National Centre for the Replacement Refinement & Reduction of Animals in Research

NC3Rs gateway – Guidance for preparing a Software Tool Article

The aim of this guidance document is to guide NC3Rs funded researchers through the process of preparing a Software Tool Article for the gateway. This document should be used in conjunction with the guidance for authors provided by F1000Research on 'Preparing a Software Tool Article'.

Scope

Software Tool articles should be written with a target audience in mind, typically mammalian/ vertebrate model users. The software tool should be described in sufficient detail to demonstrate the utility of the approach to achieve 3Rs impact, and to encourage adoption by the target audience and wider scientific community. If novel data or analyses is not presented, articles should include examples of suitable input data sets and an example of the output that can be expected from the tool and how this output should be interpreted. The 3Rs relevance and impact of the software tool should be embedded throughout the article; from the abstract through to the discussion, and where appropriate, be supported by metrics.

Format

For most Software Tool Articles, the following standard format will be the most appropriate:

- Abstract
- Introduction
- Methods
- Results (optional)
- Use Cases (optional)
- Discussion/ Conclusions
- Research highlights (this will be a stand-alone box)

Important details to include

Abstract:

Abstracts should be up to 300 words long and provide a succinct summary of the article. In addition, summarise in two sentences; 1) who the target end-user(s) are, and 2) why they should adopt your 3Rs tool both from a scientific and a 3Rs perspective.

Introduction:

- Describe the alternative *in vitro/ in vivo/ in silico* approaches that are available.
- For each of the alternative models/ approaches available, discuss the advantages and limitations of each. Describe the pros and cons of each model/ approach, with regards to the scientific outcomes, the 3Rs implications and practical aspects.
- Clearly describe the 3Rs relevance of your approach, and how it fits in with the current state of affairs.
- Clearly define who the potential end-users of your 3Rs approach are.
- Where appropriate, include metrics that support the need for 3Rs research in this area. Consider the following questions:

1. How many animals are used locally for this work, and how many would be affected/ no longer used?
2. How many groups in the UK or overseas use the animal model and could benefit from the approach?
3. How many papers published annually use this model, and how many animals are used in a typical publication.
4. What is the severity classification of the procedure as defined under the EU Directive (2010/63/EU); non-recovery, mild, moderate or severe?

Methods:

This section should be split into two parts:

1. Implementation
   Provide a short summary of how the tool works and any relevant technical details required for implementation. The content of this section should be written in a step wise manner so that the work can be reproduced/ repeated by others.

2. Operation
   Provide details of the minimal system requirements needed to run the software and an overview of the workflow.

- Include supporting diagrams and images, where appropriate.
- Consider including a 'Notes' section to supplement the 'Methods' with practical considerations or tips for implementation.
- If you are presenting any comparative data, consider addressing the following points about experimental design:
  - Include a discussion of allowances made (if any) for controlling bias or unwanted sources of variability. Any limitations of the datasets should be discussed.
  - Include the number of experimental and control groups, and sample size per group.
  - State how the same size was calculated; showing power calculations and including justification of effect size. Mention circumstances in which power calculations were not appropriate in determining sample size.
  - Provide a description of the statistical analyses used in relation to the primary outcomes that were assessed.
- Where applicable, we also encourage authors to deposit a step-by-step description of their protocols on protocols.io, where they obtain a persistent digital object identifier (DOI), which can be included in the Methods section of the article, using https://doi.org/10.17504/protocols.io.[PROTOCOL DOI] as the format (e.g. https://www.protocols.io/view/protocols-for-draft-genome-of-the-tibetan-medicina-hrkb54w). Authors should note that the protocol is only made public once they select "Publish" on protocols.io.
- For articles that describe data obtained from animal studies (such as *Drosophila* or *C. elegans*) or non-protected immature forms of vertebrates (such as embryonic or foetal forms), the article must comply with the ARRIVE guidelines.
- Abbreviations, if needed, should be spelled out.

- Add Research Resource Identifiers (RRIDs), where available, to unambiguously identify the following types of resources: software tools, data, databases and services, antibodies and genetically modified organisms. More information on this project is available from the Resource Identification Initiative and RRIDs can be obtained from the portal.

Results (optional):

This section is only required if the paper includes novel data or analyses and should be written as a traditional results section.

If appropriate, consider including a validation studies section:

- If available, demonstrate how the 3Rs tool was validated against the current state-of-the-art or gold standard? (A like-for-like comparison).
  For example, what studies were used to prove the validity and utility of the model (such as comparison against a commonly used animal model)?

Supporting data:

- All articles reporting new research findings must be accompanied by the underlying source data, together with details of any software used to process the results. Please include details of how the data were analysed to produce the various results (tables, graphs, etc.) shown (i.e. what statistical tests were used). If a piece of software code was used, please provide details of how to access this code (if not proprietary). See also F1000Research Data Preparation guidelines for further guidance on data presentation and formatting.
- If you have already deposited your datasets or used data that are already available online or elsewhere, please include a 'Data Availability' section, providing full details of how and where the data can be accessed, including the DOI. Please also provide details of the license under which the data can be used.
- If you are describing new software, source code for new software must be made openly, and permanently available in a structured repository such as Zenodo (see 'Making Your Code Citable' for more information). We also encourage code to be uploaded to a Version Control System (VCS) such as GitHub, BitBucket or SourceForge, and provide details of the repository and the license under which the software can be used in the article.
- The F1000Research team will assist with data and/or software deposition and help generate this section, where needed F1000Research will be happy to advise.

Use cases (optional):

This section is only required if the paper does not include novel data or analyses. Examples of input and output files should be provided with some explanatory context. Any novel or complex variable parameters should be explained in sufficient detail to enable users to understand and use the tool's functionality.

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Discussion/ Conclusions:

- Describe the transferability of your 3Rs software tool. Include a careful consideration of the barriers to uptake for other potential end-users and the potential solutions to address/ overcome these.
- Describe the translatability of your 3Rs software tool. To which types of scientific question/ remit/ discipline could the 3Rs approach be (or not be) applied?
- Consider the measure(s) of success/ acceptance test that could be used by another end-user of the 3Rs model/ tool/ technology to demonstrate that it is fit for purpose. For example, what performance characteristics are needed in order to demonstrate utility and confidence in using the 3Rs software tool to address scientific questions?
- Address why it is important for your 3Rs approach to be adopted by others; summarise the scientific and 3Rs benefits of taking up your 3Rs software tool.
- Quantify the 3Rs impact of the software tool described, where appropriate. For example, how many animals have been affected/ are no longer used locally (e.g. in your laboratory, department or institution)/ in the UK/ internationally?

Research highlights (stand-alone box)**:**

In the manuscript, include a separate section called 'Research highlights'. This feature will provide the reader with a quick, structured overview of the 3Rs approach described in your article and will illustrate why they should adopt your 3Rs approach both from a scientific and a 3Rs perspective.

Provide concise bullet-point responses to the following questions (multiple bullet-points can be listed for each question, and, if some questions are not applicable to your article they may be omitted):

- What are the scientific benefits?
- What are the 3Rs benefits?
- Are there any practical benefits? For example; cost effective, time, difficulty/ complexity, etc.
- What can the approach be applied to currently?
- What are the potential future applications?

Box template:

Research highlights	
Scientific benefit(s):	
3Rs benefit(s):	
Practical benefit(s):	
Current applications:	
Potential applications:	