INTRODUCTION

The Results section of a scientific paper is the third component of the conventional IMRAD (Introduction, Materials and methods, Results and Discussion) structure of an original article. This section aims to provide answers to the research question, i.e. “What was found?”

The Results section can be divided into two components, namely:
Presentation of main data collected from the research done and observations made and interpretation of analyzed data.

Information contained in this section should not overlap with contents of the Introduction, Materials and Methods and Discussion sections. As with other aspects of manuscript preparation, authors should always check the individual journal's “Instructions to Authors” or “Author Guidelines" for details of in-house style requirements.

PRESENTING THE RESULTS

The steps to presenting the results can be divided into three phases, namely: collect, analyze and interpret. Begin by reviewing all the collected data, and determine which data to present. The results that are relevant to the research question, i.e. purpose of the study, should be identified. The outcomes for every item mentioned in the materials and methods section should be given, i.e. there should be a direct match. A good practice is to start working on the results section as soon as the data collection is completed. Analysis includes data summaries (including descriptive statistics) and application of statistical tests to data.

Raw data (such as patient records, individual observations and various measurements) should not be included in the manuscript. If
this is considered to be very important, then consider adding an appendix to list these items. Ensure that the data is accurate and consistent. If the data differences are statistically significant, actual figures should be provided. When reporting results of statistical tests, any assumption that has been made should be explicated stated. The effects of variables using measures that are clinically relevant should be reported. The appropriate number of significant figures to report the means and other measured or calculated values should be used. The significant figures should accurately reflect the degree of precision of the original measurement. Exact p-values should be reported (Example 1). Reviewers and readers should be able to independently evaluate, analyze and verify the data presented. Finally, enlisting the help of a biostatistician to review the statistical analysis, and the presentation and interpretation of the results, is recommended.

USE OF TABLES AND ILLUSTRATIONS TO PRESENT RESULTS

The results should be presented, by default, in text format. Depending on the nature of data, consider using tables, and illustrations such as graphs, diagrams and images, as some data are better presented using these means. Tables are used to present information in a concise, detailed and precise manner. They help make a manuscript more readable by summarizing both numerical data and statistical results from research done (Example 2). Presenting data in a table rather than part of the text is also an effective way to reduce the length of the manuscript. Data suitable for presentation in table format include: precise numerical data rather than proportions or trends, large numbers of related data, clearer summary of information in tabular form rather than descriptive text, and complex information. Tables should be self-explanatory and do not duplicate data given in the text or graphs.

Illustrations (or figures) are visual representations of results obtained, and can be divided into graphs (Example 3) and pictorial images such as diagrams, radiological images and photographs. Illustrations functions to communicate study findings by providing visual impact. Graphs aim to present data that is too complicated to be described in the text and demonstrate relationships between variables in the data. Graphs are also able to reveal patterns or trends in the data. Depending on the kind of data to be presented, the appropriate type of graph should be selected, including: scattergrams (for independent and dependent numeric variables), bar charts (for dependent numeric variables), and bar charts or pie charts (for proportions).
Illustrations provide visual information and may effectively improve the readability of a manuscript. Common types of illustrations include: patient or specimen photographs (e.g. clinical, intraoperative, endoscopic, laparoscopic, intraoral and enteroscopic photographs), photomicrographs (including optical and electron micrographs) (Example 4), radiological images (e.g. radiograph, computed tomography, magnetic resonance imaging, ultrasonography, angiography and radionuclide imaging) (Example 4), physiological signal tracings (e.g. electrocardiography, electroencephalography, echocardiography), laboratory graphs (e.g. chromatogram and karyogram), and line drawings (e.g. flow chart, algorithm, schematic diagram and chemical structure) (Example 5). Illustrations should be submitted in a format that will allow high-quality reproduction. It is important to maintain patient confidentiality, particularly for photographs. The identity of patients should be hidden. If disclosure of identity is unavoidable, then written informed consent should be obtained from the patient or guardian prior to manuscript submission.

ORGANIZING THE RESULTS

When embarking on writing the Results section, one should first decide on the sequence. Many authors start with reprising the research question. The most important results should be listed first. If tables or illustrations have been created, key points from each table or graph can be used as a basis for writing the Results section. Tables and other illustrations should be numbered consecutively in the same chronological sequence of appearance in the text. Conventionally, past tense is used for this section. The tables and illustrations should stand-alone, with legends (or captions) that provide a clear description and contain all pertinent information. By convention, legends appear above tables and below figures and graphs.

COMMON PROBLEMS

- Illogical sequence of presentation
- Inaccurate data
- Data repetition: among text, table, graphs and other illustrations
- Expected data not reported
- Misplaced information
- Too much data/ raw data
- Use of statistical significance to prove clinical significance
- Making the assumption that a non-significant result proves the null hypothesis
• Overuse and abuse of illustrations
• Attempts to discuss and draw conclusions
• Tables listed are not cited in the text
• Data in tables do not agree with data given in the text
• Wrong type of graph is chosen to represent the data
• Graph is not plotted to scale
• Misuse of pseudo three-dimensional graphs

SUMMARY

The Results section should present relevant collected data arising from the Materials and Methods section and provide the authors' interpretation of the analyzed data. This section consists primarily of text, and if necessary, may be complemented by tables, figures and other illustrations. Tables are used to make a scientific manuscript more readable by summarizing numeric data from the text, and aid in presenting complex data in a concise and organized manner. Illustrations such as graphs and images help improve the readability by presenting data with a visual impact. The flow of tables and illustrations, in relation to text, should be able to tell a logical story.

EXAMPLES

Example 1: Actual p-values are given in this table*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Lysholm</th>
<th>IKDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at surgery</td>
<td>0.59</td>
<td>0.32</td>
</tr>
<tr>
<td>Presence of associated meniscal injury</td>
<td>0.43</td>
<td>0.48</td>
</tr>
<tr>
<td>Tibial tunnel position in the coronal plane</td>
<td>0.31</td>
<td>0.12</td>
</tr>
<tr>
<td>Tibial tunnel position in the sagittal plane</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Femoral tunnel position in the coronal plane</td>
<td>0.19</td>
<td>0.25</td>
</tr>
<tr>
<td>Femoral tunnel position in the sagittal plane</td>
<td>0.39</td>
<td>0.28</td>
</tr>
<tr>
<td>Coronal angle of tibial tunnel</td>
<td>0.32</td>
<td>0.27</td>
</tr>
</tbody>
</table>

IKDC: International Knee Documentation Committee

Example 2: Use of table to summarize numerical data and statistical results**


Table 14.2: Distribution of 25-OH vitamin D levels in the three groups of infants who received different doses of vitamin D

<table>
<thead>
<tr>
<th>Amount of vitamin D supplement</th>
<th>200 IU daily (I)</th>
<th>400 IU daily (II)</th>
<th>50,000 IU bolus/2 mths (III)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of infants</td>
<td>19</td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td>Mean 25-OH serum level + SD</td>
<td>31.3 ± 8.5</td>
<td>38.4 ± 11.4</td>
<td>53.7 ± 19.5</td>
</tr>
<tr>
<td>(range) (ng/ml)</td>
<td>(20-51)</td>
<td>(23-64)</td>
<td>(28-102)</td>
</tr>
</tbody>
</table>

One-way ANOVA: p = 0.001; Tukey’s test: (I) vs. (II); vs (III) p = 0.5 (I) vs (III): p= 0.001; (II) vs (III) p = 0.005
25.OH: 25 hydroxy. S.D. standard deviation

Example 3: Use of bar chart*

- [ ] 13 yrs
- [ ] 8–12 yrs
- [ ] 5–7 yrs
- [ ] 1–4 yrs

![Bar chart showing the location of drowning and near-drowning cases based on age](chart.png)

Figure 14.1: Bar chart shows the location of drowning and near-drowning cases based on age

Example 4: Mammograms and photomicrographs used as illustrations**


Figure 14.2: Left mediolateral oblique mammogram shows the knots in the calcified suture material (arrow)

Figure 14.3: Magnified view of left mediolateral oblique mammogram

Figures 14.4A and B: A. Magnification view shows a group of amorphous calcifications (arrow). B. Photomicrograph shows fibrocystic change with calcifications in the lumen (arrows) (Hematoxylin and eosin, x 40)

Example 5: Flow diagram used as an illustration*

Figure 14.5: Outcomes of 146 patients with neonatal cholestasis

SUGGESTED READING