UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE

GUIDE TO WRITING THE MMedSc OR PhD THESIS

SEPTEMBER 2025

CONTENTS

CONVENTIONS IN SCIENTIFIC WRITING

AUTHORSHIP

ORDER OF AUTHORS ON A MANUSCRIPT

The order of authors on a scientific paper must reflect the contribution made by each individual involved in the research. Here are the standard conventions:

First Author: The first author is usually the individual who made the most significant contributions to the research and the writing of the paper. This person took the lead in conducting experiments, analysing data, and drafting the manuscript.

Middle Authors: Authors listed in the middle have contributed to the research but to a lesser extent than the first author. Their contributions may include conducting specific experiments, providing intellectual input, or assisting with data analysis. If some authors have contributed equally to the research, this can be noted in the Authorship statement.

Last Author: The last author often holds a senior position, such as a principal investigator or lab head. This individual usually oversees the research project and provides guidance and resources. Being the last author can indicate a leading role in the overall project.

One of the authors is additionally nominated as the *Corresponding Author*. They are responsible for handling communication regarding the manuscript. Any of the authors may be the corresponding author.

WHO QUALIFIES TO BE AN AUTHOR ON A MANUSCRIPT?

Authors should fulfil the criteria for authorship set down by the International Committee of Medical Journal Editors (ICMJE), which defines authors as those who meet all four of the following criteria:

- Made a substantial contribution to the conception or design of the work or the acquisition, analysis, or interpretation of data for the work.
- *and* drafted the manuscript or reviewed it critically for important intellectual content.
- *and* approved the final version to be published.
- *and* agree to be accountable for all aspects of the work to ensure that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

(See https://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html)

Note that it is inappropriate for people who do not meet these criteria to push themselves forward as authors. Nobody is entitled to authorship because of their position (e.g., head of department) or because of a contribution not amounting to authorship (e.g., providing statistical support, performing a test on behalf of the investigators, or lending an item of equipment).

ABBREVIATIONS

Use abbreviations sparingly and consistently. The following rules apply to the use of abbreviations in scientific writing:

1. *Necessity*: Introduce abbreviations only if the term appears frequently (about three or more times in a single chapter).
2. *Define on first use*: Write the term in full the first time, followed by the abbreviation in parentheses, e.g. *acute glomerulonephritis* (*AGN*). Thereafter, use only the abbreviation. It is common for students to make mistakes with this. You do not want the abbreviation occurring alone before you have defined it. Not do you want the full term appearing subsequently once the abbreviation has been defined.
3. *New chapters*. If your thesis is in manuscript format, start each new chapter afresh: do not carry abbreviations over to later chapters, including the Discussion chapter.
4. *Standard forms*: Where there is already an abbreviation in common use, use it, and do not invent your own version. For example, rheumatoid arthritis is widely abbreviated as RA. Do not invent your own abbreviation, such as RhA or RArth.
5. *Abbreviations which do not need to be defined on first use*. Certain terms are so widely known by their abbreviations that it is now unnecessary to write them out in full before first use. Examples include:
    a. *General scientific/measurement units* such as kg and mmol/L
    b. *Basic biological/medical abbreviations such as* DNA, RNA, mRNA, ATP, , HIV, AIDS, BMI, ECG, EEG, MRI, CT, USA, UK
    c. *Statistical terms* such as SD, SE, CI, p, R^2.
6. *Avoid ambiguity*. Do not use ambiguous abbreviations; do not invent abbreviations which overlap with an abbreviation already in common use. . For example, if you refer to the chemical *dinitroaniline* repeatedly in your thesis, it would be wrong to abbreviate it to DNA.
7. Once introduced, use them consistently.
8. Format: Do not use periods (DNA, not D.N.A.). Make plurals with a lowercase "s" (RBCs, not RBC's).
9. Titles and abstracts: Avoid abbreviations unless universally recognized. If used in the abstract, define at first mention.
10. Figures and tables: Define abbreviations in legends or footnotes, even if already explained in the text.
11. Theses **and long reports**: Provide a separate list of abbreviations for reference.

1. ---

Would you like me to also make a **one-sentence summary rule** that your students could memorize, so they don't have to recall all eight points in detail?

NUMBERS AND UNITS

UNITS

Use units correctly and consistently

1. Use only the approved SI unit abbreviation. Always use the abbreviation and not the whole unit name without good reason.

2. **Spacing**. The strict SI convention is that there should be a space between the number and the unit (e.g., 5 kg, 29 cm). The two exceptions are temperature and percentages (e.g., 37°C, 47%). That said, some journals do not require this space. While we recommend that you use the space, we will accept either, provided you are consistent.

3. **Litres.** The correct abbreviation is uppercase *L* (e.g., 5 L), given that lowercase *l* is easily confused with *I* and *1*. This requires the use of *mL* for millilitres. We expect you to use L as the abbreviation for litres, given the ambiguity of lowercase *l*. While we recommend that you use *mL*, we note some variation in practice with this. We will accept both *mL* and *ml*, provided they are used consistently.

REPORTING NUMBERS

There are standard rules for reporting numbers in scientific writing. Be careful to use them consistently.

Use numerals for numbers 10 and above.	12 patients, 25 mL
Write out numbers below 10.	three samples, five days
Use numerals for measurements, decimals, percentages, and units, even if below 10.	5 cm, 6 kg, 3%, 6.5
Use a period as the decimal marker	4.25 mL, 0.3 g
For ranges, use "to" instead of a hyphen between numerals. This avoids confusion between hyphens and the *minus* and *negative* symbols.	5 to 10 years (not 5-10 years).
Do not start a sentence with numerals: Write out the number or rephrase the sentence.	Twenty-five patients were examined *or* We examined 25 patients *but not*: 25 patients were examined.
Use scientific notation for very large or small numbers.	1.5 × 10^6 cells
Use a space on either side of operators such as =, > and <. Many style guides prefer this because (a) it is easier to follow, and (b) the operator stands in for a verb, e.g., *equals*, which would typically be surrounded by spaces.	p = 0.03, values < 50

ROUNDING OFF TO THE CORRECT NUMBER OF SIGNIFICANT FIGURES

Examiners will detect inconsistencies in the number of significant figures quoted and ask for corrections. For most of our research, you may think of *number of significant figures* as *number of decimal places*.

Report meaningful digits only

Use only the number of digits that accurately reflect your measurement's or calculation's precision. For example, if you measured a length with a school ruler, it would be incorrect to say that the length was 4.137 cm. The ruler cannot measure that accurately. The length should be stated as 4.1 cm. This applies to all scientific measurements. The number of significant figures (or decimals) must match the measurement precision.

In calculations, use the least precise value.

The result should have the same number of significant figures as the least precise input in any calculation.

For example, if you find the mean (average) of two sodium concentrations reported by the lab, your calculator or computer is likely to return more decimal places than were in the original values, e.g., the mean of 7.3 mmol/l, 12.4 mmol/l and 9.8 mmol/l is returned as 9.83333 mmol/l. However, this implies a precision of 5 decimal places, which the lab does not provide. The mean must be quoted as 9.8 mmol/l, rounded to one decimal place, like the original values. (There is an exception for averaging over many values since this tends to reduce error in the original dataset. A mean of *many* values **can** be quoted to one more significant figure, but this is a technical point, probably not one you should be using.)

For any particular measurement, all values must be reported to the same level of precision.

For example, you report values of 12.1, 34.5, 7.0 and 11.0, *not* 12.1, 34.52, 7 and 11. Note the need to add a ".0" after the unit numbers so that they match the same number of decimals. Here is the reasoning. *12.0* means that we were accurate enough to find *11.9* or *12.1*, but we found 12.0. *12* means we were only accurate enough to find *11* or *13*, but we found 12.

Use the correct number of significant figures in scientific notation for very large or small numbers.

For example: 4.7 x 10^6, 2.30 × 10^3. (Both are quoted to three significant figures, hence the need for the final 0 in 2.30.).

Round appropriately.

Round only at the final step of calculations, not during intermediate steps; otherwise, errors will accumulate.

REPORTING STATISTICAL SIGNIFICANCE

The International Committee of Medical Journal Editors (ICMJE) provides guidelines on various aspects of medical writing, including how to quote statistical significance in research papers. Here are the critical conventions for quoting significance based on ICMJE recommendations:

Use a lowercase p for p-values.

It should be in regular font, not italics. Insert spaces on either side of symbols such as = and <. You will also encounter upper case *P*, but ICMJE recommends *p.*

Report exact p-values.

For example, p = 0.03, p = 0.52. p = 0.007. All p-values less than 0.001 should be reported as p < 0.001.

Use a standard length |(precision) for the p-value.

Quote the p-value to the correct number of decimal places

Two decimals for $p \geq 0.01$, three decimals for $p \geq 0.001$.

Always report the p-value.

With few exceptions, do not use terms such as *was significant* or *was not significant* on their own. They should be backed up with the actual p-value, e.g., *was not significant (p = 0.15*).

Confidence intervals.

When reporting estimates, include confidence intervals (CIs) along with p-values. For example, *The mean difference was 5.2 (95% CI, 3.1 to 7.3; p = 0.002).* CIs provide additional context about the precision and reliability of the estimates.

FIGURES AND TABLES

These are particularly important in your results (Chapter 2 and following), but you may also have some in Chapter 1. Make sure that each figure and table is clear and comprehensible. Do not use blurred or poor-quality figures. Remember that if you use figures or tables taken from elsewhere, you must provide an acknowledgement, source (e.g. web page) or reference.

A legend must follow each figure and table. The legend must convey the purpose of the figure or legend and should be sufficiently detailed that it is possible to understand a figure or legend independently of the main text of the chapter.

Each figure and table must be numbered. Start each legend with *Figure X* or *Table Y*, numbering the figures and the tables consecutively. All figures and tables must be referenced in the chapter text, e.g., *Diagnostic criteria are summarised in Figure 1.* They may not stand without an incoming reference from the text.

Common errors in figures and tables

Examiners invariably complain about figures and tables which are blurred or unclear, do not have legends, are not referenced in the text, are not numbered sequentially, or where the reference number in the text does not match the number in the legend.

Tables and figures are described in more detail in the section dealing with later chapters of your thesis.

REFERENCING

THE QUALITY OF YOUR REFERENCES

The references you provide should be *the most appropriate* for your chapter. Examiners are asked whether the student has demonstrated an adequate understanding of the literature in the field. Students who appear unable to identify the most appropriate references do not meet this criterion and should fail.

The appropriate references are (1) most relevant to your work and (2) most credible. If your research project concerns diagnosis, do not quote references that concentrate on therapy. Do not reference a small case series in a low-quality journal when there are far better alternatives, such as large case series in high-quality journals. Doing so usually implies that you are lazy and just making use of any reference that comes to hand. Under no circumstances should you reference the popular press and web pages other than where the web page contains an important report from an authoritative body, for example, a piece of legislation or official guidelines.

Never use a reference without having read it. In particular, do not rely on an article's abstract or a reference to that article from another source. You will be surprised how often abstracts and other people's references fail to reflect the article's contents accurately.

Always ensure that the references you supply agree with whatever you are referencing in your text. It is common to find that a student uses a reference to support a particular point of view when that reference states the opposite.

FORMATTING YOUR REFERENCES

This must be done accurately and consistently. The Vancouver system should be used for all theses except for some in the social science domain. You must note that the Vancouver system lays down precise rules for how citations (the references in the text) and bibliographies (the reference list at the end of the manuscript) are structured and formatted. You must have studied the instructions for their use, either independently or by following the instructions given to authors by a particular journal. It is not just a matter of putting a number in the text and writing some words in the bibliography.

Note that printed journal references are generally simple to format. References to chapters in books, books, e-journals, official reports and webpages are more complex and often require you to put some extra work into obtaining all the details necessary to reference them correctly (for example, the city in which a book was published, or the DOI number of an electronic article). You must provide these references correctly.

You must know how to use a reference manager like Endnote or Mendeley. Your references must be marked as the correct type so that your reference manager can format them properly in the bibliography. If chapters in books, books, electronic articles and webpages are marked as the default "journal articles", they will be formatted incorrectly. Here is a summary of the essential reference types and how they should be structured in Vancouver style.

CONTEXT	FORMAT	EXAMPLE
Journal Articles	Author(s). Title of the article. *Abbreviated title of the journal*. Year;Volume(Issue):Page numbers.	Smith AJ, Clark A, Johnson B. The impact of hypertension on kidney disease. *J Nephrol*. 2020;**15**(3):145-52.
Books	Author(s). Title of the book. Edition (if not the first). Place of publication: Publisher; Year.	Brown HJ, Miller T. Renal Pathophysiology. 3rd ed. New York: Springer; 2018.
Chapters in books	Author(s) of the chapter. Title of the chapter. In: Editor(s), editor(s). Title of the book. Edition (if not the first). Place of publication: Publisher; Year. p. Pages of the chapter.	Peters MD. Diagnosis of chronic kidney disease. In: Harris JL, editor. Advances in Nephrology. 2nd ed. London: Academic Press; 2017. p. 89-102.
Webpages:	Author(s). Title of the webpage/document. Website name. URL. Published date (or updated date); Accessed date.	World Health Organization. Chronic kidney disease. WHO [updated 2023 May 12; cited 2024 Jul 19]. Available from: https://www.who.int/health-topics/chr.
Electronic journal articles	*Where you know the DOI* Author(s). Title of the article. *Journal Name*. Year;**Volume**:Pages. doi:DOI.	Smith AB, Johnson CD. Impact of lifestyle interventions on metabolic syndrome. *J Clin Nutr*. 2023;**50**:200-10. doi:10.1016/j.jcnut.2023.03.010.
Electronic journal articles	*Where you do not know the DOI* Author(s). Title of the article. *Journal Name* [Internet]. Year;**Volume**(Issue):Pages [cited Year Month Day]. Available from: URL.	Smith AB, Johnson CD. Impact of lifestyle interventions on metabolic syndrome. *J Clin Nutr* [Internet]. 2023;**50**:200-10 [cited 2024 Oct 22]. Available from: https://www.jcnut.org/article/12345.

Explanatory notes

Formatting with bold and italic. Journals have different expectations for using bold and italic in Vancouver references. A standard format is to use italics for the journal name and bold font for the volume number. This helps break up the parts of the reference. We suggest you do so.

Journal names. All journal names should be abbreviated using the official abbreviation (e.g., S Afr Med J). Do not use your own abbreviations, e.g., SAMJ. No full stops are used in the abbreviations. The abbreviations are available from Index Medicus or the journal website.

Issue number, e.g. J Nephrol. 2020;15(3):145-52. The issue number here is the (3). The rule is that this need only be included where each issue has its own numbers, starting from 1. (There must be very few journals which still do this.) For journals where the whole volume is numbered consecutively, it is unnecessary to put the issue number.

Page numbers in books and book chapters. In most cases, it is sufficient to reference the book or chapter without supplying exact page numbers.

Webpages. The reason for providing the cited date is that web pages, unlike printed pages, can change. Your cited date says that you are saying that that is what the website said on the day you accessed it.

Electronic journal articles with DOI. Many e-articles now carry a DOI (digital object identifier). This is linked to that article as it was published at a particular time before any update. The article linked to it cannot change. You can also access the article directly from the DOI. Therefore, it is unnecessary to state the date you cited it, nor provide its web address.

Electronic journal articles without DOI. The page can still be updated if there is no DOI but only a website address, meaning your reference may become outdated or inaccurate. Therefore, you have to give a citing date that says that the article said **that** on **that** date. You must also provide the URL and web address so your readers can access it. Wherever possible, use the DOI, as this makes referencing simpler.

FORMATTING A THESIS

Refer to the companion document Specimen PhD thesis (in preparation) *to see how the layout should look in practice.*

LAYOUT AND STYLE

PAGE LAYOUT

A4 size, portrait. The following margins work well: Top, left and right=2.2 cm, bottom=2.4 cm.

FONTS

We recommend two standard fonts: Times New Roman (TNR) and Arial. Use a standard font throughout your thesis. Stick to a few standard sizes depending on the type of paragraph or heading. The recommended style is described below.

LINE SPACING

Abstract, chapter 1 and chapter 2 other than the bibliographies (reference list). Use 1.5 line spacing. The intention is to space the text sufficiently to allow the examiner to engage easily with the text and to insert comments or notes.

Appendices, bibliographies, tables and preface other than the abstract: Use a narrower spacing since these paragraph types look unsightly when spaced at 1.5 lines. Set spacing at 1.15 lines or at a size equal to the font size for that paragraph type + 2 pt. (Expanding the line spacing to a measurement slightly larger than single spacing makes the paragraph easier to read and more attractive.)

STYLE GUIDE

Here are descriptions and examples of recommended styles which work well in the thesis chapters.

Normal paragraph style

Normal style looks like this. 12 pt, lowercase,

Justified, line spacing 1.5 lines, space above=18 pt, space below=0 pt

Headings

Do not overuse headings. Use heading levels 2 and 3 (major and minor headings) in your chapters. Use heading level 4 occasionally and heading level 5 as little as possible or not at all. Do not use heading levels below this. Here are examples and properties.

HEADING 1

Section or page heading. 16 pt, all caps, bold, top of a new page, centre-aligned. space above = 0 pt, space below = 18 pt

HEADING 2

Major heading. 14 pt, all caps, bold, left-aligned, line spacing 1.5 lines, space above = 24 pt, space below = 12 pt

Heading 3

Minor heading. 14 pt, lowercase, bold, left-aligned, line spacing 1.15 lines, space above = 18 pt, space below = 6 pt

Heading 4

Sub-minor heading. 12 pt, lowercase, bold, italic, left-aligned, line spacing 1.5 lines, space above = 18 pt, space below = 6 pt

Heading 5

Sub-sub-minor heading. 12 pt, lowercase, italic, left-aligned, line spacing 1.5 lines, space above = 12 pt, space below = 0 pt

TABLES, TABLE LEGENDS AND FIGURE LEGENDS

Table entries can be slightly smaller and single-spaced. Centre-align column headings and make them bold, left-align row headings. Numbers usually look best centred within the cells, while text is left-aligned. Adjust your table until it is neat and easily readable. Centre the table itself on the page.

Tables should not break across pages unless they are longer than a page. Ensure that the legend appears immediately below the table or figure, and not on a new page.

Table entry. 11 pt, lowercase

Line spacing single, space above = 3 pt, space below = 3 pt

Legends can be smaller but should be 1.5 lines-spaced. They should be indented on the left and right to distinguish them from normal paragraph text. A one-line legend can be centre-aligned within this block. Longer legends should be justified, running between the left and right indents.

Legend. 11 pt, lowercase

Line spacing 1.5 lines, left and right indent = 1.5 cm, space above = 12, space below = 18

Group	Male	Female
Healthy	24	16
Control	12	10
Total	36	26

Table3. Summary of the participants. The excess of males is characteristic of the patient population using our facility.

FIGURES

Figures must be of high quality when printed or viewed in a PDF. Do not use unclear images unless they are unavoidable; in this case, explain why in the text or legend.

Do not digitally enhance figures which themselves represent results. A standard example in laboratory research is an electrophoretic gel. **Image manipulation constitutes scientific misconduct** and may lead to failure and exclusion from the University.

LAYOUT OF THE THESIS

WRITING THE PREFACE

The preface consists of the following pages in order.

Title page

Formatted as shown in the specimen. No page number.

Dedication

Formatted as shown. No page number. Numbered Roman numeral 1 (i)

Appreciation

This should be formatted as shown. This section replaces the *Acknowledgments* page used earlier. The reason is that the student must give an accurate account of their contribution to the work of the project and of the contributions of everyone else who collaborated in one way or another. Some of these contributors are authors on the manuscript; others are not. All their contributions are gathered together on a later page in this section.

On this page, only acknowledge support in a very general sense, such as the following:

My supervisor, Dr SE Mkhize, for his patience and support.
My Head of the Discipline, Prof JG Naidoo, for her never-failing encouragement
The Medical Manager of ABC Hospital, Dr JN Zondi, for allowing me dedicated time to complete the writing of this thesis
My family, for always standing by me, even…

Acknowledge those who provided you with actual intellectual, technical and financial support on the *Authorship* page later in this section. This includes those who help with statistics, calculations, software, laboratory work, library searches, data collection and financial support. On the Authorship page, you are not "thanking" them so much as making it clear to the examiners which parts of the project are your own work and in which parts others actively assisted you.

Declaration

This is a formal, signed statement confirming that the work of the thesis is all your own, except where otherwise explicitly stated and acknowledged. Use the text in the specimen.

Authorship statement and acknowledgements

In this section, you will state the extent of your contribution to the work. Note that in modern science, research is very rarely the work of one individual. Journal editors and the University expect each person's contribution to be accurately described. Failure to do so accurately constitutes academic dishonesty and is taken seriously. Compile this page under three headings.

Authors

The authorship statement refers to the authors of your manuscript or published paper. Compose this as follows.

- Each author is listed, starting with the first author (yourself).
- Each author's name is followed by a list of responsibilities for the paper, as described below.
- For each contribution, the extent of the contribution is described, in brackets, as *lead* (was primarily responsible), *equal* (contributed approximately equally) or *support* (made a secondary contribution).

To compile the list, answer the following questions and combine them as in the example.

1. Who conceptualised (thought up) the project?
2. Who procured funding for the project?
3. Who oversaw the planning and execution of the research and took responsibility for it?
4. Who designed the methodology?
5. Who carried out the investigation or experiment and produced the data?
6. Who undertook the analysis of the results?
7. Who wrote the first draft of the thesis and manuscript?
8. Who contributed to the subsequent revision and editing of the manuscript and thesis? to the preparation of the manuscript and thesis?
9. Is there any other activity which should be credited to one of the authors?

Note the following:

- Refer to yourself in the third person, i.e., Dr GK Patel, not *I* or *me*.
- Most authors will have had multiple roles.
- Leave out any roles which do not apply.

Acknowledgements

List all those who contributed but did not qualify to be an author. This includes, for example, those who contributed to the statistical analysis, proofread, performed a laboratory test, or collected data. It does not include secretarial work like typing, data capture or arranging appointments. These belong on the *Appreciation* page.

You may follow this with a statement of gratitude.

Use of AI

Identify any contribution to text or figures generated with AI. You must detail the contribution of AI to your thesis. Plagiarism-checking software will flag these contributions, and you need to reassure your examiner that their use was legitimate and acknowledged. This includes Grammarly. Spelling and punctuation changes suggested by Grammarly are not typically flagged as AI, but **rephrasing suggested by Grammarly to improve the readability of sentences and paragraphs may be flagged**.) Rephrasing is acceptable, provided it goes no further than making your thesis read better. Acknowledge its use in this section. Acknowledge use of AI for automation of complex, repetitive or mundane tasks, such as generation of computer code, designing spreadsheets or writing captions.

Example

Authorship

- *Dr GE Brown*: conceptualisation (lead), oversight (lead), methodology (equal), data collection (lead), analysis (lead), first draft of manuscript (lead), review and editing (equal)
- *Prof K Mpathi*: conceptualisation (support), methodology (support), oversight (support), review and editing (equal)
- *Dr U Ramchand*: methodology (support), analysis (support), review and editing (support)

Acknowledgements

Dr JR Green performed the statistical analysis

- *Ms HK Dlamini* assisted with the preparation of the graphs and figures.
- *The College of Health Sciences* provided financial assistance.

The help of these individuals and institutions is gratefully acknowledged.

AI

Grammarly was used to check punctuation and spelling, and to improve the wording of the text. It was not used for the primary generation of text.

Table of Contents

Compose this as shown in the example.

- The four main sections are the Preface, Chapter 1 (Introduction), Chapter 2 and subsequent chapters (Manuscripts), Chapter X (Discussion chapter) and Appendices. Left-align these.
- Indent the subsections of each section below the main entries.
- Do not use include too many levels of subheadings. You do not want the table to become too long or complex. Nor do you want multiple entries sharing the same page number. The following work well: Heading level 1 (section heading), heading level 2 (major heading), heading level 3 (minor heading). Omit lower levels.
- Use Roman numerals for the preface, starting with the Dedication. Use Arabic numerals for the rest of the thesis, starting with 1 on the first page after the abstract.

List of Abbreviations

Collect every abbreviation used in the thesis in this list, sorted alphabetically. See the notes on use of abbreviations later in this document.

Abstract

Format

Line spacing 1.5 lines. (The examiner may wish to comment on the abstract.)

Structure

The University rules prescribe a maximum length for the abstract of 350 words. This is about 1.5 pages of text printed with a line spacing of 1.5 lines. Try not to exceed this. Structure your abstract as follows:

- Background
- Aims and objectives
- Participants and methods
- Results
- Conclusions

Ensure that the abstract is accurate, which means that each section is an adequate and precise summary of the corresponding section of the thesis (or corresponding sections in all the manuscripts that make up your thesis). The abstract cannot reflect everything, but all the most significant aspects of your project's introduction, methods, results and conclusions must appear in the abstract.

Note that the abstract should not contain abbreviations, tables or figures.

WRITING CHAPTER 1

LENGTH

The length of this chapter should be about 3000 to 4000 words, corresponding to approximately 8 to 10 pages of 1.5-line-spaced text. This excludes the bibliography.

PAGE NUMBERING

Each page must be numbered, either in the top right corner of the page or at the bottom, either in the middle or on the right. Use Arabic numerals, starting on the Chapter 1 title page.

Some supervisors want headings and subheadings to be numbered. In general, it is unnecessary, and MS Word's hierarchical numbering system is notoriously difficult to keep correctly ordered and formatted.

LAYOUT

Divide Chapter 1 into four sections: *title page, background and literature review, the current project* and *references*.

Title page

Begin Chapter 1 with a title page, as shown in the example. The text *Chapter 1. Introduction and literature review* are placed midway down the page, as shown in the example.

Background and literature review

Here, you describe the background of the project and review the literature.

What is relevant?

The information you provide here and the literature you review must be relevant to your research problem and question. A frequent error is for students to go into too much detail about aspects of the topic *which, though relevant to the practice of medicine, are not directly relevant to the work of the thesis*. An example is a thesis where the project is centred on the diagnosis of a particular disease. The student then writes large and approximately equal amounts on the disease's aetiology, pathogenesis, diagnosis, treatment and prognosis. *This would be appropriate in a textbook but inappropriate in a thesis*. Provide no more than a few paragraphs on each topic other than diagnosis to provide context. Direct most of your attention to diagnosis, about which you will write pages. If understanding aetiology is essential to understanding the method of diagnosis you are studying, then you will expand on that, too—it is critical to understanding your research project, whereas treatment is not. Examiners will typically ask for all the unnecessary material in Chapter 1 to be removed. Scientific writing centres on writing crisply and accurately about matters essential to understanding the research being described, omitting everything else except some background information necessary for contextualisation.

This section should lead up to and end with a statement of the research problem, thus leading into the description of your project, which follows.

Layout

Use natural headings to break up your writing. Note the following:

- Ensure that headings are correctly formatted.
- Avoid too many headings and too many levels of subheadings. In particular, be careful not to have multiple headings with almost no text beneath them. Too many headings disrupt the flow of your writing, complicate formatting and complicate the construction of the Table of Contents.
- Remember that headings and subheadings are there to make reading and understanding easier. They are not there for their own sake.

The current project

Here you list the research question, hypothesis (if there is one), aims and objectives. End with a brief statement summarising how you set about answering the research question. This is not a detailed description of the methods. It is more an explanation of why you set about answering the question in the way you chose to, why you chose a particular approach, etc. It is an opportunity to demonstrate that you understand how to set about answering a scientific question. Keep this to one or two paragraphs.

References

Provide a bibliography at the end of the chapter, separate from that of Chapter 2. Use Vancouver-style referencing as described earlier in this document.

Format

Line spacing 1.15 lines, left-aligned. References look unsightly when spaced at 1.5 lines. Justified alignment tends to cause wide, unsightly gaps to open up between words.)

CHAPTER 2 AND SUBSEQUENT CHAPTERS

LAYOUT OF THE MANUSCRIPT CHAPTERS

Divide Chapter 2 and subsequent manuscript chapters into two sections: *chapter title page, manuscript*.

Chapter title page

Format

Line spacing 1.15 lines.

Structure

Begin Chapter 2 with a title page, as shown in the example. This contains the text placed midway down the page, as shown in the specimen thesis.

> *Chapter 2. Title of manuscript.*

Follow this with your bridging text. This is a paragraph which explains where the work of this chapter fits into the overall project. This is not as important in Chapter 2, where you might just say something like: *As the first step in this project, we…* In later chapters it is much more important, e.g.*, In the previous chapter we showed that people living with HIV/AIDS perceive themselves as subject to discrimination on multiple levels, including… In the next phase of this project, we examine the nature of this discrimination, as reported by our participants in structured focus-group interviews.* The same need to bridge chapters exists in positivist, quantitative projects.

Follow this with the sentence:

> *This work is presented as a submission-ready manuscript entitled* **[insert the title of your manuscript].**
>
> or
>
> *This work was published as* [reference your published paper as it would appear in a Vancouver-style bibliography, e.g.] *Jones AG, Ndlovu S, Chetty FG. Neutrophil chemotaxis in pericardial fluid drawn from HIV-positive patients following a novel accelerated antituberculous regimen. KZN Heart J 2025:24:56-77. (Appendix* **[**Insert number of appendix where you have included the PDF**]).**

If a journal has already accepted your manuscript but it has not yet been published, add the following sentence:

> *This work has been accepted for publication by* **[Journal name].**

If your manuscript has already been accepted or published, but you are submitting an updated version for examination (see the following section), add a sentence such as this:

> *This manuscript is an edited and updated version of the manuscript accepted for publication.*

THE MANUSCRIPT

LENGTH

The length of the manuscript must not exceed 5000 words (approximately 14 pages with text spaced at 1.5 lines). This limit refers to the body of the manuscript: Introduction to Discussion, excluding title pages, abstract, tables and references.

Note that this is a maximum length, *not the target length*. Many good journals impose lower limits, such as 3000 words. If you can produce a scientifically appropriate manuscript in fewer than 5000 words, so much the better.

Length of discussion compared with introduction

The discussion should be longer than the introduction. A standard guideline is:

- *Introduction*: 10-15% of the total manuscript length (about 750 words of a 5000-word thesis).
- *Discussion*: 25-30% of the total manuscript length (about 2000 words of a 5000-word thesis).

This means the discussion is usually 2-3 times longer than the introduction. The introduction is concise, provides context, states the research question, and outlines the hypothesis, while the discussion involves a detailed interpretation of the results, comparisons with previous studies, and an exploration of the broader implications. The examiners will scrutinise your discussion with particular intensity. In this section, you display your intellect and understanding of science by searching your results for meaning, drawing conclusions and positioning them in the context of science, medicine and society.

WHICH MANUSCRIPT TO SUBMIT?

If your manuscript has not been accepted or published, insert your publication-ready document in Word format.

If your manuscript has already been accepted or published, insert your final draft in Word format, maintaining compliance with the instructions for the a*uthors* of that journal. You can include the PDF version of the published report as an appendix.

Updated version

Even if your manuscript has been accepted or published, you can still improve the manuscript you submit for examination (for example, add newer references, update a table, or otherwise improve it). You want to be judged on your very best work. Submit the updated manuscript in MS Word format and state that this is an updated version on the Chapter title page as described earlier.

Corrected version

Note: It is currently being debated whether students should have to make changes to manuscripts already published, which would mean providing an updated, corrected manuscript which would differ from that published and in the literature. You should ask about this when your thesis is returned from the examiners.

LAYOUT OF THE MANUSCRIPT

The manuscript is structured in line with standard journal practice. The following is a generic form of that. If your manuscript has already been accepted, or you have chosen to follow the format required by a specific journal, then you need to structure it in line with its requirements.

Page numbering

Run the page numbers sequentially across all chapters. This makes it easier for you and the examiner to reference corrections.

Tables and figures

You can decide between including your tables and figures in the logical point within the manuscript, which makes for better reading and comprehension but complicates formatting, or including them after the references in numerical order. Most journals require figures and tables to be submitted separately so that their staff can decide how to format them and where to place them.)

Manuscript title page

Follow the example in the specimen thesis. Do not add qualifications to authors' names. This is now an uncommon practice.

Format

Line spacing 1.5 lines from this point on until the bibliography.

Abstract

Provide an abstract not exceeding 350 words. Structure the abstract under four headings: Background, Methods, Results, and Conclusions.

Introduction

Start the introduction on a new page.

Purpose

You should have already demonstrated your familiarity with the literature and thoroughly explained the background to your research problem in Chapter 1. There will be some overlap

between that chapter and this introduction, but this should be limited. Do not repeat phrases from Chapter 1 here.

Chapter 1 and this Introduction have different purposes. Chapter 1 has two purposes:

- To prove your familiarity with the field of research, discuss it broadly and include a solid literature review, using as many references as you wish.
- To contextualise your research question: how did it arise, why it is necessary, etc.

The introduction has a more concentrated purpose, resulting in a much shorter and more focused document (750 words versus 6000 words!). The purpose of the introduction in a scientific manuscript is to provide context and background for the research being presented. **It is not a textbook where you "teach" the reader about your subject**. You are being examined on your science, not your medicine. It sets the stage by describing the broader field of study, explaining why the topic is important, and identifying gaps or unanswered questions in the existing literature. The introduction helps readers understand the significance of the research and how it fits into the broader scientific conversation. Its focus should shift from general knowledge to the specific problem or question the study addresses, ultimately formulating the research hypothesis or objectives.

Furthermore, the introduction serves to clarify the rationale behind the study. Briefly reviewing key studies and highlighting unresolved issues explains why the research is necessary and relevant. This section also establishes the scope and aims of the research, ensuring that the reader knows what to expect in the rest of the paper. A well-crafted introduction draws the reader's interest and ensures they have enough context to appreciate the novelty and significance of the study's findings.

It is expected to end the introduction with a statement that bridges the background and the research project, e.g., *Given this background, we designed and executed a study to determine the relative survival of patients with Hodgkin's and non-Hodgkin's lymphoma*.

Note that there is often considerable leeway for specific sections of your paper to be placed in either the introduction or the discussion, particularly when you report previous papers and experience. A helpful guide is as follows. Place in the introduction anything you knew to be important before you conducted your study (general background). Place anything that became particularly relevant after your study in the discussion. For example, it is often better to describe previous studies on the same question as yours in your discussion rather than the introduction so that you can compare your findings with theirs. In the introduction, all you can do is state who did what, and what they found. You cannot evaluate their findings in the light of your experience as you should in the discussion.

Here are some further guidelines that make your logic and scientific argument clear and significantly improve the comprehensibility of your manuscript.:

- *Try to keep like with like within a section*. Mention an aspect once in the introduction and discuss it once in the discussion. Do not keep returning to it out of sequence, with this aspect separated by others. For example, if your key topics in the introduction or discussion are A, B and C, then they should appear in the order A, B, C, and not repeatedly and disjointedly as A, B, A, C, B, C, A
- *Handle aspects of your introduction and discussion in the same order.* Describe them in the introduction in a specific order, A, B and C. Do the same in the discussion. It may even be possible to report your results in the same order, A, B, C. The logic behind your writing is then very clear.
- Best clarity is by aligning A, B and C with the three main findings of your study**.** If your results give rise to two major conclusions (call them A and B), then follow the sequence A,

B in the introduction and discussion. If there are four, then follow the sequence A, B, C, D in the introduction and discussion.

Methods

This is usually laid out in three sections as follows:

(Introduction)

(Do not actually write *Introduction*.) Start the paragraph directly after the heading *Methods*. Report the place and time of the study. Follow it with a statement on ethics permission, for example:

> *The study was approved by the University of KwaZulu-Natal Biomedical Research Ethics Committee (BR35/25556).*

Patients or participants

The term *patient* applies to clinical studies. *Participants* should be used elsewhere. The term *subject* is now discouraged. Describe participants and inclusion/exclusion criteria. Include the number of participants first enrolled. Their further involvement (such as dropping out of the study) should be discussed in the results section.

End with a statement about informed consent, e.g., *Patients were provided with an information sheet (Appendix 5) and all patients provided informed consent*.

Methods

Describe the methods used in enough detail for the examiners to understand what you did. A standard requirement is that they should be described in enough detail for another researcher to replicate the study. Confine this section to a description of the methods. Do not provide any justification or evaluation of the methods or anything which anticipates the results or discussion here. These aspects belong to the other sections of the manuscript.

Data handling

Describe how data were stored, analysed and analysed statistically. Provide the version number, publisher and city for statistical or other software you use. This is not necessary for Microsoft Office products. Here are the standard citations for Stata and SPSS, which are supported by UKZN:

> *All statistical analyses were conducted using Stata (version* [insert version]*, StataCorp LLC, College Station, TX, USA).*
>
> *Data were analysed using IBM SPSS Statistics (version* [insert version]*, IBM Corp., Armonk, NY, USA).*

Results

The results section of a manuscript presents the data and findings of the study in a clear, concise, and objective manner. This section should focus on **what** the research uncovered, without interpretation or discussion, which is reserved for the discussion. The results should be organised logically, often following the structure of the research questions or hypotheses introduced earlier in the manuscript.

Start by outlining the primary findings in response to the key research questions or objectives. Use clear and direct language to describe the data, avoiding unnecessary detail or repetition. Numerical results should be reported with appropriate statistical measures (e.g., means, standard deviations, p-values, confidence intervals) to provide a complete picture of the data's significance and variability. Always ensure that the results in the text align with the figures and tables but avoid repeating the same data in both forms. Instead, use the text to summarise the key points in tables and figures.

Organise the results section in a logical sequence. Begin with the most important or primary findings, followed by secondary or exploratory outcomes. Each subsection can address a specific part of the study, whether describing characteristics of the study population, comparisons between groups, or results of statistical analyses. Remember the *A, B, C* example discussed earlier.

In addition to reporting the findings, remember to highlight any negative or unexpected results. These findings are just as important as positive outcomes, as they contribute to the overall transparency and integrity of the research. Avoid interpreting these results at this stage; save the interpretation of their meaning or implications for the Discussion section.

Text, tables and figures

Results may be displayed or described in three formats: written sentences (text), graphs or figures. You need a systematic approach when deciding how to use these three formats. Some data are better described in one format than another.

Text

The purpose of the text in the results section is to present and summarise the study's key findings clearly and objectively. It guides the reader through the data, highlighting the most important results, such as statistical significance, patterns, or trends, without interpreting or explaining their implications (which is reserved for the Discussion section). The text provides a narrative that complements the tables and figures, emphasising the main points and helping readers understand how the findings relate to the study's research questions or hypotheses.

Rather than repeating all the data shown in tables and figures, the text should summarise the most critical aspects, offering context for the reader to interpret visual data more easily. It also directs the reader's attention to specific aspects of the tables and figures. The text also ensures clarity by explaining any unexpected results or nuances, such as outliers or missing data, making the section informative but concise.

When to report actual results in text format

Report results as sentences within text when the theme they belong to are short enough not to justify making a table or inserting a graph. For example, consider a study where the only demographic data (the theme in this sense is demographics) to be reported is gender. This would not justify a table on its own, so you might write *We studied 45 males and 33 females* as text. Where there is so much information that it becomes very hard to keep track of it all while reading in sentence form, then it is best to use a table. For example, results such as the following are impossible to keep track of when reported in text: *We studied 34 South African males with a mean age of 50.3 (SD 5.4), 25 South African females, with a mean age of 45.7 (SD 4.6), 19 Namibian males with a mean age of 57.3 (SD 6.5), 18 Namibian females with a mean age of 49.9 (SD 6.3), 23 Zimbabwean males …* Such results are best displayed in a table.

Common errors

Common errors in the text are:

Ambiguity or incomprehensibility. You must have your results read by an outside person to confirm that they can follow your results and know what point you are getting across.

Reporting results in text that are too complex to be understood by the reader, e.g., long strings of numbers, possibly each with standard deviation, p-values, etc. These are far more easily understood as a table or a graph.

*Repeating material i*n the text which is already in a figure or table. You can draw attention or contextualise it, but do not duplicate it.

Redundancy. Some examiners will accept phrases such as *20 participants: (12 female, 8 male).* Others will request you to stop at *20 participants (12 female)* on the grounds that it is not necessary to state that 8 were male: this can be calculated by the reader. This applies in tables too. You should decide for yourself how necessary it is to provide both figures in a particular context. Does it really aid understanding?

Discussing the results, when this should be left for the discussion.

Tables

To construct a good table of results, ensure it is clear, concise, and well-organised, allowing readers to interpret the data easily. Give the table a descriptive legend that accurately reflects its content. Organise the data logically, grouping related variables in rows and columns. Use clear, unambiguous labels for both row and column headings, and ensure that units of measurement and statistical notations (e.g., mean, standard deviation, p-values) are included where relevant. Avoid excessive detail—only present the data essential to answering the research questions. Use the legend to explain any abbreviations or specific terms that might be unclear to readers. Finally, ensure the table is self-contained, meaning that a reader can understand the key findings without reading the surrounding text.

Common errors

Common errors with tables include:

Actual mistakes. Wrong results, misplaced decimals, results which differ from those mentioned elsewhere (e.g. you state that you studied 40 patients, but the numbers in the table add up to 37).

Apparent mistakes. These arise when something is not adequately explained (e.g. you state that you studied 40 patients, but the numbers in the table add up to 37. You have omitted to explain that three patients were excluded).

Missing information. Numbers are given, but no standard deviation, IQR, confidence intervals or p-values are provided in contexts where one or more are necessary.

Incomprehensibility. Tables are crowded or poorly constructed, making them challenging to understand.

Inadequate and wrongly-numbered legends.

Redundancy as described above. Do you need a row stating the number of females if you have already provided rows stating the total number of participants and the number of female participants in the table?

Figures

Figures are not used in scientific writing for decoration: they are a means of conveying information about the study and the results. Occasionally a purely illustrative figure enhances the impact of the introduction for a manuscript, e.g. a clinical illustration. The main purpose of a figure is to communicate the study's key findings visually, enhancing the reader's understanding of the data. A good figure should be clear, simple, and directly related to the research questions or hypotheses. The type of figure—whether a graph, chart, or diagram—should be chosen based on the type of data being presented as described below. Ensure that the figure has a descriptive legend and that all axes are clearly labelled with units of measurement, legends, and any necessary statistical markers (such as error bars or confidence intervals). Avoid clutter and unnecessary embellishments; the figure should highlight the most critical aspects of the data. An appropriate figure should complement the text and tables without duplicating information, and it should be easily interpretable by itself, allowing the reader to grasp the main points without needing extensive explanations.

Types of graph

Appropriate graphs can enhance the appearance and comprehensibility of your manuscript. Well-designed graphs are often easier to interpret than tables or text. Bar graphs, line graphs and scatterplots (XY graphs) have specific purposes. *They are not interchangeable*.

- Bar or column graphs are intended for displaying *categorical* data, allowing for easy comparison of the frequency or values across different categories and making them helpful in presenting discrete groups or counts. Changing the graph to reflect percentages rather than numbers or using a “stacked column” chart can make information much more meaningful and easier to interpret. Explore these options and find which works best.
- Line graphs are best suited for illustrating trends over time, as they show the relationship between two variables and highlight changes in values across a continuous scale, making it easier to visualise patterns or trends.
- Scatter plots are used to examine the relationship between two quantitative variables, allowing researchers to assess correlations or patterns in data points, and are particularly helpful for visualising the strength and direction of a relationship between variables.
- Histograms and box-and-whisker plots are best for displaying the spread of results
- There are many other chart types with niche application. Exploring your data in determining which chart type its best is an important part of your analysis.

Common errors

Common errors with figures include:

Actual and apparent mistakes, as described for tables.

Missing information. Graphs which should but do not include error bars (standard deviation, standard error or range).

Irrelevance. Students frequently include graphs just because they have them, even where they are of no value (e.g., where the information is irrelevant to the research question or is already given in text or a table).

Inappropriateness. It makes no sense to use up half a page for a graph when its data are simple enough that they could be reported in a few lines of text.

Amateurish graphs. Keep graphs simple and two-dimensional. Avoid Excel's fancy three-dimensional bar graphs and pie charts. (These are largely for business presentations). Use colour only sufficiently to make meaning clear. The graph is there to convey results, not for decoration.

Missing information on axes (title, scale, units)

Incomprehensibility. The figures are so poorly designed that it is challenging to understand them.

Wrong type of graph for the data. See above.

Inadequate and wrongly numbered legends.

Discussion

Fatal flaws in discussion

The following are serious shortcomings in the discussion that almost always result in the examiners requiring a second examination after corrections.

Superficial discussion. The degree of intellectual engagement with your results (often manifesting in a very short discussion section) is not worthy of a master's level degree.

Drawing inappropriate conclusions from your results (e.g., concluding that A is better than B when you failed to show a statistically significant difference between A and B).

Missing interesting and relevant conclusions that your results should lead you to. This often represents intellectual laziness. Students write down their results but cannot be bothered to think deeply enough about what the results are or could be telling you. So, they write down something superficial while completely missing the actual value of the results.

Irrelevant discussion. The discussion fails to remain focused on your actual results but moves on to topics not directly related to your results.

Unbalanced and missing discussion. Your study had two aims, or you found two equally important results. You discuss one in great detail and the other hardly or not at all.

General points

Here are some general points about your discussion.

Do not report results for the first time in the discussion. They must appear in the results section.

Do not repeat results reported in the results section in the discussion.

Stay focused: Ensure that the discussion focuses on the study's results and implications.

Do not stray into a discussion of or make recommendations for topics not part of your study. If you studied diagnostic markers for a disease and have useful findings, you can make recommendations for diagnosis. It is inappropriate to offer treatment recommendations. Nor should you be discussing treatment.

Write clearly: Write in clear, concise language, avoiding jargon or overly complex sentences. Ensure that your arguments are logically structured and easy to follow.

Support arguments with evidence: Use citations from relevant literature to support your interpretations and claims. This adds credibility to your discussion and shows how your work fits the larger scientific landscape.

Stay objective: Maintain an objective tone throughout the discussion, even if it is necessary to advocate for the significance of your findings.

Do not overstate the significance of your findings. It is best to remain somewhat guarded. Imagine that you found that 62% of patients improved on treatment A, and 64% of patients on treatment B and the difference is significant. You might write *Our results suggest that there may be some advantage in applying treatment A, although the small difference we noted may not be clinically significant. We believe the result should in any event be replicated in larger studies before a definitive recommendation can be made*. Do not write *We recommend a change in clinical practice such that all patients receive treatment B*. To do so would be to overstate the confidence people should have in your result and the size of the effect it would have if clinical practice were changed.

Laying out the discussion logically

One way (but not the only way) to begin is by *Restating the purpose of the study and its key findings*. This sets the stage for discussing the implications of the results.

Interpret the results: Analyse the findings in detail, discussing what they mean in the context of the existing literature. Address how the results support or contradict previous studies and explain any discrepancies.

Consider implications: Discuss the broader implications of your findings for clinical practice, policy, or future research. Explain how your study contributes to the field and what changes it may suggest.

Discuss the limitations of your study: Acknowledge the limitations of your study candidly. Discuss any factors that might affect the validity or generalizability of the results, such as sample size, study design, or potential biases. *Discuss* means *discuss*. You must explain why your study's conclusions remain valid despite the limitations. Do not list limitations just for the sake of doing so (or even making up some). If your study yielded statistically significant results, it cannot have been underpowered, even if you only had 12 subjects. The sample size was, from the statistical point of view, adequate. Do not state that the sample size was too small. You need to think very carefully about this section.

Suggest areas for future research based on your findings and limitations. Highlight unanswered questions from your study and how they could be addressed in subsequent work. Avoid the trite phrase *We recommend that further research is undertaken* unless you are very specific about what direction that research should take.

Conclude thoughtfully: End with a strong concluding paragraph that encapsulates the significance of your findings. Reiterate the main takeaway from your study and its relevance to the field.

References

Start the bibliography (Reference section) on a new page.

Check your bibliography very carefully. Check that all references are present, correctly numbered and in sequence. Ensure that all details are correct. Ensure that the Vancouver system is followed consistently. Check that different reference types, such as journal articles, book chapters, books, electronic articles and websites, are correctly referenced.

It is not uncommon for referencing software to scramble references, such that numbers in the text no longer reflect the actual references in the bibliography. You must check this repeatedly, and as the final last step before submitting your thesis.

How many references should there be?

Journals limit the number of references in a paper. For a manuscript of 5000 words, the limit should be approximately 50 well-chosen references. You had the opportunity in Chapter 1 to prove your understanding of the literature by referencing extensively. *Do not do so here*. Research articles are typically allowed many fewer references than review articles. Your examiners will judge your manuscript by the appropriateness of your references, not their number.

Format

Line spacing 1.15 lines, left-aligned.

It is not uncommon for referencing software to scramble references, such that numbers in the text no longer reflect the actual references in the bibliography. You must check this repeatedly, and as the final last step before submitting your thesis.

DISCUSSION CHAPTER (FINAL CHAPTER)

The discussion should be somewhat longer than the thesis introduction, about 3500-6000 words (MMedSc), 6000-9000 words (PhD). (In page equivalents, 4000 and 9000 words are about 8 pages, and 20 pages respectively, typed at 1.5 lines.) This is flexible. The right length is that length which adequately does justice to your work.

INTRODUCTION TO THE CHAPTER

The final chapter of a thesis, particularly when earlier chapters are presented as manuscripts, serves to integrate and synthesize the research findings into a coherent whole. This chapter is about the project, not about subsections of the work reported as manuscripts. It begins by briefly restating the overall research question or aim of the thesis, providing a clear context for the discussion that follows. A roadmap for the chapter should be outlined, explaining how the findings from the manuscript-style chapters will be brought together, interpreted, and evaluated. It is often helpful to summarise the findings of each chapter generically, but without detail, e.g., *In the first part of this study, we showed that neutrophils drawn from HIV-positive subjects… (Chapter 2). We proceeded to investigate this at the molecular levels, and were able to show that this neutrophil behaviour is explained by the presence of specific chemotactic factors…(Chapter 3)…* etc. Detailed background information or methods from earlier chapters should be avoided, as the focus is on synthesis and interpretation rather than repetition.

SYNTHESIS OF FINDINGS

This section draws together the key results from each manuscript, emphasizing patterns, consistencies, and any apparent contradictions across the studies. The discussion should show how the individual findings collectively address the overarching research question. Where relevant, cross-cutting analyses or subgroup comparisons should be highlighted to illustrate broader trends or insights. The goal is to move beyond a simple chapter-by-chapter summary, presenting a cohesive narrative that links the results into a unified interpretation.

INTERPRETATION IN CONTEXT

Following the synthesis, the findings should be interpreted in relation to the existing literature. This includes demonstrating how the results support, extend, or challenge current knowledge and theoretical frameworks. Any unexpected findings should be addressed thoughtfully, with plausible explanations or hypotheses offered. The chapter should also emphasize the novel contributions of the research, highlighting the unique insights gained through the work as a whole.

LIMITATIONS

A critical discussion of limitations at the thesis level is essential. This section should acknowledge methodological constraints, such as sample size, study design, or data quality, as well as limitations in generalizability. While limitations may have been noted in individual manuscript chapters, this section focuses on the overall weaknesses and boundaries of the thesis, offering a balanced perspective on the reliability and applicability of the findings. You must see this section, not as just

a list of weaknesses, but as a defence of your work. For each limitation, you need to provide some thoughtful discussion as to the extent to which it weakens your work, and why your results are still valuable and can be believed despite the limitation.

Common errors

Superficiality, writing a few points down here without really considering the strengths and weakness of your methods properly and thinking them through.

Major omissions, omitting some real weaknesses and leaving these to be picked up by the examiner.

False limitations, overstating limitations which are either not limitations or are trivial or minor. An example was given earlier. You have a relatively small sample of 20 participants. Some students will automatically claim that this small size is a limitation. Say that you wish to determine whether the level of a protein differs between a treatment and control group within this small group. Your answer is significant, $p = 0.004$. For this comparison, therefore, the sample size was *appropriate*, and the study was *not* limited by the "small" sample size. (If, however, the p value had been 0.07, then it may well have been limited by the sample size.) You must apply your mind and not just trot out stock phrases.

Failure to discuss the limitations. You need to evaluate each limitation. Does it fatally destroy your conclusions? Are they still valid? What are the limits placed on your interpretation by those limitations?

IMPLICATIONS AND RECOMMENDATIONS

The discussion should then consider the broader implications of the research. Depending on the field, this may include relevance for clinical practice, policy or future research. Clear recommendations should be offered, identifying practical applications or proposing studies to address remaining gaps in knowledge. This section should demonstrate how the thesis contributes meaningfully to the field and how its insights can be used moving forward.

CONCLUSION

The chapter concludes by summarizing the main contributions of the thesis succinctly, reiterating how the research addresses the overarching question or problem. The final sentences should provide a clear, authoritative statement of significance, leaving the reader with a strong sense of the work's impact and value.

BIBLIOGRAPHY

The chapter is fully referenced and has its own bibliography which follows it.

APPENDICES

PAGE NUMBERS

Page numbers are optional for the appendices. It is acceptable to stop numbering on the title page of the first appendix. If you know how to superimpose external page numbers on PDF pages, you may do so. It is, however, tricky. You will need to ensure that the superimposed page numbers do not fall on top of the document's internal numbering, and you will have to edit the Table of Contents manually.

LAYOUT

Title page

For each appendix, construct a title page which matches those at the start of chapters 1 and 2.

- Position the text APPENDIX [**number**] halfway down the page.
- On the following line, write the title of the appendix.
- Then, insert the document after this, typically in PDF format.
- Repeat for all appendices.

WHAT TO INCLUDE

Include the following, as appropriate, and in the following order.

- Protocol
- Formal letter awarding ethics approval. Where necessary, Department of Health approval and University approval (e.g. for research involving students).
- Explanatory material for patients and participants (if any)
- Consent forms (if any)
- Published paper as a PDF (if any)
- If you have stated that your manuscript is formatted according to the instructions of a specific journal, include its *Instructions for authors.*
- Data capture sheets, instruments and the like
- Any other relevant material.

NOTES

- Include your protocol and all other material as a PDF. If you insert them as a Word document, they share formatting with the rest of the thesis, resulting in a loss of proper formatting.
- You must include the official approval from Department of Health head office, but you do not need to include approval from hospitals or institutions.