**Authorship for Interdisciplinary Research: Who should be the first author??**

Abstract:

Many a times researchers end up with authorship issues in interdisciplinary research which is a result of a collaboration of different disciplines and many researchers. This paper recommends two suggestions for authorship guidelines in interdisciplinary research based on the literature review and the present scenario. Suggestions are based on the consideration of the “Instructions to author guidelines”, authorship scale and Contributor Roles Taxanomy (CRediT). Suggestion 1 proposes to use four steps and 1000 point system to decide the first author. Suggestion 2 proposes the group authorship with contributorship.

Key words: collaboration, publications, research.

Introduction

*Dr X and Dr Y both wanted to be listed as the first author on a study. Dr X was a Physiotherapist whose case was treated upon by Dr Y, who was an Ayurved specialist . They both had put in similar amount of effort in different aspects of the case. Each one felt that whatever they did was more important than what the other person did. The case was treated with an interdisciplinary treatment modality. I stood clueless at this authorship disagreement.*

This dispute genuinely got me thinking for a need to have a yardstick of fair means to decide: who should be the first author? Who should be in the author byline? What should be the order of the author list?

Research today is rarely an one-person job and original research papers with a single author, particularly in the life sciences are a vanishing breed.1 Indirectly indicating that the quantum of research is growing and a sizeable collaborative team is actually planning and executing the research. Authorship and collaboration have changed dramatically since the 1970s, and growth in multi-authorship has accelerated, driven both by academic reward systems and the ease of collaboration in the Internet age .2

In disciplines where multiple authors work together, the listing of authors can be much more complicated. This can be compounded in interdisciplinary research where contributors can come from fields where the practices are different.3 Many of today’s global scientific challenges require the joint involvement of researchers from different disciplinary backgrounds.4 Interdisciplinary research integrates the analytical strengths of two or more often disparate scientific disciplines to solve a given biological problem.5 Collaboration is often used to undertake interdisciplinary research.6 Owing to the substantial increase in the collaborative, multi-centric trials authorship issue in publications has arised.7

Authorship is not just a list of names, it is a mechanism to establish credit, integrity, accountability and responsibility in research and the position of “first author” is usually the most preferred by any researcher since most studies are referred and cited by the first author's name.7 Nevertheless , every author in the byline is as important as the first and without the co-authors contribution the interdisciplinary research cannot be completed successfully.

The aim of this paper is to recommend authorship guidelines for interdisciplinary research through review of literature.

**Material and Methods:**

Literature was searched using the search terms “Interdisciplinary research and authorship” in Medline and Google scholar. The literature was read and compiled. Based on the available literature suggestions and the present day journal guidelines recommendations were proposed.

**Results:**

12 unique and relevant articles were selected. They were read thoroughly and two suggestions for determining authorship in interdisciplinary research are proposed.

**Suggestion 1**

Step 1: Team members should establish the roles and duties of individuals involved in the project at the outset of the project.

Step 2: Team member can be considered as author , if the person fulfils the four criteria according to , the International Committee of Medical Journal Editors (ICMJE)8 recommendations (Table 1).

Step 3: The role of each contributor should be determined using the Contributor Roles Taxanomy (CRediT)9 [Table 2] which will be helpful for deciding the authorship order.

Step 4: The order of authorship should be a joint decision of all the co-authors. A 1,000-point system can be used. Using the CRediT, generate a 1000- point system. Conceptualization, Formal analysis, Investigation, Methodology and Writing the draft to be scored at 110 each and the remaining 9 parameters to be scored at 50 points each. The sum total will be 550 +450 = 1000 points. The total score obtained by the author will determine the ranks. The author with the highest score becomes the first author and subsequently the further ranks are decided on the scores obtained by each author.

The sequence of author byline is as follows: First author, middle authors (contributing authors) and last author (supervising senior).10 The author who takes the primary responsibility for communication and answering to the queries raised by the journal or reviewers during the manuscript submission, peer review, and publication process is the corresponding author.8,10

**Suggestion 2**

Group authorship: When a large group with multiple authors conduct a research, the authorship can be designated by a group name, with or without the names of individuals8. All the members listed in the group should fulfill the 4 criteria of ICMJE8 (Table 1) . The names of the individuals in the group are listed in an alphabetical order Further, contributorship form is filled, wherein the contribution of each person is listed which is included at the end of the manuscript. Example11 depicted in Fig 1.

**Discussion**

Suggestion 1 proposed here is drawn from the five literature reports.3,7,9,10,12 The proposed four steps will help the team in forming the authorship list. Deciding on the authorship in interdisciplinary research is the joint predetermined decision of the team.7 Sharma H and Verma S reviewed the authorship guidelines since 1997 and reported that among all these guidelines, the ICMJE is the most accepted guideline for the majority of journals.10 To eliminate ambiguity in contribution of the authors and to have transparency of “who did what” Holcombe AO proposed to use the Contributor Roles Taxonomy (CRediT available at , <http://www.casrai.org/credit.html>) to record what individuals contributed to scientific papers.9 Dance A12 in her report proposed the 1000- point system to be marked for the four parameters, giving 250 points each ( conceptualization, writing, designing and running the experiment and analysing the data). However, here we have considered the CRediT system which has 14 parameters and 1000 points have been rewarded accordingly to cover all the points. High and equal score for Conceptualization, Formal analysis, Investigation, Methodology and Writing the draft to be scored at 110 each and the remaining 9 parameters to be scored at 50 points each (Refer Table 2). The sum total will be 550 +450 = 1000 points. Authorship scale is a useful tool for determining the assignment and order of authorship in multi-authored publication.13

Suggestion 2 on Group authorship proposed here is drawn from recommendation of IJCME8 and “*Instruction to authors”* of British Medical Journal11. In a large multi-author group, the advantage of publishing with a group name is that , the contributorship list at the end of the manuscripts describes “who did what”. Thus this highlighting of the role of each contributing author in the respective research gives equal credit to all the authors . “No one is first and no one is last”.10 Contributorship gives credit to the authors irrespective of which position they are placed.This will support theauthorship criteria which aim to reduce unethical practices like coercive authors, honorary authorship, guest authorship, gift authorship and ghost authorship14.

**Conclusion**

The suggestions proposed in this paper will facilitate the interdisciplinary team to harmoniously prepare the author list for their research. In biology variation is a rule. Each individual case is different from other. Hence it difficult to draw a common denominator for authorship issues in interdisciplinary research. Authorship issues therefore need to be sorted at the initial planning stages before undertaking the work to avoid displeasure at the end. We are confident that the points discussed in this manuscript will give a definite direction to authorship chaos created otherwise.

Table 1: ICMJE recommendations8 for designating as an author.

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| * 1. Substantial contributions to the conception or design of the work; or the acquisition, analysis,   or interpretation of data for the work; AND * 2. Drafting the work or revising it critically for important intellectual content; AND * 3. Final approval of the version to be published; AND * 4. Agreement to be accountable for all aspects of the work in ensuring that questions related to   the accuracy or integrity of any part of the work are appropriately investigated and resolved. |

Table 2: Contributor role taxonomy9 (CRediT)\*

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|  | **Conceptualization** | Ideas; formulation or evolution of overarching research goals and aims. |
|  | **Data curation** | Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later re-use. |
|  | **Formal analysis** | Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data. |
|  | **Funding acquisition** | Acquisition of the financial support for the project leading to this publication. |
|  | **Investigation** | Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection. |
|  | **Methodology** | Development or design of methodology; creation of models. |
|  | **Project administration** | Management and coordination responsibility for the research activity planning and execution. |
|  | **Resources** | Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools. |
|  | **Software** | Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components. |
|  | **Supervision** | Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team. |
|  | **Validation** | Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs. |
|  | **Visualization** | Preparation, creation and/or presentation of the published work, specifically visualization/data presentation. |
|  | **Writing – original draft** | Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation). |
|  | **Writing – review & editing** – | Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre- or post-publication stages. |

*is high-level taxonomy, including 14 roles, that can be used to represent the roles typically played by contributors to scientific scholarly output.*

Fig 1: Group Authorship11

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