodological and reporting execution? This systematic review clearly shows that those assessing case series often highlight areas that could have been improved through better conduct and reporting within the construct of the case series design.

Problems with the reporting of surgical case series have been documented in a recent systematic review of autologous fat grafting for breast reconstruction.[16] In this study, 25 of 31 included studies were case series. Failure to correctly define the patient population

under investigation, their demographic details and previous treatments is important, yet 20% did not mention the age of the participants and 48% did not mention whether the participants had been treated with radiotherapy, an important prognostic factor.

It has been noted elsewhere that there are few formal assessments of how often the conclusions based on cases and case series are actually correct.[17] This was highlighted in an investigation assessing side effects reports, where 35 of 47 anecdotal reports were qualified as "clearly correct". Hence the predictive record of unstructured observations may be valuable.[18] Furthermore, two modeling exercises have shown that case reports are likely to pick up true associations, for either rare diseases or more common diseases with a high relative risk.[19,20] Indeed such types of association led to the detection of "flock-workers lung".[21]

So when should a case series be performed? Vandenbroucke argued in defence of case reports and case series, and listed their potential roles as[22]; the recognition and description of new diseases, the detection of drug side effects (adverse or beneficial), study of the mechanisms of disease, medical education and audit, and the recognition of rare manifestations of disease

For surgical case series specifically, we advocate the following reasons can be advocated: rare diseases or rare circumstances (e.g. emergencies), new diseases – their description, natural history and management, studying the mechanism of disease and studying the impact of established procedures. In addition, late or delayed effects following surgical interventions, such as biliary malignancy after bilio-digestive anastomosis, could be collated into a case series.

Where a new technique or device has been conceived and requires development and assessment, then the IDEAL (Idea, Development, Exploration, Assessment and Long-term follow-up) framework is recommended[23].

In the on-going drive to improve the evidence base for clinical practice, a number of tools have been developed to improve the quality of reporting research. For example publication of CONSORT (Consolidated Reporting Standards of Randomised controlled Trials) has seen the quality of articles in some fields improve significantly.[24,25] The CONSORT statement has also been used to highlight and raise awareness of poor compliance in some fields.[26,27,28,29,30] The same is true of observational studies using the STROBE guideline

(strengthening the reporting of observational studies in epidemiology).[31]

A wide variety of reporting guidelines are now available across different research study types, from case reports to systematic reviews, but case series are a notable exception.[32,33] Surgery has the additional complexity of learning curves. The surgical technique selected is not the sole factor affecting outcome. Patients need to be carefully selected, appropriately worked-up, the technique has to be meticulously implemented in an appropriate setting with the relevant safe anaesthesia and with an appropriate post-operative setting/regimen. The entire package has to be delineated and documented in case series in order to be reproducible by others.

Strengths of this review include conduct by a group with significant interest and experience in this area of methodological and reporting quality.[34,35,36,37,38] Limitations include restriction to the English language, although it has been estimated 80–90% of papers in scientific journals are written in English.[39] No synonyms for "case series" were used , as none of the authors was aware of any. The potential to have missed relevant articles in the search or incorrectly scoring the articles was hopefully minimised by having two teams that independently selected and scored articles.

The group's focus will now shift towards developing a guideline for the conduct and reporting of a case series. This has been named **PROCESS** – **P**referred **R**eporting **O**f **C**as**E** **S**eries in **S**urgery and has been registered on the EQUATOR Network site – a repository for reporting guidelines.[40] This systematic review has now provided the initial items for an expert panel to consider through a Delphi consensus exercise.

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