

METHODS

A modified Delphi study was conducted to achieve consensus on a checklist of items to be included in a reporting guideline for patent landscapes. We did not, *a priori*, limit the number of rounds of the Delphi study; rather, it continued until pre-defined stopping criteria were met. This occurred after two rounds. The modified Delphi study was followed by a phase in which the identified items were consolidated into a final checklist.

The Delphi Process

The Delphi process can be described 'as exercise in group communication that brings together and synthesizes the knowledge of a group of geographically scattered participants who never meet'¹. The aim is to achieve consensus on a topic or series of questions through structured communication between a panel of experts². The process is systematic and iterative, in that successive rounds of questioning are used, with information gathered from each round communicated back to experts in a standardised format. The process ends when consensus is achieved, or opinion fails to change between rounds.

Sample Identification and Selection

We previously conducted a systematic review of patent landscapes, during which the name and email address of the first and senior authors of included manuscripts was noted, creating an initial list of experts suitable for inclusion. The authors also suggested potential experts for inclusion in the study and supplementary internet searches were conducted for individuals with relevant expertise. These individuals were contacted if they met the inclusion criteria, as determined by one of the authors:

Inclusion criteria

- 1 Author on a published patent landscape/ analysis study
- 2 Involved in production of patent landscapes in a commercial setting
- 3 Previous experience in development of guidelines for the reporting of research

Consensus on the number of individuals that should be recruited to a Delphi study is lacking³; however, the minimum number generally used appears to be around ten⁴, and the median number of participants involved in developing reporting guidelines is approximately 22 (ref: ⁵). Given that we expected the number of available experts available to be lower than in some other areas of guideline development, and in anticipation of response rates between Delphi rounds of approximately 90%¹, we aimed to recruit 20 participants. Once 20 participants had been recruited, the Delphi study was commenced. Participant characteristics are illustrated in Supplementary Figure 1.

Identified experts were invited to participate through a standardized email template, which included a study information sheet and participant consent form. Individuals were sent reminder emails one and two weeks after initial invitation; if they failed to respond, there was no further communication.

Questionnaire Production and Structure

The initial survey round represented an over inclusive list of reporting items that could theoretically be reported in a patent landscaping study (Supplementary Table 1). These were agreed upon through searches of the extant literature, results of our previous systematic review, and consultation with

experts. Questionnaires were pre-tested by an individual not involved in the initial production of the questionnaire prior to final distribution to ensure face validity and flow^{6,7}.

Each questionnaire consisted of seven themed sections based on the format of a standard research paper to facilitate the placement of items into appropriate categories in the final reporting guideline. These themes were: title, summary/abstract, introduction, methods, results, discussion and other. Each question consisted of a potential item for inclusion in the guidelines. Respondents were asked to rate the item on a ten point Likert scale; ten and one denoted the participant strongly agreed, or strongly disagreed with the item's inclusion, respectively. In situations where degree of agreement is sought, this scale is commonly used⁴. An answer of 1-4, and 7-10 indicated that the item should be excluded or included in the guidelines, respectively. An answer of 5 or 6 denoted that the respondent was unsure.

To facilitate the inclusion of new question items in each round, and reasoning for specific responses, free text responses were possible at the end of each themed section. As such, both quantitative and qualitative responses were collected. Data regarding the panel of experts such as age, occupation, and location was also recorded.

Based on comments received during the first round of the Delphi study, we proposed a definition for a patent landscape in the second round which was assessed for agreement and consensus in the same manner as reporting items.

Data Collection

The purpose of each round of the survey was to reach consensus on proposed items and to gather qualitative responses to determine if any additional items should be considered. In addition, round two aimed to address any comments raised by participants in round one.

Once an individual had agreed to participate, an email, including a link to complete the survey, was sent in which they were asked to complete the survey within two weeks. If an individual failed to complete the survey in the allocated time they were sent two reminders. Failure to respond within a fortnight of the initial reminder resulted in exclusion. There was a five-week period between each survey round to allow time for data analysis, survey construction, and pre-testing.

When consensus was reached on an item, it was removed from the subsequent round of the questionnaire. Quantitative responses and a summary of the items on which consensus was achieved were fed-back to respondents using descriptive statistics (see *data analysis*) in the subsequent round. This process was repeated until stability and/or consensus was reached on all items, until response rates fell below the critical value of ten individuals⁴, or until the number of items on which consensus was not reached became impractically low (less than 5). This occurred after two rounds.

Questionnaires were delivered and responses collected in SurveyMonkey, (www.surveymonkey.com).

Data Analysis

We considered consensus to be achieved when an item achieved an inter quartile range of two on a ten point Likert scale in one round of the survey^{8,9}. For an item to be included in or excluded from the

checklist, greater than 75% of experts had to agree that it should be included (a value of 1-4) or excluded (a value of 7-10). When question items met these criteria, they were not included in the next Delphi round.

The Kappa test was used to assess the stability of responses between rounds; it was agreed amongst the central research team that at least moderate consensus¹⁰ (0.41 or above) would represent stability, based on Cohen's suggested interpretation¹¹. If responses were stable between two rounds and consensus had not been reached, the authors discussed the items and determined whether or not they should be included.

Descriptive statistics including the mean, mode, median, range, standard deviation, and interquartile ranges were calculated for each item in each round. The group mean, standard deviation, median, and range were reported back to respondents. These parameters were chosen as they are universally understandable and provide a quick means for respondents to assess the results of survey rounds.

Free text responses were manually reviewed and if additional reporting items were suggested they were included in the following round.

All statistical analyses were carried out in R (v3.2.1).

Round One

The initial survey round represented an over inclusive list of 57 reporting items that could theoretically be reported in a patent landscaping study (Supplementary Table 1). These were agreed upon through searches of the extant literature, including the PRISMA checklist¹², results of our previous systematic review¹³, and discussion amongst the authors. In round one, consensus was reached on the inclusion of 38 items in the checklist which were not included in the subsequent round, and one item which was removed due to similarity in meaning to another item in the checklist. No items were excluded (Supplementary Table 1).

Round Two

The second round included a total of 22 items, of which four were new items added as a result of qualitative responses provided during round one (Supplementary Table 2). The group mean, standard deviation, median, and range of scores for each item remaining from round one were reported back to respondents. Consensus was reached on the inclusion of ten items and the exclusion of eight items. For two items, consensus was reached but the inclusion or exclusion criteria were not met, and thus the outcome was unclear. For two further items, consensus could not be achieved but responses were stable.

In addition, in the second round of the study, we proposed a definition of a patent landscape, on which consensus and agreement was reached.

Consolidation of Consensus Items

At the end of round two, consensus had been reached on the inclusion of 48 items in the reporting guideline. Because having a large number of reporting items in a checklist is likely to reduce its practicality and usability, and because reporting guidelines include a median of 21 checklist items¹⁴,

the authors consolidated the consensus items into a 19 item checklist, grouping related items into single items. 46 of the 48 items on which consensus was reached are represented in the final checklist; two items were removed due to ambiguity of meaning. Two additional items were added in the consolidation phase following suggestion by co-authors, resulting in a final 21 item checklist. The final checklist was checked for comprehension and unambiguity by all authors and revised where required.

Post-publication Activities

Any feedback on this checklist is welcomed to the corresponding authors of this paper. As stated in the body of the paper, should feedback or changing practices warrant changes to reporting requirements, the guidance will be updated.

Ethical Approval

The Central University Research Ethics Committee (CUREC) granted ethical approval to carry out the modified Delphi study under reference R46326/RE001.

EXPLANATION OF REPORTING ITEMS

Reporting items are grouped according to the typical structure of research articles. We recognise that, in some cases, reporting in this format may not be appropriate and information may need to be included in the supplementary materials or elsewhere in the manuscript. However, this format provides a useful framework for discussing the items. Additionally, recognising that patent landscapes represent original research that others may wish to scrutinise or replicate may improve reporting quality and, therefore, reporting in a structured, research article format may be preferable when possible. In our systematic review¹³, research articles were reported marginally but significantly better than review articles. Here, we briefly explain the rationale for each item in the checklist. Where there is overlap with items in other guidance, similar rationale is provided here^{15–18}.

Title

Item 1, Title: Identify that the article includes a patent landscape and state the subject matter under investigation (e.g. gene editing technologies)

Information or insight in patent landscapes can only be used if the studies can be identified. Given the increasing number of research articles published¹⁹, identifying relevant literature is challenging and lack of ability to identify papers may lead to wastage and duplication of effort. Stating that an article is a patent landscape in the title is therefore important. For the same reasons, the subject matter should be included in the title. Delphi participants did not think that the main conclusion of the article should be stated in the title, possibly mirroring other concerns that doing so can exaggerate findings¹⁵.

Summary/Abstract

Item 2, Abstract: Provide a summary which includes the background, rationale, results and main findings in the context of the aims

Abstracts provide important information that allows the reader to determine whether the full article should be read, and, with the title, may be the only information available to readers¹⁵ (e.g. if articles are behind a paywall). As a minimum, the reader should be able to understand the background and rationale of the study, the results and the main findings in the context of the aims. If journal policy permits, including methodological information is also useful; however, key journals publishing patent landscapes permit only short abstracts for patent articles (e.g. ^{20,21}) so this may not always be possible.

Introduction

Item 3, Rationale: Describe the rationale for the study, including relevant background information and the potential impact of the investigation

Patent landscapes may be conducted for a number of reasons already outlined. Therefore, it is important to understand the specific rationale for the reported study to allow readers to determine relevance. This would typically include briefly discussing current evidence or work in the field and its limitations, along with what the patent landscape hopes to add to this work and why that is useful.

Item 4, Aims: Describe the aims of the study

Providing an explicit statement of the question being addressed by the patent landscape is essential. The aims should allow the reader to understand the article's scope and therefore applicability. Explicit aims are particularly important because they assist in determination of methodological elements¹⁵ (e.g. patent eligibility criteria and analysis) and facilitate critical appraisal of the study¹⁷. Stating that the aim was "to review the patent landscape of X" is not sufficient because the term "patent landscape" does not represent a single methodology and patent landscapes can be conducted for many reasons. A statement describing what the patent landscape aims to achieve is more useful, such as: "Our objective in this paper is to shed light on the use of primary and secondary patents by multinational originator companies in Chile and to gauge their effect on creating and maintaining exclusivity"²². In some cases, it may be useful to report aspects of Item 3 with the aims, such as in the following example: "The information resulting from this study may be of value to both R&D managers and researchers in the field by identifying the most relevant technologies and giving an overview of the rFVIII inventions in the last 20 years"²¹.

Methods

Item 5, Search: State the databases and patent offices searched, the dates on which searches were conducted, and the components of the patents searched. Include the search terms used for all databases searched

Depending on the aims of the patent landscape and availability of resources, different databases and patent offices may be searched. Searching different databases and patent offices leads to different results (e.g. European patents vs. US patents) so the details must be disclosed for the purposes of reproducibility and determination of applicability. Similarly, the dates for searches (including any prior date restrictions) and components of patents searched (e.g. title, abstract, whole text, inventors, classifications) influence the retrieved patents and must be reported. Developing search terms is a time consuming process requiring subject matter expert input²³, and search terms, therefore, represent a valuable resource. Reporting the full search terms, including specifying for which databases they were used, allows searches to be re-run simply. This is useful for critically appraising articles, reproducing findings, and updating landscapes. If possible, the dates and components of the patents searched should be incorporated into the search terms. Using patent classification codes, such as international patent classification (IPC) or cooperative patent classification (CPC) codes, to narrow search results is often useful; details should again be included in the reported search terms. Supplementary materials are often an appropriate location for search terms given their complexity and potential size. Useful guidance on quality control for patent search strategies is available²⁴.

Item 6, Selection criteria: Include details of the selection criteria of patents to be included in the patent landscape, including the subject matter of those patents

There are a large number of published patents, and the perceived relevance of a patent to a particular research question could vary between researchers. Reporting the selection criteria for patents included in the landscape is, therefore, important for understanding the landscape's comprehensiveness, validity and applicability. If any sorting of patent documents is conducted the selection criteria are also essential for reproducibility. Selection criteria should include information such as: language restrictions, jurisdiction(s) of interest, patent status (e.g. applications, grants, all), and, importantly, subject matter. Subject matter should include the general field of interest (e.g. small molecule therapeutics for melanoma) but also, if applicable, which patents within that area are relevant (e.g. product, manufacturing, all).

Item 7, Identification of relevant patents: If applicable, state how patents identified in searches were sorted for relevance

Patent search results often require sorting to remove irrelevant documents, either computationally, through manual review, or both. If applicable, details of this process should be reported to allow reproducibility and assessment of the likely levels of noise in the data. Reported information should include which parts of the patents were used in sorting for relevance (e.g. title, abstract and claims were reviewed to exclude irrelevant patents), who conducted the sorting or which software was used, and any measures taken to enhance objectivity, such as repetition of part or all of the process by an independent investigator. If input from experts, such as subject matter experts or patent agents was sought, this should be stated. If identified patents are not sorted, for example because the number of documents is impractically large, this should be reported.

Item 8, Data extraction: List and define all information that was collected from the patent documents in the patent landscape (e.g. technical area, date of publication), any software used to extract the data, and the protocol if the information sought from a patent document was not available

In almost all forms of patent landscape, some information is extracted from patents and defining it is essential to understand later analysis. Examples include the date of patent publication, the technical area of the patent, inventor or assignee names, patent classification codes and number of claims. Details of the information extracted from each patent should be reported and if software was used for extraction, information such as name and version should be given. If an information extraction sheet was used, providing it may be useful. As in Item 7, if applicable, any measures to enhance objectivity and input from experts should be reported. Information sought from patents may not be available from every patent; the protocol employed in this scenario should be stated as treatment of missing data, or assumptions relating to it, might influence results.

Item 9, Analysis: Describe any analysis and synthesis of results

All patent landscapes, by definition, include analysis of patent documents. This analysis provides the central means by which the aims of the landscape are addressed and is critical to report. Examples of analyses include counts of patents applications or grants over time, citation network analysis, assignee network analysis, thematic clustering, geographical analysis and text-mining^{21,25,26}, all of which differ in the specific procedures. Details of the methods for analysis and synthesis of patent documents should be given that are sufficient to allow reproducibility. This should include details of the software and software version used, any assumptions made about the data, any statistical analysis conducted,

and which information was included in which analysis (for example, a subset of patent documents may be used for certain analyses). Preferably, analysis should be planned in advance²⁷, and noting which analyses were planned post-data collection would be useful.

This item has overlap with Item 12 (data standardisation) in the results section, details of which could optionally be reported in the methods section. Reporting data standardisation in the methods section may be more appropriate if uncommon methods which require explanation are used, such as custom programming scripts. Some aspects of Item 14 (analysis) might also be reported in this section, depending on the details of the analysis. For example, if multiple spatial concept maps are generated, each with different settings, reporting the specific settings alongside the results might be preferred; if multiple thematic spatial concept maps are generated using the same settings, reporting those settings once in the methods may be more efficient.

Item 10, Patent family designation: State the source of patent family designations (e.g. DWPI or INPADOC) if any analysis incorporated patent families

It is often useful to analyse patent families as well as or instead of individual patent documents. Patent families represent distinct inventions, whereas there can be many patent documents associated with a single invention (e.g. multiple national filings). However, there are multiple definitions of patent families and different methods available for generating them, all of which will influence results of analysis and are associated with different limitations²⁸. Common patent family designations include Derwent World Patent Index (DWPI) or International Patent Documentation (INPADOC), or European Patent Office simple patent families but other options are also available. If patent families are used in analysis, their source and definition should be reported.

Results

Item 11, Patent selection: State the number of patents (or patent families) assessed for eligibility, the number included in the study, and the reasons for exclusion at each stage of the process. A flow diagram may be useful

It is helpful for readers to understand how the data collection process resulted in the final patent documents included in the landscape. As a minimum, the initial number of patents returned from searches, the final number of patents included in the landscape, and the reasons for exclusion should be reported (if applicable). Reporting reasons for exclusion is important to assess how the selection criteria were applied. Ideally, the total number of patents retrieved from each search (e.g. of different patent offices or databases) should be stated separately and the effect of combining, collapsing and cleaning the data on the number of documents provided. Flow diagrams are often recommended for similar dataflows in other fields¹⁵, and may be a useful to summarise the steps taken between original searches and arrival at the final dataset(s).

Item 12, Data standardisation: Provide details of any steps taken to standardise or normalise the data. Examples would typically include correcting misspellings, and discussion of assumptions associated with licensing or mergers and acquisitions

Raw patent data is often “messy” and may require cleaning before analysis²⁸. For example, if analysing patent assignees, a single commercial entity may be represented by different suffixes (e.g. Inc. vs Ltd.), or the same suffix presented differently (e.g. Limited vs. Ltd.) and it may be necessary to combine these. There are often misspellings in assignee and inventor names which require cleaning for

accurate results. Mergers and acquisitions may need to be considered and acquired companies combined with their now parent companies. These cleaning steps can be done using automated or manual methods, and details should be provided. As stated in the explanation for Item 9, this information may alternatively be reported in the methods section.

Item 13, Summary: Summarise the patents included in the study (e.g. with reference to the data extracted from them, geographical distribution, temporal distribution)

A summary of the patent dataset is needed to understand its scope and comprehensiveness. As well as number of patents (Item 11), other useful and common summaries include geographical distribution, temporal distribution (noting details as per Item 14) and summarisation of any data extracted from patents (e.g., number of process vs. number of product patents).

Item 14, Analysis: Present and explain the results of any analysis (statistical or otherwise) conducted. Include details of settings used for any analyses (e.g. spatial concept maps). For any temporal analysis, include details of what year convention was used (e.g. earliest priority year, application year, publication year)

The results should be presented and explained such that any decisions made with respect to treatment of the data and details of the analysis are transparent. Many automated analyses have a large variety of settings for customisation, and details of these should be included so that the analysis could be reproduced with the same data. For spatial concept maps, any manual adjustment, such as grouping or exclusion of terms, should be described. For temporal analysis, it is important to state which year convention is used, as year conventions influence results and their interpretation. If different data are used for different analyses, this should be stated and the differences in the data explained. Whether patent documents or families are used for analysis should be stated.

Item 15, List of patent numbers: List the patent publication numbers for any patents included in the study (the supplementary material will often be a suitable location for this)

The patent publications included in the landscape are the data for analysis and underpin the findings of the study. As all of the documents will be available in the public domain, providing a list of the patent numbers included in analysis allows other researchers to repeat or check any analysis without the need to repeat searches and time-consuming sorting steps, and also to directly assess the relevance of data to their interests. In most cases, supplementary material will be a suitable location for this information. Some landscapes include very large numbers of patents so providing a link to a data repository with the information may be preferred.

Discussion

Item 16, Summary: Summarise the main findings, how they relate to the aims, and to whom they may be relevant

A summary of the main findings, how they relate to the original aims, and the applicability of the findings to different stakeholders should be provided, as is common in most research.

Item 17, Limitations: Discuss any limitations of the work in the context of the reliability of the conclusions; include discussion of limitations related to the methodology and software. If applicable, include information relating to how sources of error were reduced

All patent landscape studies are likely to have limitations, and these should be discussed. Methodological limitations can include those related to the data or to the analysis. Often, relatively simplistic analyses are performed which aim to address complex questions. For example, spatial concept maps may be used to identify gaps in technology development. If readers are not closely familiar with the patent landscaping process and the methods for generating spatial concept maps, 'gaps' may be misinterpreted as areas where there is no patent activity. However, without specific analysis of claims such inference cannot be made. Similarly, counts of patents are a common form of analysis but are known to provide little insight²⁹. Limitations in analyses should therefore be discussed so the reader is not misled. Discussing limitations in the data is important to allow assessment of the generalizability of the findings. For example, geographical or language restrictions, or changes in institutional regimes that may influence the observed trends²⁷, would be useful to highlight. Software used in analysis of patent documents also has limitations which should be discussed: for example, automated data cleaning may be imperfect. If sources of error were reduced, for example by manual cleaning, this information should be included.

Item 18, Context: Explain how the findings relate to other studies in the field, how the study builds upon previous work, its potential impact, and implications for future research

If previous work has been conducted in the same or a similar area, a more detailed discussion of the differences between that work and the authors' work is useful at this stage. This should include how the work builds on previous studies, what the impact of the study is and what implications might be for future research.

Item 19, Conclusions: Provide a conclusion which gives a general interpretation of the results in the context of other evidence

A conclusion summarising and providing a general interpretation of the results in the context of the work discussed in Item 18 should be provided.

Other

Item 20, Conflicts of interest: Disclose any potential conflicts of interest

The subject matter of patents is inherently of commercial interest. It is therefore essential that any potential conflicts of interest are disclosed so that readers can assess likelihood of bias. Conflicts of interest should be reported in accordance with journal policy. If no policy is available, guidance is available for medical research reporting that could be used in this context³⁰.

Item 21, Funding: Disclose any sources of funding for the study and the role of the funder in the study, and any other support received during the study (e.g. supply of data)

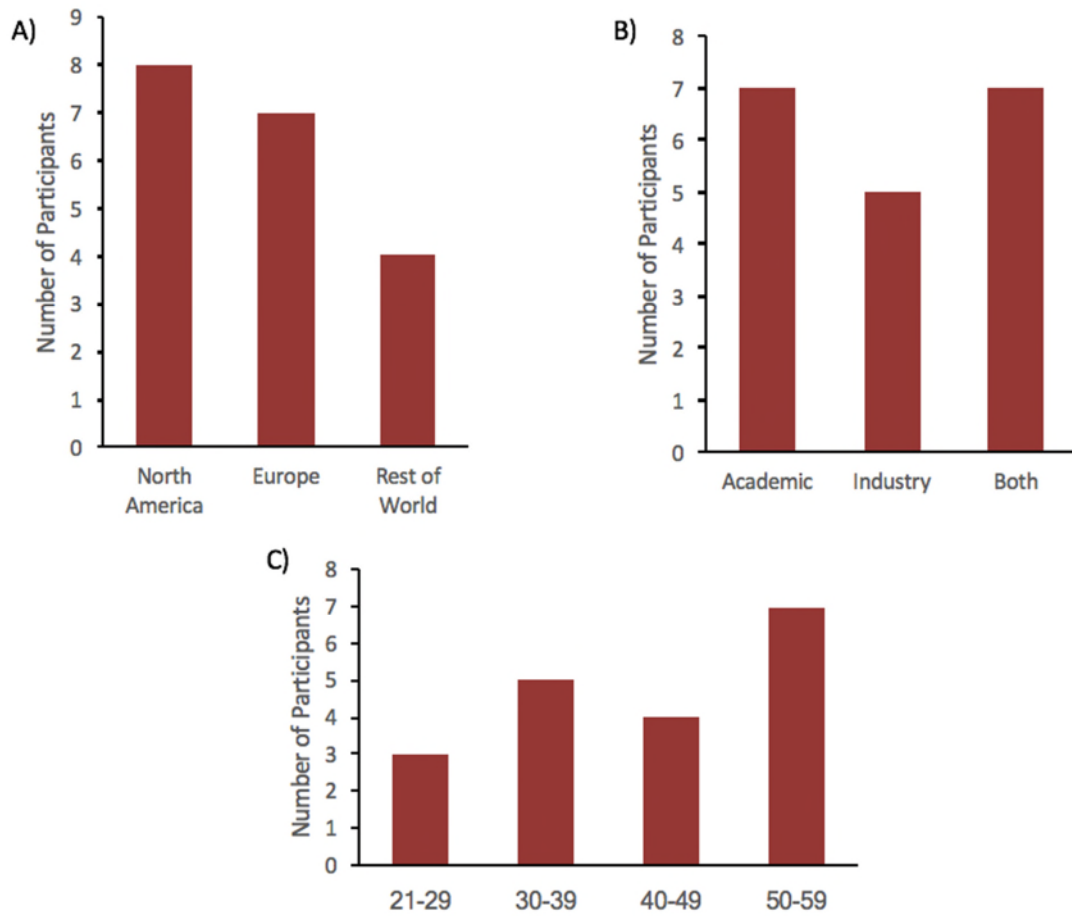
Commercial funding has been associated with increased likelihood of reporting favourable results in other research areas^{31,32}. Disclosing sources of funding is therefore important to allow assessment of credibility and bias, particularly because patent landscapes may be concerned with strategic questions with commercial value. For the same reasons, the role of the funder and any support received during the study should also be reported.

REFERENCES

1. Boulkedid, R., Abdoul, H., Loustau, M., Sibony, O. & Alverti, C. Using and reporting the Delphi method for selecting healthcare quality indicators: a systematic review. *PLOS One* **6**, e20476 (2011).
2. Hasson, F., Keeney, S. & McKenna, H. Research guidelines for the Delphi survey technique. *J. Adv. Nurs.* **32**, 1008–1015 (2000).
3. Powell, C. The Delphi technique: myths and realities. *J. Adv. Nurs.* **41**, 376–382 (2003).
4. Giannarou, L. & Zervas, E. Using Delphi technique to build consensus in practice. *Int. J. Bus. Sci. Appl. Manag.* **9**, 65–82 (2014).
5. Simera, I., Altman, D. G., Moher, D., Schulz, K. F. & Hoey, J. Guidelines for reporting health research: the EQUATOR network's survey of guideline authors. *PLOS Med.* **5**, e139 (2008).
6. Bolarinwa, O. A. Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *Niger. Postgrad. Med. J.* **22**, 195–201 (2015).
7. Burns, K. E. A. & Kho, M. E. How to assess a survey report: a guide for readers and peer reviewers. *CMAJ Can. Med. Assoc. J.* **187**, E198–E205 (2015).
8. Scheibe, M., Skutsch, M. & Schofer, J. Experiments in delphi methodology. in *The Delphi Method: Techniques and Applications* **18**, (1975).
9. von der Gracht, H. A. Consensus measurement in Delphi studies: Review and implications for future quality assurance. *Technol. Forecast. Soc. Change* **79**, 1525–1536 (2012).
10. Anthony, D. *Understanding advanced statistics: A guide for nurses and health care researchers*. (Churchill Livingstone, 1999).
11. Viera, A. J. & Garrett, J. M. Understanding Interobserver Agreement: The Kappa Statistic. *Fam. Med.* **4**
12. Moher, D., Liberati, A., Tetzlaff, J. & Altman, D. G. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ* **339**, b2535 (2009).
13. Smith, J. A., Arshad, Z., Thomas, H., Carr, A. J. & Brindley, D. A. Evidence of insufficient quality of reporting in patent landscapes in the life sciences. *Nat. Biotechnol.* **35**, 210–214 (2017).
14. Moher, D. *et al.* Describing reporting guidelines for health research: a systematic review. *J. Clin. Epidemiol.* **64**, 718–742 (2011).
15. Liberati, A. *et al.* The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ* **339**, b2700 (2009).
16. Shamseer, L. *et al.* Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *BMJ* **349**, g7647 (2015).
17. Moons, K. G. M. *et al.* Transparent reporting of a multivariable prediction model for individual prognosis or diagnosis (TRIPOD): explanation and elaboration. *Ann. Intern. Med.* **162**, W1 (2015).
18. Husereau, D. *et al.* Consolidated Health Economic Evaluation Reporting Standards (CHEERS)—Explanation and Elaboration: A Report of the ISPOR Health Economic Evaluation Publication Guidelines Good Reporting Practices Task Force. *Value Health* **16**, 231–250 (2013).
19. Plume, A. & van Weijen, D. Publish or perish? The rise of the fractional author.... *Res. Trends* **38**, (2014).
20. Roberts, M. *et al.* The global intellectual property landscape of induced pluripotent stem cell technologies. *Nat. Biotechnol.* **32**, 742–748 (2014).
21. Pereira, C. G., Picanco-Castro, V., Covas, D. T. & Porto, G. S. Patent mining and landscaping of emerging recombinant factor VIII through network analysis. *Nat. Biotechnol.* **36**, 585–590 (2018).

22. Abud, M. J., Hall, B. & Helmers, C. An empirical analysis of primary and secondary pharmaceutical patents in Chile. *PLOS One* **10**, e0124257 (2015).
23. Bubela, T. *et al.* Patent landscaping for life sciences innovation: toward consistent and transparent practices. *Nat. Biotechnol.* **31**, 202–206 (2013).
24. Endacott, J. & Poolman, R. Looking for insights – quality control initiatives for enhancing patent searches. *World Pat. Inf.* **1**, 3–7 (2013).
25. Yang, Y. Y., Akers, L., Yang, C. B., Klose, T. & Pavlek, S. Enhancing patent landscape analysis with visualization output. *World Pat. Inf.* **32**, 203–220 (2010).
26. Tseng, Y.-H., Lin, C.-J. & Lin, Y.-I. Text mining techniques for patent analysis. *Inf. Process. Manag.* **43**, 1216–1247 (2007).
27. Gold, E. R. & Baker, A. M. Evidence-based policy: understanding the technology landscape. *J. Law Inf. Sci.* **22**, (2012).
28. World Intellectual Property Office (WIPO). Guidelines for preparing patent landscape reports. (2015).
29. Adelman, D. E. & DeAngelis, K. L. Patent metrics: the mismeasure of innovation in the biotech patent debate. *Tex. Law Rev.* **85**, 1–79 (2006).
30. Drazen, J. M. *et al.* Uniform format for disclosure of competing interests in ICMJE journals. *N. Engl. J. Med.* **361**, 1896–1897 (2009).
31. Bell, C. M. *et al.* Bias in published cost effectiveness studies: systematic review. *BMJ* **332**, 699–703 (2006).
32. Black, N. The Cooksey review of UK health research funding. *BMJ* **333**, 1231 (2006).

SUPPLEMENTARY FIGURES AND TABLES



Supplementary Figure 1: Characteristics of participants completing at least the first round of the study (n=19). A) Geographical location B) Background C) Age

Supplementary Material: The RIPL Statement

Supplementary Table 1: Results from round one of the modified Delphi study (n=19)

[illegible]

Supplementary Material: The RIPL Statement

[illegible]

Supplementary Material: The RIPL Statement

Question Number	Question Item/ Section	Min	1st Quartile	Median	Mean	3rd Quartile	Max	Range	Mode	SD
34.	State number of patents assessed for eligibility	3	9	10	9.1	10	10	7	10	2.0
35.	State number of patents included in the study	5	10	10	9.5	10	10	5	10	1.2
36.	Provide reasons for exclusion at each stage	8	9	10	9.4	10	10	2	10	0.8
37.	Provide a summary of all patents included in the study	3	9	9	8.6	10	10	7	10	1.9
38.	Provide a list of patent publication numbers for patents included in the study.	1	3	5	5.8	8	10	9	5	3.0
39.	Present results of each analysis carried out with explanation of results.	5	9	10	9.1	10	10	5	10	1.6
40.	Provide an explanation of how each analysis contributes to the aims of the paper	2	8	9	8.0	10	10	8	10	2.3
41.	A list of patent publication numbers should be provided, for included patents, for each analysis carried out	1	2	5	5.6	9	10	9	5	3.2
	Discussion									
42.	Provide a summary of the studies findings	5	10	10	9.5	10	10	5	10	1.3
43.	Link the findings of the study to its aims	5	9	10	9.3	10	10	5	10	1.4
44.	Link the findings of the study to other work in the area	3	8	9	8.5	10	10	7	10	1.9
45.	Authors should discuss the potential impact of their work	3	8	8	8.4	10	10	7	10	2.0
46.	Authors should discuss to whom their work may be relevant	1	5	7	6.8	9	10	9	9	2.5
47.	Describe the limitations of the review in context of the reliability of the conclusions	3	9	10	9.1	10	10	7	10	1.7
48.	Discuss the limitations that are related to the methodology of the study	7	9	10	9.4	10	10	3	10	0.9
49.	Discuss the limitations that are related to the software used in the study	2	5	9	7.8	10	10	8	10	3.0
50.	Authors should discuss how they attempted to reduce sources of error	4	7	9	8.2	10	10	6	10	2.1
51.	Conclusion should provide a general interpretation of the results in the context of other evidence	3	8	10	9.1	10	10	7	10	1.7
52.	Conclusion should state how the work has implications for future research	5	8	9	8.8	10	10	5	10	1.5

Supplementary Material: The RIPL Statement

Question Number	Question Item/ Section	Min	1st Quartile	Median	Mean	3rd Quartile	Max	Range	Mode	SD
53.	Conclusion should state how the study builds on previous work	2	4	7	6.7	10	10	8	10	2.9
	Other									
54.	Conflicts of Interest	6	10	10	9.6	10	10	4	10	1.0
55.	Describe sources of funding for the article	6	10	10	9.6	10	10	4	10	1.0
56.	Other support (e.g., supply of data)	6	10	10	9.4	10	10	4	10	1.2
57.	Describe the role of funders for the article	5	8	10	8.8	10	10	5	10	1.7

Supplementary Table 2: Results from round two of the modified Delphi study (n=18)

Question Number	Question Item/ Section	Min	1st Quartile	Median	Mean	3rd Quartile	Max	Range	Mode	SD
	Definition									
1.	"NEW ITEM* Do you agree with this definition? Please indicate your level of agreement by selecting a value between 1 and 10. 10 denotes that you strongly agree, and 1 that you strongly disagree with the definition.	6	8	10	9.1	10	10	4	10	1.3
	Title									
2.	*NEW ITEM* Authors should state the subject matter (e.g. stem cells for cancer, gene editing technologies) of the investigation in the title.	8	10	10	9.6	10	10	2	10	0.7
3.	*NEW ITEM* Authors should state the main conclusion(s) in the title.	1	1	1	2.6	2	10	9	1	3.2
	Summary/Abstract									
4.	Sources of data for the patents included in the review	2	3	3	3.7	3	10	8	3	2.2
5.	Dates data sources were searched	1	1	1	2.5	2.75	10	9	1	3.0
6.	Patent offices searched	1	1	1	2.2	2	10	9	1	2.5
7.	Component(s) of patent documents searched	1	1	1	1.9	1.75	10	9	1	2.3
8.	Methods of analysis of data	2	3	3	3.8	3	10	8	3	2.2

Supplementary Material: The RIPL Statement

9.	*NEW ITEM* Funding information.	1	1	1	2.5	1	10	9	1	3.2
	Introduction									
10.	What the patent landscape adds to the literature – Kappa is 0.67*	1	5.5	10	7.5	10	10	9	10	3.1
11.	For whom the review may be relevant – Kappa is 0.69*	5	7.5	10	8.7	10	10	5	10	1.8
	Methods									
12.	Describe how patent documents were collected (e.g. through search of databases, or application of software).	2	9.5	10	8.6	10	10	8	10	2.4
13.	*NEW ITEM* Authors should specify the definition and source of patent family designations, e.g., Derwent or INPADOC, if any analysis incorporated patent families.	6	10	10	9.4	10	10	4	10	1.1
14.	Methods regarding how included patents were sorted for relevance; 'Relevant patents were included through manual review of the title and abstract of each patent document'	9	10	10	9.8	10	10	1	10	0.3
15.	State that patent selection should be blindly reproduced	1	5	5	5.1	5	10	9	5	2.5
16.	State data collection was shown to be reproducible	1	5	5	5.3	6	10	9	5	2.5
17.	State what was done when this information was not available in a patent document	8	9	10	9.5	10	10	2	10	0.9
	Results									
18.	Provide a list of patent publication numbers for patents included in the study.	2	8.5	10	8.5	10	10	8	10	2.3
19.	A list of patent publication numbers should be provided, for included patents, for each analysis carried out.	1	1	1	2.4	2	10	9	1	2.9
	Discussion									
20.	Authors should discuss to whom their work may be relevant	4	8.5	10	8.9	10	10	6	10	1.6
21.	Discuss the limitations that are related to the software used in the study	3	9	10	8.9	10	10	7	10	1.7
22.	Authors should discuss how they attempted to reduce sources of error	3	9	10	8.9	10	10	7	10	1.8
23.	Conclusion should state how the study builds on previous work	2	9	10	8.3	10	10	8	10	2.7