How to Write the Discussion and Conclusion

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INTRODUCTION

The discussion section is the last component of the conventional IMRAD (Introduction, materials and methods, results and discussion) structure of an original article. This section aims to provide answers to "what do the findings mean?" by answering the research question posed at the end of the Introduction section, stating the major findings of the study, and explaining how the results support the answers and fit in with existing knowledge. Many authors find this section the most difficult to write, probably as this section requires the most "originality" and organization, such that the thoughts of the authors' are conveyed in a logical and easily-comprehensible flow. To achieve this, several rewritten drafts are often required.

It is important to keep focused and to bear in mind that this section aims to discuss and not repeat the major findings of the study. Authors should avoid the temptation to pack in too much information, particularly extraneous information that may not be directly relevant to the objectives of the study. The discussion section should encompass the following items: emphasize new and important aspects of the study, its relation to previous work done, implications of the current work, weaknesses or limitations of the current study, suggestions for future research, and the conclusion.

COMPONENTS OF THE DISCUSSION

New and important aspects of the study should be emphasized, but avoid repeating detailed data or other material from the Introduction, Materials and Methods, and Results sections. Condensing the main findings of the study into one to two sentences that form the opening statements of the discussion section is encouraged (Example 1). When discussing each new finding, provide evidence for each individual finding.
It is expected that a thorough literature search has been performed, in order to adequately provide relationship of findings from the current study to what has been previously reported by others. There is, however, no need to quote every single reference that has been found. Only sound and relevant work should be quoted, omitting those studies of low clinical impact and lacking scientific rigor. Contradictory and unexpected findings from the authors’ study should be identified and highlighted, and then discussed and explained, particularly discrepancies (Example 2). The creed “honesty is the best policy” holds true when attempting to explain data that does not quite fit.

An attempt should be made to highlight the implications of the current work, particularly if there is any clinical and scientific impact. If there are new findings, the authors should try to explore possible mechanisms or explanations, and state new hypotheses, if any. Potential alteration of existing practice or contributions to progress and understanding in the field of study should be listed and discussed. The authors should provide their own insights, suggest further areas of study, state any plans to expand on their work and areas of future research (Example 3). For recommendations for future areas of research, specifics (rather than general statements) should be provided with a stated purpose.

It is expected that authors objectively mention the weaknesses and limitations of the current study (Example 4). These include small sample size, retrospective nature of the study, and problems with the methods or investigative tools. If unusual methods were used, explanations should be provided. How these methodology pitfalls influenced the validity of the results or their interpretation should be discussed.

The conclusion should be succinct and be a precise summary of the most important findings, and is linked with the goals of the study. Ideally, a clear take-home message should be provided (Example 5). The conclusion is often the last paragraph of the Discussion section, although in some journals, the Conclusion may be a separate section.

**Common Problems**

- Overlong or irrelevant discussion
- Repetition of data from the Results section
- Introduction of new data in this section
- Failure to discuss importance of findings
- Misinterpretation of results (leading to faulty conclusions)
- Unqualified statements
- Conclusion is not supported by data
• Failure to identify any weaknesses of the study
• Excessive quoting and discussion of irrelevant references
• Preferential quoting of references
• Omission of key references
• Claiming unwarranted priority
• Alluding to work that has not been completed
• Making statements on economic benefit and cost, without obtaining appropriate economic methodology, data and analysis.

SUMMARY

The Discussion section aims to answer the research question, emphasize new and important aspects of the study, provide the authors’ interpretation of the meaning of the study findings, highlight study weaknesses, and suggest areas of future research. There should be a succinct conclusion supported by original data, with a clear take-home message.

EXAMPLES

Example 1: The opening statement of Discussion states the main study finding, followed by comparison with previously-published work*

Overall, the level of mental health knowledge of the general public is considerably low. The current finding is not dissimilar to previous studies done on knowledge of mental health using different tools and different population groups which concluded that lay people generally have a poor understanding of mental illness; they were unable to correctly recognize and identify the mental problems, did not understand the underlying causal factors, were fearful of those perceived as mentally ill, had incorrect beliefs about the effectiveness of treatment interventions, and were often reluctant to seek help from mental health professionals.

Example 2: Explanation of contradictory findings**

In the present study, a low-risk of GCA was observed in patients who have a high intake of pulses. This could be the reason for the low

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incidence of GCA in North India, where pulses are consumed in large amounts compared to South India, where the consumption of pulses is much lower. The staple food for the people of South India is rice and it has been shown to be an independent risk factor for GCA in another case-control study from the southern part of India. However, we did not identify rice as a risk factor for GCA. Smoking as a variable risk factor for GCA has been reported from India. However, smoking did not predict the development of GCA in the present study. The results were contradictory in another study from the same city, which however consisted of a heterogeneous population. This could probably be attributed to cigar smoking rather than cigarette smoking being more common in this part of the country, and explain the noncontribution of smoking as a major risk factor. In addition, there was no significant association between betel quid chewers and GCA.

Example 3: Authors’ explanations for their findings and suggestions for further areas of study*

The present study thus demonstrated the chemopreventive efficacy of curcumin and piperine in DMBA-induced hamster buccal pouch carcinogenesis. The chemopreventive potential of curcumin and piperine are probably due to their antilipid peroxidative and antioxidant potential or modulating effect on the carcinogen detoxification process. Further studies are, however, required in order to better understand the underlying mechanisms of the chemopreventive actions of curcumin and piperine.

Example 4: Stating study limitations**

There were several limitations in the present study. This series of patients was enrolled from a single institution, and the data was retrospectively reviewed. The small number of patients may also mask several other important factors that could be accountable for the outcomes identified. Although these limitations are significant, this study remains important in reviewing the numerous issues surrounding the management of diaphragmatic rupture after blunt trauma.

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Example 5: Conclusion and take-home message*

In conclusion, selenium intake and status are related to breast cancer risk. Therefore, selenium intake through the diet should be emphasized as a chemopreventive agent in reducing the risk of breast cancer. There is an urgent need to analyze the selenium content in Malaysian foods.

**SUGGESTED READING**

1. Hess DR. How to write an effective discussion. Respir Care 2004;49(10):1238-41.