

Effective Medical Writing

Pointers to getting your article published

Ng K H, Peh W C G

Writing the discussion

ABSTRACT

The discussion section comprises the last component in the IMRAD system. The purpose of this section is to provide the interpretation of the results obtained, explain the implications of the findings, state study limitations and make suggestions for future research. This is a critical part of the scientific paper, as it places the particular study within the broader context of how the research contributes to improving diagnosis, treatment or patient care.

Keywords: conclusion, discussion, medical writing, scientific paper

Singapore Med J 2009;50(5):458-461

INTRODUCTION

The discussion section comprises the last component in the IMRAD (Introduction, Methods, Results And Discussion) system. Its main functions are to answer the questions posed in the introduction and explain how the results support the answers, as well as how the answers fit in with the existing knowledge on the topic. The discussion section requires the author to analyse the broader context within which the findings of his particular study is situated. The author must always remember to ask himself, "What do the findings mean?" The discussion section also provides a platform to explore the challenges and limitations faced by the study, and ways in which future studies can be improved.

COMPONENTS OF THE DISCUSSION SECTION

While most new authors may find this section of the paper difficult to write, especially when there is no fixed format for writing the discussion, there are several important components that should be covered. These components will help the author to organise his thoughts, decide what

to include in the discussion, as well as the flow that the "storyline" should take.

Highlighting new and important findings

The author should highlight aspects of the study that are original and have not been conducted in other studies, and explore possible mechanisms or explanations for the new findings. Care must be taken not to repeat in detail data or other material that have already been presented in the introduction or results sections.

Presenting the principles, relationships and generalisations derived from the results

With reference to the results section, the author should describe the principles and relationships drawn from each major finding. The discussion of each finding should be logically organised to follow this sequence: first stating the answer, then the relevant results, then citing the work of others who have made similar findings. If necessary, reference to a figure or table can be made to support the "story".

Corroborating with previous work

Before starting the study, it is highly recommended for the author to conduct a thorough literature search in order to have a grasp of the research that has already been done on that particular topic. In writing the discussion, the author can then compare and contrast his results and interpretations with previous major and relevant published work of others. Conflicting findings from other published work should be highlighted, and possible reasons for the differences discussed.

Summarising the implications of the current work

The main implications of the findings, regardless of statistical significance, should be summarised in this section. Any possible clinical and scientific applications for the findings, and their implications should be discussed.

Biomedical Imaging and Interventional Journal,
c/o Department of Biomedical Imaging,
University of Malaya,
Kuala Lumpur 50603,
Malaysia

Ng KH, PhD, MIPEM,
DABMP
Editor

Singapore Medical Journal,
2 College Road,
Singapore 169850

Peh WCG, MD, FRCP,
FRCR
Editor

Correspondence to:
Prof Ng Kwan Hoong
Tel: (60) 3 7949 2069
Fax: (60) 3 7949 4603
Email: dwlng@tm.net.my

Identifying contradicting and unexpected findings

Any contradicting and unexpected findings should be discussed and evaluated. When the results differ from what was expected, the discrepancy should be explained.

Stating the limitations of the methods used

It is important for the author to identify the potential limitations and weaknesses of the study methodology and comment on how they affected the accuracy in the interpretation of the results. The author should honestly state how these limitations may have influenced the validity of the findings and their interpretations.

Providing a concise conclusion

The discussion should end with a conclusion summarising the main points and linking them to the objectives of the study. The author should try to keep the conclusion focused on the main question addressed in his study. It should be carefully written as many readers will read this part first. Only if the “take home” message is clearly stated and interesting would the readers be more likely to read the rest of the paper in detail.

Suggesting further areas of research

The author can provide recommendations for further areas of research. This is also the appropriate place to propose a specific further study if that will serve some purpose, but general statements, such as “this problem needs more study”, should be avoided. Thus, the author should be explicit in proposing the kind of study that will best take the research further.

WRITING THE DISCUSSION

Once the components that will go into the discussion section have been identified and organised, the author can then proceed with the writing. The discussion section is considered to be the heart of a paper. Greater attention and effort must be paid to writing it. A few drafts are often required to achieve a satisfactory discussion section.

The first sentence of the discussion is relatively straightforward: it should summarise the main findings of the research. One common approach is, “In this study, it was found that ...” Then, as described above, the author can proceed to write a brief essay about the implications of the findings, the new and important aspects of the study, and the conclusions drawn. Use the same key terms, the same verb tense (present tense), and the same point of view that was used when posing the questions and hypotheses in the introduction.

Any redundancy between the results and the discussion sections should be avoided; detailed descriptions of the data and results do not belong in the discussion section. In some journals, the results and discussion sections are combined in a single section, in order to permit a single integrated treatment with minimal repetition. This is more appropriate for short, simple articles than for longer, more complicated ones.

The discussion should be kept brief and clearly written. Even though this section allows the author to explore the context and meaning of the study, it is not a place for flowery, colourful descriptions or analyses. The message should be clear, and sentences unambiguously and concisely constructed to clearly and fully state, support, explain and defend the results provided, as well as to discuss other important and relevant issues. Side issues should be avoided, as these tend to obscure the main message.

WRITING THE CONCLUDING SENTENCES

The last sentence of the discussion section is the most important sentence of the entire article, as it contains the parting message that the reader will take home with. There are four common types of last sentences:

- (1) “Another puzzle solved.” Examples are:
 - We conclude that HIV infection leads to progressive immune deterioration and AIDS irrespective of clotting factor usage.
 - Physicians treating asthmatic patients should use a history of major tranquilliser use as a marker for identifying patients at high risk for the serious complications of asthma.
- (2) “Perhaps possibly”. Examples are:
 - ... is likely to ... have important implications for the prevention of ...
 - The unexpected risk connected with the use of ... indicates that the routine use of ... cannot be recommended.
- (3) “More research is indicated”. Examples are:
 - Our results emphasise the need for further studies.
 - The effectiveness of such... cannot be inferred from this observational study but requires verification in...
- (4) “Powerful conclusions”. An example is:
 - “It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material.”⁽¹⁾

The type of last sentence used will depend on the findings and implications of the study at hand.

Box 1. Common errors:

- Repetition of data presented in the results section.
- Incorrect interpretation of the findings.
- Importance of results inadequately discussed or omitted.
- Conclusions not supported by findings.
- Irrelevant and faulty discussion points.
- Obscure interpretation.
- Failure to identify any weakness.
- Omission of key and relevant references.
- Preferential quoting of references.
- Explanations are too long or verbose.

posed in the introduction, explain how the results support the answers and how the answers fit in with existing knowledge on the topic. When writing this section, the author should explain how the results and conclusions of this study are important and how they influence our knowledge or understanding of the research problem being studied.

Box 2. Take home points:

1. Summarise the major findings.
2. Explain what the findings mean.
3. Identify the limitations.
4. Suggest possible areas of future research.

SUMMARY

The main function of the discussion section is to explain what the findings of the study mean, answer the questions

REFERENCE

1. Watson JD, Crick FHC. Molecular structure of nucleic acids; a structure for deoxyribose nucleic acid. Nature 1953; 171:737-8.

SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME
Multiple Choice Questions (Code SMJ 200905A)

	True	False
Question 1. The purpose/s of the discussion section is/are to:		
(a) Explain the implications of the findings.	<input type="checkbox"/>	<input type="checkbox"/>
(b) Explain the interpretations of the results.	<input type="checkbox"/>	<input type="checkbox"/>
(c) Explain how the experiment was conducted.	<input type="checkbox"/>	<input type="checkbox"/>
(d) Present data in a visually arresting manner.	<input type="checkbox"/>	<input type="checkbox"/>
Question 2. The discussion section should be written:		
(a) In a concise and specific manner.	<input type="checkbox"/>	<input type="checkbox"/>
(b) Such that it flows in an organised manner.	<input type="checkbox"/>	<input type="checkbox"/>
(c) At the beginning of the scientific paper.	<input type="checkbox"/>	<input type="checkbox"/>
(d) Before conducting a thorough literature search.	<input type="checkbox"/>	<input type="checkbox"/>
Question 3. Some common errors in writing the discussion section are:		
(a) Data from the results section are repeated.	<input type="checkbox"/>	<input type="checkbox"/>
(b) Issues not relevant to the study are mentioned.	<input type="checkbox"/>	<input type="checkbox"/>
(c) The main findings of the research are summarised in the beginning.	<input type="checkbox"/>	<input type="checkbox"/>
(d) Conclusions are not supported by the findings.	<input type="checkbox"/>	<input type="checkbox"/>
Question 4. The following are common types of last sentences in the discussion section:		
(a) How the story began...	<input type="checkbox"/>	<input type="checkbox"/>
(b) Another puzzle solved...	<input type="checkbox"/>	<input type="checkbox"/>
(c) Powerful conclusions...	<input type="checkbox"/>	<input type="checkbox"/>
(d) More research is indicated...	<input type="checkbox"/>	<input type="checkbox"/>
Question 5. The following statements about the discussion section are true:		
(a) The limitations of the methods used are discussed.	<input type="checkbox"/>	<input type="checkbox"/>
(b) The current findings are compared and contrasted with previously published findings.	<input type="checkbox"/>	<input type="checkbox"/>
(c) Results that are not statistically significant should not be discussed.	<input type="checkbox"/>	<input type="checkbox"/>
(d) The question, "What do the findings mean?", should be addressed.	<input type="checkbox"/>	<input type="checkbox"/>

Doctor's particulars:

Name in full: _____

MCR number: _____ Specialty: _____

Email address: _____

SUBMISSION INSTRUCTIONS:

(1) Log on at the SMJ website: <http://www.sma.org.sg/cme/smj> and select the appropriate set of questions. (2) Select your answers and provide your name, email address and MCR number. Click on "Submit answers" to submit.

RESULTS:

(1) Answers will be published in the SMJ July 2009 issue. (2) The MCR numbers of successful candidates will be posted online at www.sma.org.sg/cme/smj by 15 July 2009. (3) All online submissions will receive an automatic email acknowledgment. (4) Passing mark is 60%. No mark will be deducted for incorrect answers. (5) The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council.

Deadline for submission: (May 2009 SMJ 3B CME programme): 12 noon, 7 July 2009.