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Review article

Research and Publication. Part 6. Key Aspects of the Discussion and Conclusions in a Scientific Article

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Abstract

Introduction: Publishing a manuscript in scientific journals allows for the dissemination of knowledge. However, for many researchers, writing the manuscript can be challenging, which delays the communication of their findings. The discussion section is arguably the most difficult part, as it involves interpreting the results, comparing them to existing knowledge, and recognizing the strengths and limitations of the study. **Objective:** To provide clear and practical recommendations for writing a strong discussion and conclusion section that enhances the overall quality of a scientific article. **Results and conclusions:** The discussion should clearly explain the main findings, compare them with those of previous studies, and address both the limitations and strengths of the research. It is essential to use clear, concise language and terminology that accurately conveys the implications of the results. The limitations section should detail the factors that may affect the generalizability of the findings, which in turn enhances the study's credibility. It can also be used to propose recommendations or new research questions to guide future investigations. The conclusions should be brief and straightforward, emphasizing the most important findings and their relevance. Ideally, the reader should come away with two or three key takeaways from the study.

Keywords

Research, journal article, epidemiological study design.

INTRODUCTION

Publishing articles in indexed scientific journals now enables broader and faster access to knowledge[(1)]. Writing a scientific article is an essential part of the research process; however, for many researchers, transforming findings into a clear and coherent text presents a challenge that may delay the dissemination of results[(1)].

After analyzing data and presenting results, the time comes to draft the discussion—one of the most demanding sections of the manuscript[(1,2)]. Here, authors interpret their findings in light of the proposed hypothesis and compare them with current evidence, conducting a critical analysis that requires clarity and depth[(1,2)]. For many authors, this section is the most complex, as it involves addressing multiple aspects: interpretation, comparison, argumentation, and acknowledgment of limitations, among others[(3,4)]. Many editors consider the discussion the core of the article, and its quality can determine whether the manuscript is accepted or rejected[(1,4)].

The discussion is closely linked to the introduction and results: it must answer the research questions posed at the outset[(3)]. Thus, along with the conclusions, it plays a key role in establishing the value of the study[(3)]. After the abstract, these sections receive the most attention from readers[(3)].

This article provides practical, clear recommendations for crafting a strong discussion and conclusions to enhance the quality of a scientific paper.

DISCUSSION: WHAT IS ITS PURPOSE?

The discussion aims to interpret study results clearly and comprehensibly[2]. It seeks to answer the research questions, assess whether findings support the proposed hypothesis, and suggest new avenues for investigation[2].

WHAT SHOULD THE DISCUSSION INCLUDE?

It should present key findings in accessible language, avoiding ambiguities that could lead to misinterpretation[2]. Additionally, authors must compare results with other studies, acknowledge limitations, and highlight strengths[3]. To guide writing, authors should ask: What are the most relevant findings? Do they confirm or contradict the hypothesis? What factors may have influenced them? How do they compare with other studies? What explanations justify differences? What new contributions do they make to knowledge?[5].

It is important to objectively relate results to other studies, recognizing biases and avoiding unfounded conclusions[2]. In cases of discrepancies or lack of evidence, authors should state whether results align with published data and how they might integrate to advance knowledge[1,3]. Another key point is acknowledging study limitations—from methodological aspects to factors affecting generalizability[3]; addressing them strengthens the work's credibility[2]. Finally, the discussion may conclude by proposing hypotheses for future research on the topic[5].

WHAT SHOULD BE AVOIDED?

Common mistakes must be avoided: misinterpreting results, introducing previously unreported data, making unsupported speculations, or drawing conclusions beyond the study's scope. All claims must be evidence-based and properly cited[2]. Unsubstantiated criticism should be avoided. Strengths and contributions should be highlighted without exaggeration to maintain a robust, credible discussion[2].

HOW TO WRITE THE DISCUSSION?

Writing the discussion section is often one of the most challenging tasks when preparing a scientific manuscript[1]. This section should be written in clear, direct, and accessible language, avoiding an authoritative tone, to help readers easily understand and interpret the study's findings[2,3]. During its preparation, it's helpful to use verbs that precisely communicate what the results show. Common examples include: demonstrate, indicate, reveal, suggest, confirm, illustrate, or imply[3]. These verbs can provide clarity and appropriate nuance based on the strength of the evidence presented.

Several valid strategies exist for beginning the discussion[2]. Some authors choose to start by directly answering the research question based on the obtained results. Others prefer to revisit the study's objective and relate it to the main findings, which helps build a solid foundation for the conclusions. Another approach is to list the most relevant results without repeating numerical data, giving readers an overview of the study without requiring them to constantly refer back to tables[2,4,6].

Below is an example of how the discussion section might begin[7]:

- Objective: The *MULTISTARS AMI* trial was designed to determine whether immediate multivessel percutaneous coronary intervention (PCI) during primary PCI was non-inferior to staged multivessel PCI in hemodynamically stable patients with multivessel coronary artery disease and ST-segment elevation myocardial infarction (STEMI).
- Discussion: Results from the *MULTISTARS AMI* trial showed that in patients with STEMI and multivessel coronary artery disease, immediate multivessel PCI was non-inferior to staged multivessel PCI regarding the risk of a composite of all-cause death, non-fatal myocardial infarction, stroke, unplanned ischemia-driven revascularization, or hospitalization for heart failure at one year. Several randomized controlled trials have demonstrated that complete revascularization is safe and reduces the risk of recurrent myocardial infarction and future revascularization in hemodynamically stable patients with STEMI and multivessel coronary artery disease.

The second part of the discussion should focus on interpreting the results, paying particular attention to comparing them with published findings from other authors. This critical comparison helps identify similarities, differences, and potential novel contributions of the study relative to existing literature[2]. To facilitate this, it's helpful to use expressions that appropriately qualify the degree of agreement or contrast with other studies. For instance, when results align with previous research, phrases like "similar to," "consistent with," "in line with," and "in agreement with" may be used. Conversely, when identifying differences or discrepancies, expressions such as "different from," "in contrast to," "contrary to," "in conflict with," or "differs from" are appropriate[3]. As an example, here's a model discussion opening that incorporates comparisons with other studies[8]:

- Objective: To characterize complications arising from sickle cell disease and transfusion therapy in patients treated at a tertiary care hospital in Medellín, Colombia.
- Discussion: This study described the main characteristics of transfusion therapy in the evaluated population.

We found that the primary indication for transfusion was symptomatic acute anemia, and that the vast majority of patients had undergone transfusion therapy during the course of their disease. Most patients had the homozygous SS phenotype, followed by double heterozygous SC, and finally heterozygous S-beta thalassemia–findings similar to those described in other populations from South America, Europe, and countries like Nigeria and Senegal. These latter countries are particularly relevant since hemoglobin S haplotypes in Colombia are predominantly of African origin, with significant associations between the SS phenotype and greater transfusion requirements in these populations. Most patients in our study were diagnosed with the disease within their first seven years of life. This contrasts with findings reported by Pinto et al. in 1991, who described that in a group of patients from Medellín, 50% of diagnoses were made after the age of ten.

Finally, it is essential to include a dedicated section outlining the study's limitations. These should be clearly and thoroughly described, considering aspects such as study design, participant inclusion/exclusion criteria, control of potential biases, and the scope or applicability of results[2,6]. Typically, these limitations are presented in a single paragraph placed immediately before the conclusion. Beyond acknowledging the study's weaknesses, this section provides an opportunity to propose new research questions or suggest future work addressing the identified challenges[3].

Below is an example of how to articulate limitations:

- Objective: To characterize the population with rapid ventricular response (RVR) atrial fibrillation (AF) presenting to an emergency department in Armenia, Quindío, during 2021-2022.
- Discussion, limitations section[9]: This study has several limitations. As a retrospective analysis, we had to exclude numerous patients due to incomplete medical records. Furthermore, being a single-center study, our findings cannot be generalized to other populations or healthcare settings with different resources. Future research should evaluate how different emergency department intervention strategies for AF management affect long-term clinical outcomes beyond success rates, including emergency department length of stay and RVR AF recurrence rates.

WRITING THE CONCLUSIONS

Depending on the target journal's format, conclusions may appear as a standalone section or be integrated at the discussion's end[3]. In either case, this section should be concise, clear, and direct, typically comprising 5-10% of the manuscript's total word count[10].

Conclusions should highlight the research's most relevant aspects, emphasizing contributions to existing knowledge and the implications of findings. This section also serves to propose specific recommendations for future research[3,10]. Effective conclusions directly address the study objectives. A helpful guiding question is: If readers remembered only two or three key ideas from the article, what should they be? These key points must be clearly articulated in the conclusion[3,10].

Example conclusion addressing study objectives[7]:

- Objective: The *MULTISTARS AMI* trial was designed to determine whether immediate multivessel percutaneous coronary intervention (PCI) during primary PCI was non-inferior to staged multivessel PCI in hemodynamically stable patients with multivessel coronary artery disease and ST-segment elevation myocardial infarction (STEMI).
- Conclusions: Among hemodynamically stable patients with STEMI and multivessel coronary artery disease, immediate multivessel PCI was non-inferior to staged multivessel PCI regarding the risk of all-cause death, nonfatal myocardial infarction, stroke, unplanned ischemia-driven revascularization, or hospitalization for heart failure at 1 year.

Below is a model conclusion highlighting key findings and their significance[8]:

- Objective: To characterize complications arising from sickle cell disease and transfusion therapy in patients treated at a tertiary care hospital in Medellín, Colombia.
- Conclusions: We observed high transfusion rates among sickle cell disease patients, with notably low utilization of red blood cell exchange for complications. While adverse transfusion reactions were infrequent, significant iron overload was apparent, underscoring the need for appropriate management strategies to mitigate this risk. These findings advance understanding of sickle cell disease clinical management and highlight the necessity for comprehensive approaches considering both benefits and risks associated with transfusion therapy.

CONCLUSIONS

This article provides practical guidance on essential elements for crafting a scientific manuscript's discussion section. This portion should be clear and concise, serving to integrate key findings, contrast them with existing evidence, and highlight both strengths and limitations. Furthermore, it should establish foundations for proposing new research questions based on obtained results, thereby contributing to continuous advancement of medical science knowledge.

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