How to read a scientific paper for nurses - types of Scientific papers

ESN
EUROPEAN SPECIALIST NURSES ORGANISATION

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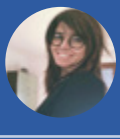

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THIS IS A PUBLICATION IN THEE SERIES OF:
ESNO Nurses Education and Communication Guides.

CONTENTS

Foreword

As Chairman of the ESNO Education and Science Committee, I am delighted to introduce the guide developed by Luigi Apuzzo, Elena Brioni and Cristiano Magnaghi.

It seems to me that it's essential to understand how to write scientific papers in order to develop the critical sense needed to evaluate the relevance of publications. It is this intellectual curiosity that contributes to the evolution of professional practices in terms of both quality and safety. The skills that this gives us helps us to discuss and develop strategies to optimise care.

Healthcare professionals need to be trained and educated before they can carry out patient care. In the same way, reading scientific and medical publications needs a basic level of knowledge of the methodology of writing papers, to allow analysis of the validity of the data in an objective way. Also, understanding the elements on which the evidence is built allows us to acquire the skills to carry out our own research.

The European macro-environment opens up important opportunities to exchange and share different professional cultures and to identify best practice.

The leadership of specialist nurses is undoubtedly present in the health sectors, but is not sufficiently translated into policy. We need to make visible the work we do every day not only with our heart and our professional conscience, but also with our head and our reflective approach. It is the combination of expertise and know-how that leads to knowledge.

On behalf of the ESNO Education and Science Committee, I congratulate the authors with this significant paper.

"Science is the great antidote to the poison of enthusiasm and superstition."
Adam Smith

Nico Decock,
Chair of the ESNO Education and Science Committee

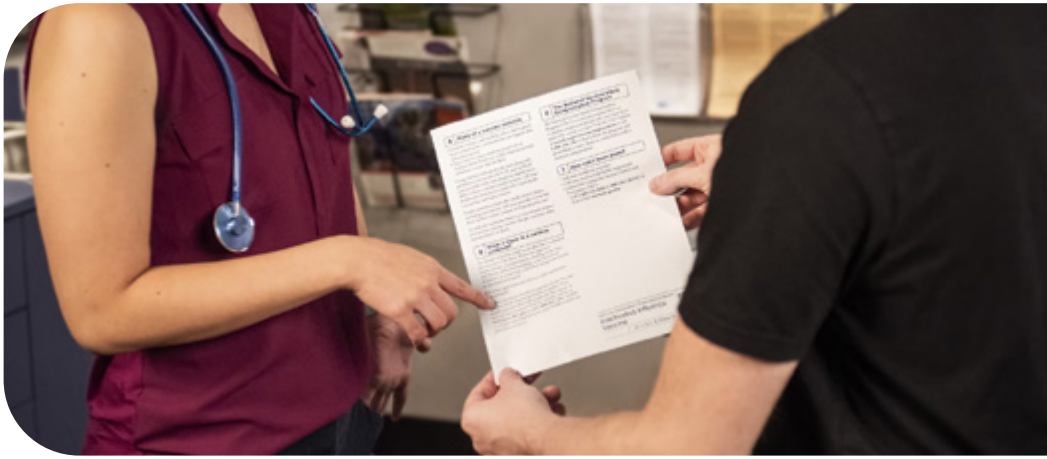
Who is this guide for?

The guide has been developed for nurses, both those with few research skills and who want to understand scientific research, and those who have some research expertise but who want to know more. The guide is also a useful tool for other health professionals.

Why read this guide?

The nursing profession, all over the world, has seen years of scientific progression and social recognition, especially in the years following the Covid-19 pandemic. In over 70 countries around the world, nurses have been granted additional responsibilities, including the ability to prescribe medications. However, in many other countries, the profession is struggling to progress and gain greater responsibilities and recognition, despite the fact that nurses are recognised healthcare professionals.

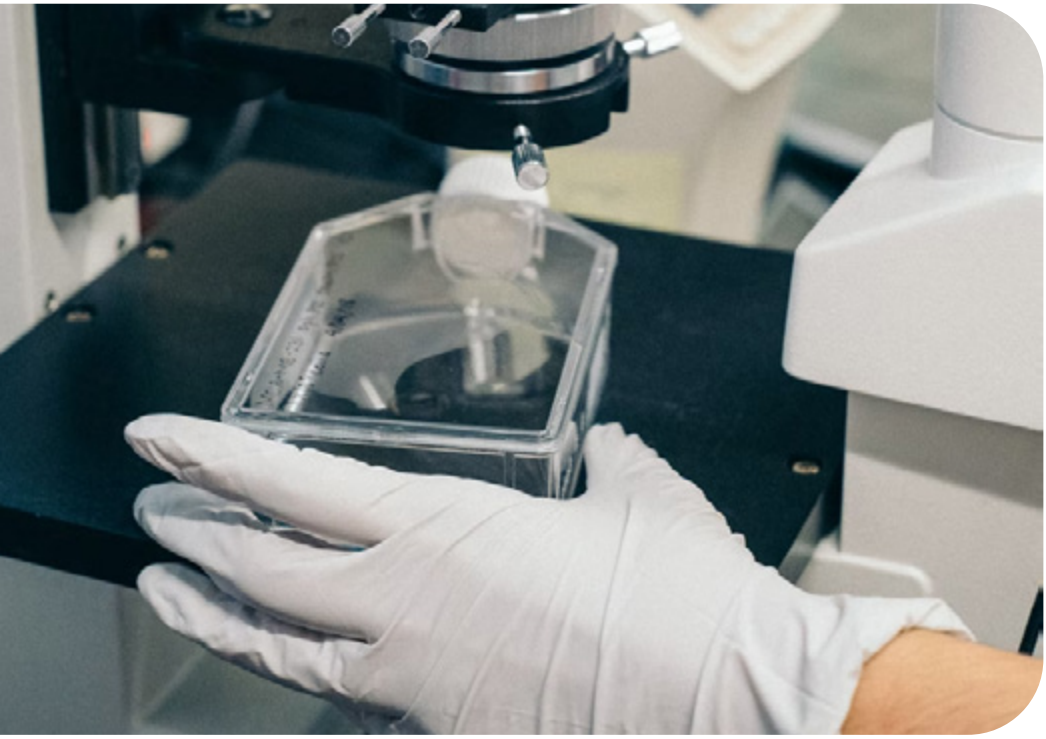
Nurses have professional autonomy and responsibility in the management of patients, in the fields of prevention, treatment, rehabilitation and palliation. The purpose of this guide is to encourage the constant development of the nursing profession and the career progression of nurses. To achieve these goals, nurses need to act with competence and professionalism, which can only be achieved



with structured study pathways and continuous in-depth studies, as well as in-depth guides like this one.

This guide provides simple and clear guidelines for reading a scientific paper and is based on international ground rules. It aims to help nurses to gain and deepen their knowledge of aspects of research in a simple and practical way. It includes examples of how a scientific paper is structured, how it must be interpreted and what needs to be classified. This will allow nurses to evaluate the potential impact on your practice, and find useful recommendations to support evidence-based medicine. This is not only valuable for people new to nursing, but also for those who have many years of experience, because there can be a danger of failing into habits and thinking 'this is how it has always been done'.

By helping nurses to understand scientific papers, this guide will support them as they play a central role in direct patient care, planning health services, and preparing protocols and care procedures. Nurses will also find it easier to participate in daily briefings and daily meetings with a variety of healthcare professionals, including doctors, other nurses, midwives, physiotherapists and others.



INTRODUCTION TO THIS GUIDE

Introduction to this guide

The nursing profession is continuously evolving, and nurses need to keep themselves updated to ensure safe and effective clinical care. Reading scientific publications is an important part of exchanging knowledge in the national and international scientific community.

> **Nursing research has a long history. The person to whom the origins of modern nursing are commonly attributed is Florence Nightingale, who condQucted research of a kind when she used statistical methods – in which she was trained – to impress her point about the link between social deprivation and disease on British politicians of the 1800s.**
>
> *Watson 2013*

The evolution of nursing into an evidence-based profession has made nurses more aware of the role of research in supporting their practices. More nurses are studying at postgraduate level, creating a growing pool of clinically rooted research nurses advancing the knowledge for the benefit of patients .

Reading a scientific paper critically allows us to understand how the study is conducted, whether the data is complete and valid and the conclusions reflecting the outcomes, whether the study is ethical, and how the study will impact clinical practice.

The importance of applied research in clinical practice is discussed in the International Council of Nurses Code of Ethics for Nurses, first drafted in 1987 and revised in in 2021 (ICN 2021). This emphasizes the need for training and evidence-based practice:

> The nurse is a person who has completed a programme of basic, generalised nursing education and is authorised by the appropriate regulatory authority to practice nursing in their country. Basic nursing education is a formally recognised programme of study providing a broad and sound foundation in the behavioral, life and nursing sciences for the general practice of nursing, for a leadership role, and for post-basic education for specialty or advanced nursing practice. The nurse is prepared and authorised (1) to engage in the general scope of nursing practice, including the promotion of health, prevention of illness, and care of physically ill, mentally ill, and disabled people of all ages and in all healthcare and other community settings; (2) to carry out healthcare teaching; (3) to participate fully as a member of the healthcare team; (4) to supervise and train nursing and healthcare auxiliaries; and (5) to be involved in research.

> Evidence-informed practice (EIP) is a process for making informed clinical decisions. Research evidence is integrated with clinical experience, patient values, preferences and circumstances.

The Italian Code of Ethics for Nurses (Codice Deontologico delle Professioni Infermieristiche 2019 Il testo approvato dal Consiglio Nazionale), revised in 2019 (FNOPI 2019), emphasises the importance of nursing research and training in clinical practice:

Art. 9 – "The Nurse recognises the value of scientific research and experimentation. Elaborates, carries out and participates in research paths in the clinical assistance field, organizational and training, making the results available."

Art. 10 – "Nurses base their work on knowledge validated by the community scientific and update skills through study and research, critical thinking, reflection based on experience and good practices, in order to guarantee the quality and safety of the activities..."

THE SCIENTIFIC PAPER: A WAY TO COMMUNICATE

The scientific paper: a way to communicate

The role of communication is to convey information. Scientific papers should be supported by data and include a clear and reproducible methodology by the users of the information itself.

Effective communication is based on a thorough and direct knowledge of the subject and on knowledge of the audience. It should be written in a style that makes reading and understanding as accessible as possible.

Reading scientific selected documents, through a careful search of the literature papers, is a good way to deepen knowledge on a topic of interest. It's to obtain information through the reading of scientific papers selected through a careful search of the literature. A careful analysis of the literature will allow us not only to implement our knowledge on the subject but will also allow us to evaluate the inclusion of new evidence-based nursing practices or to launch our research in the field.

> I view nursing as a scientific art, which may seem like an oxymoron. However, I believe that the art cannot exist without the science. I define nursing as a basic science and the practice of nursing as the scientific art of using knowledge of unitary human beings who are in mutual process with their environments for the well-being of people. Personal definitions of nursing are quite varied, as they reflect our unique professional identities, as well as our philosophies of nursing and our paradigmatic propensities.
>
> *Elizabeth Ann Manhart Barrett,*
> *RN; PhD; FAAN Professor Emeritus, School of Nursing,*
> *Hunter College, City University of New York.*

Types of scientific papers?

There are different types of scientific journals and they range from authoritative international and national periodicals to journals where authors pay to have articles accepted.

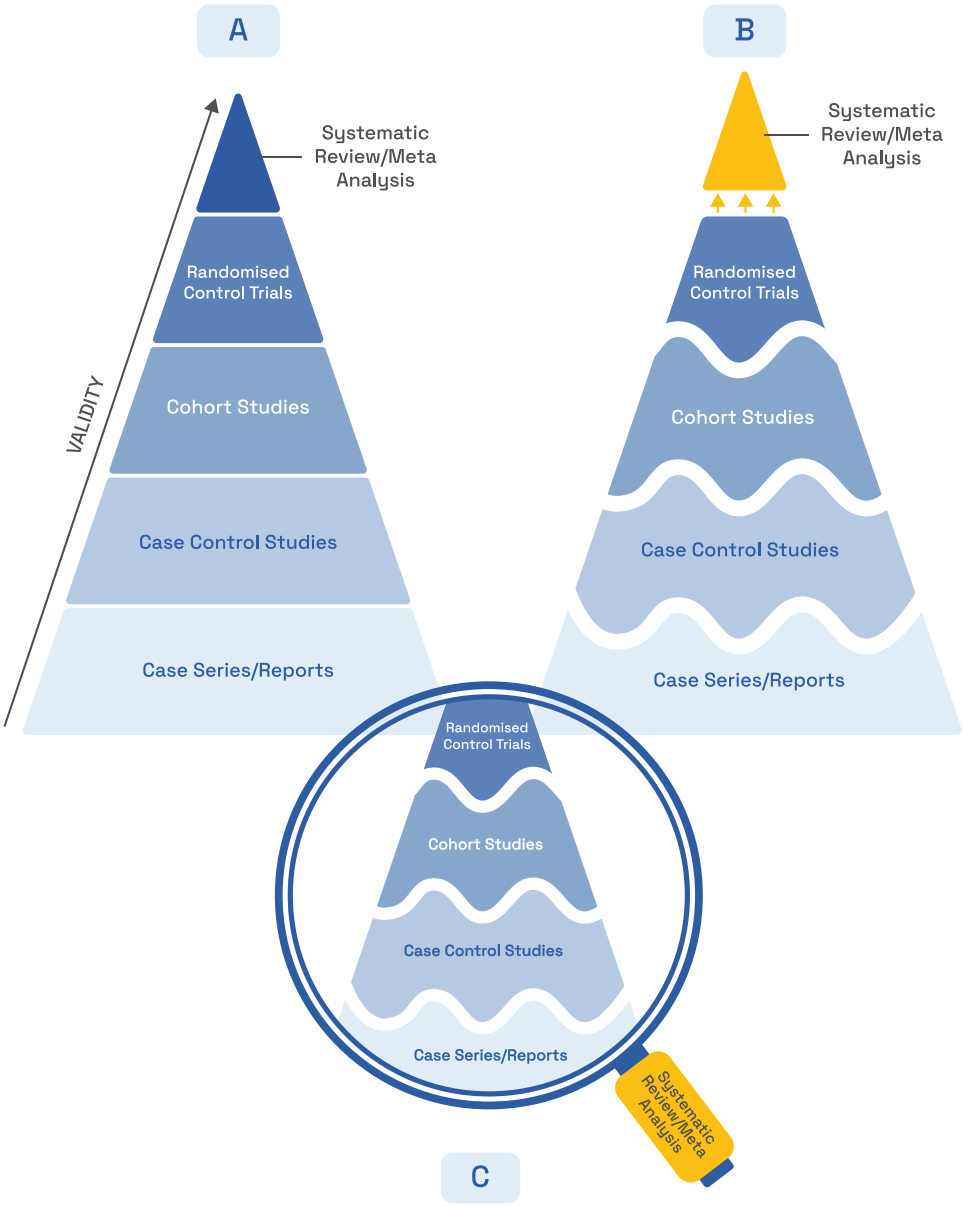
The types of papers most commonly found in scientific journals:

- **Systematic review or meta-analysis**
    - A literature review of research on a specific topic, with a critical evaluation. Documents methods, and may or may not include a meta-analysis (a statistical analysis that combines the results from a number of scientific studies).
- **Papers presenting original research – randomised controlled trials/cohort studies/case control studies**
    - A presentation of the results of one or more studies, describing a new theory or corroborating/disproving existing theories.
- **Case series/reports**
    - A description and anecdotal report of the clinical history of a single case or a series of cases.

> **The first and earliest principle of evidence-based medicine indicated that a hierarchy of evidence exists. Not all evidence is the same.**
>
> *Murad 2016*

The evidence pyramid (Figure 1) shows the different levels of evidence in each type of paper, with the magnifying glass showing the role of metanalysis.

Journals can also include articles written by experts in the field, usually at the invitation of the editor, to comment on a paper in the same issue of the magazine, to express an opinion, or to discuss a controversy, as well as letters to the editor that focus on a previously published paper and that critique, correct or explain the results, or add further data.



Source: Murad 2016

Figure 1: The evidence pyramid

Structure of a scientific paper

The structure of an original research paper can be described as **IMRaD**, or Introduction, Methods, Results, and Discussion/conclusion.

IMRaD gives us, as readers, a structure to evaluate the completeness and validity of the data, the methods and protocols, the conclusions, the ethics, and the independence of the contents.

INTRODUCTION	• Background of the study • Literature reviews (previous studies the researchers used as a basis) • Objectives/questions (presentation of the hypothesis)
MATERIALS AND METHODS	• Study design • Sample studied/data collection • Tools used • Data analysis • Ethical considerations
RESULTS	Presentation and analysis of the data obtained, including graphs/ tables/figures
DISCUSSION (CONCLUSION)	In the discussion, the relevant points of the results obtained must emerge that allow us to reach conclusions

Table 1. The IMRAD structure of the scientific publication

Title

The title is like the business card of the research, and has a number of requirements.

It should:

- be consistent with the content;
- clearly explain the topic of the study;
- attract the attention of the reader;
- be concise, informative and precise;
- contain the keywords that summarise the content.

The title increases the visibility of the work. If the title reflects the main theme, it makes it more likely to be found by search engines, or spotted by people looking through the contents of a journal. This will increase the chance of it being read and cited in other pieces of work. The title should be short and incisive, and should include the crucial elements of the study, as well as the basics of the study design if possible. Sticking to these guidelines allows the reader to get an understanding of the topic covered in the paper quickly.

Abstract

The abstract summarises the content of the paper, document, research report or presentation. It allows the reader to get a general understanding of the research without reading the entire document. It should highlight the main points of the research and describe the purpose of the work, methodology, results, conclusions and any impacts of the work on clinical practice.

There are different types of abstracts (Source 2023):

- indicative abstract: a short, simple and objective summary of the paper;
- informative abstract: a summary of the paper, along with a description of the objectives and conclusions;
- evaluative or critical abstract: evaluates the contents of the paper.

An abstract of a scientific paper is usually around 250-300 words, but this varies between publications.

At the end of the abstract there are often four or five keywords listed – the Medical Subject Headings (MeSH) thesaurus provides lists of keywords used in indexing, cataloguing, and searching of biomedical and health-related information.

Using the PICOM approach allow the reader to check:

- **P – population**
  - whether it is their field of interest (e.g., renal disease) and whether it includes their patients of interest (e.g. kidney dialysis)
- **I – intervention**
  - whether it covers an intervention of interest (e.g., health education)
- **C – comparison or control**
  - whether it includes a control group or another comparator
- **O - outcome**
  - Whether it includes an outcome of interest (e.g. reduction in infections)
- **M – method**
  - what methodology research design was used.

Other approaches include PICOT (T=time) or PIO, where no comparison is included.

The control group (sometimes called the comparison group) is used in an experiment to ensure that the experiment actually works. It's a way of making sure that the intervention you're introducing into your research is responsible for the experimental results and not something outside the experiment.

Issues with abstracts

- Abstract does not include the main results of the study;
- Introduction does not clearly describe why the research is important;
- Methods section is either not detailed enough or is disorganised and unclear;
- Results section provides comments and explanations rather than just reporting the results;
- Conclusions do not answer the research question proposed by the study.

Authorship

According to the International Committee of Medical Journal Editors (ICMJE 2023), the authors should:

- Have made substantial contributions to the conception or design of the work, or the acquisition, analysis, or interpretation of data for the work
- Drafted the work or revised it critically for important intellectual content
- Had final approval of the version to be published
- Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Papers reporting complex studies may have a number of authors. In many disciplines, including nursing, the authors are ordered approximately by their contribution to the paper. The first author is the one who did most of the work. The last author may be the coordinator of the research group.

Introduction or background

In the introduction or background section, the authors provide a rationale for the study, along with a review of the evidence available at the time of the study. This highlights the relevance of the new study and the presence or absence of other relevant studies. A good introduction is clear and concise.

The introduction should include what motivated the researchers to carry out the study (the hypothesis), followed by a clear description of the questions asked (the aims) and how the study plans to answer these questions. The introduction should not discuss any of the results or conclusions.

All statements that are not derived from data collected in the study should be supported by a reference.

st be familiar with, and follow, the policies in their country, region or hospital, and use these to guide the process and communicate with healthcare professionals and patients.

Materials and methods

The materials and methods must be detailed so that other researchers can duplicate the study or continue the research. They also indicate whether the results will be relevant to a reader's clinical practice.

This section can include:

- **Study design**
    - The study type and methodology
    - Sequence of measurements and treatments
    - Blinding, in order to prevent conscious or unconscious bias that could affect the final results of the study.
        - **Single blind:** only the healthcare professional is aware of the treatment received
        - **Double blind:** the patient and the healthcare professional are not aware of the treatment received
        - **Triple blind study:** the patient, the healthcare professional and the researcher carrying out the data analysis are not aware of the treatment received
    - Randomisation, including the randomisation ratio (e.g., 1:1) and any changes after the start of the study

- **Patient characteristics**
    - Age, gender, any other relevant characteristics such as previous treatments, disease sub-type, comorbidities, vital signs etc.
- **Inclusion/exclusion criteria**
- **Environment**
    - Location (e.g., country, city)
    - Clinical setting (e.g., hospital, clinic, professional office)
    - Sigle centre or multicentre
- **Measurement techniques**
    - Measurement techniques used
    - Methods of data collection (grids, questionnaires, interviews, tools, equipment)
    - Bibliographic references for validated methods
    - Descriptions of new methods
- **Treatments and controls/active comparators**
    - Name of the drug
    - Dose
    - Frequency of dosing
    - Any crossover
    - Route of administration
    - Time and duration of administration
- **Outcome measures and endpoints**
    - Outcome measures
    - Primary and secondary endpoints
- **Statistical analysis**
    - The statistical methods used for the various types of assessments:
        - Correlations
        - Distribution curves
        - Confidence intervals
        - Statistical significance values
    - The statistical procedures used for each analysis;
    - The type of software used for the statistical analysis.

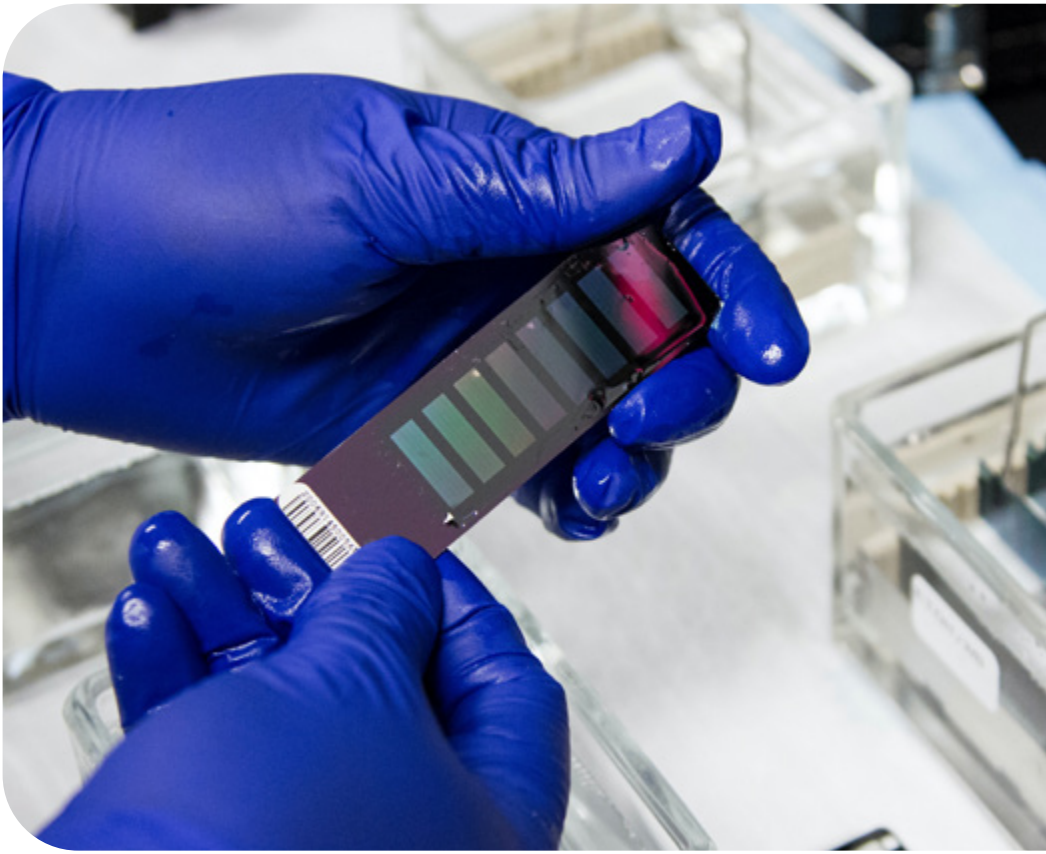
The materials and methods section must indicate that the researchers have obtained Ethics Committee approval for the study, and that informed consent has been obtained from each subject recruited in accordance with the Declaration of Helsinki.

Results

PRESENTING THE RESULTS

The results in a paper are presented in text, tables, figures and graphs. Whether the paper is original research or a literature review with or without meta-analysis, the reader needs to critically analyse and interpret the results. This involves the reader asking themselves a set of questions:

- Do the results answer the questions posed in the introduction?
- Are the results presented clearly and consistently?
- Is there a clear correlation between the intervention studied (the independent variable) and the outcome of interest (the dependent variable).



OUTCOME MEASURES

Scientific papers of interest to nurses, such as studies of different treatments, can have endpoints that directly measure clinical outcomes, such as improvements in symptoms or rates of survival, or that are surrogates for clinical outcomes, such as blood test results. As an example, a clinical outcome measure in rheumatoid arthritis could be a reduction in swelling or stiffness, and a surrogate measure could be inflammatory biomarkers in the blood.

Negative results in research

Finding negative results in research is an integral part of being an effective researcher. Negative results tell researchers that they are on the wrong track or that they need to change their techniques. This is a natural and necessary part of discovering something that was previously unknown. Publishing negative results from rigorous research contributes to scientific progress (Marin Gonzalez 2017).

Journals such as Journal of Negative Results in Biomedicine, PLOS ONE, and The All Results Journals encourage researchers to publish negative results.

ORIGINAL RESEARCH

Original research

Bias and errors

Readers need to be aware of any bias and errors in a paper:

- Is this the right study design for this type of research?
- Has the randomisation been carried out correctly?
- Is the study blinded, and if not, why not?
- How many patients people didn't take their treatment correctly (were non-compliant)?
- How many patients withdrew from the study and for what reasons?

Intention to treat - ITT

Studies may include an Intent To Treat (ITT) analysis, where all randomised patients and included in the analysis, whether or not they completed the treatment. This may be used where the patients find it hard to complete the treatment, for example because of side effects. Including the people who do not complete the treatment gives the researchers an unbiased estimate of the efficacy of the treatment (McCoy 2017). If the analysis is based on only the patients completing the study, this may be described as 'per protocol'.

Generally, the authors will state that they have carried out an ITT analysis. If it's not declared, readers can check by comparing the number of randomised subjects with the number of participants analysed. If there is an ITT analysis, these numbers will be the same (Figure 2).

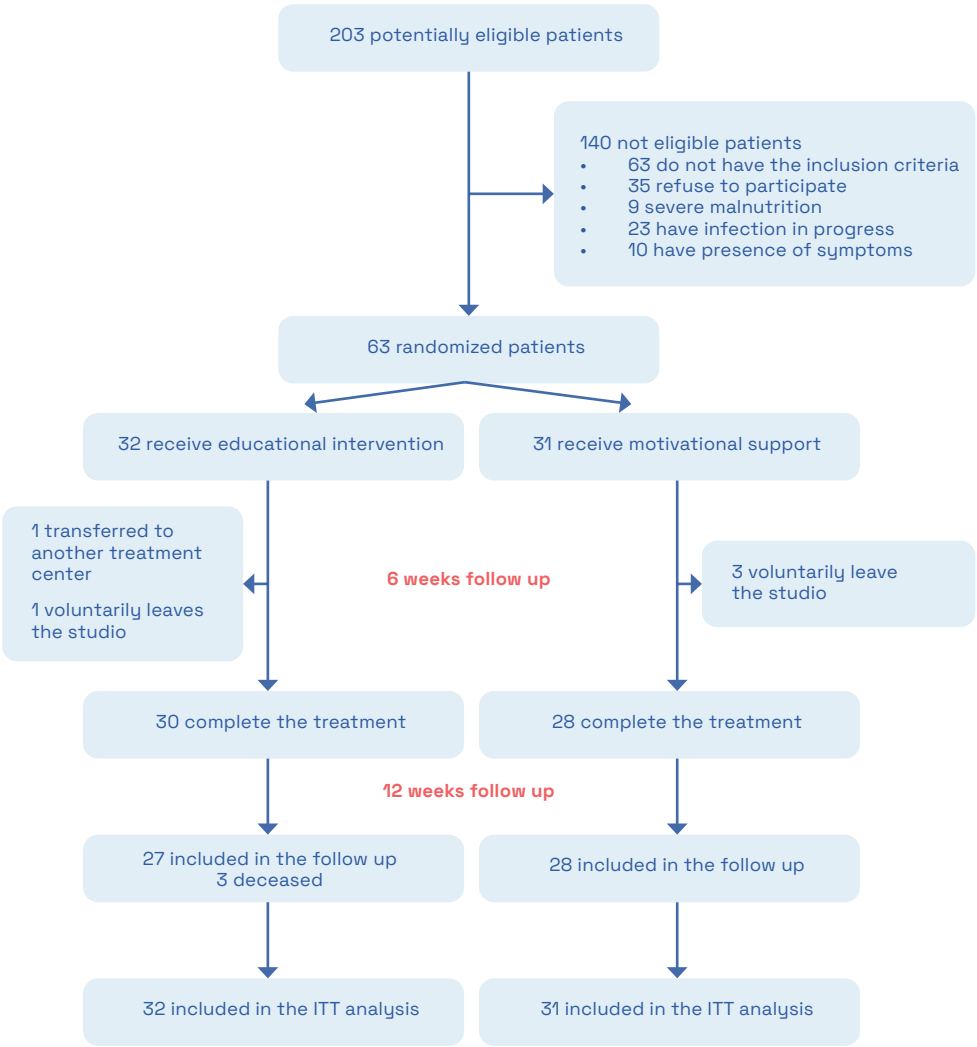


Figure 2: Example of a flow chart with the inclusive Intention to Treat analysis

Follow up period

The follow-up period shows how long the participants were followed. The length of the follow-up will depend on the type of study. The paper should include the number of participants lost in the follow-up.

Readers should look at the group of patients left to see if the group remains homogenous, or whether the patients that have dropped out have meant that the group skewed in one direction or another, and should check that the group left is large enough to make the results meaningful. The authors should also have discussed possible causes for the withdrawal from the study, especially if the numbers that have withdrawn are high.

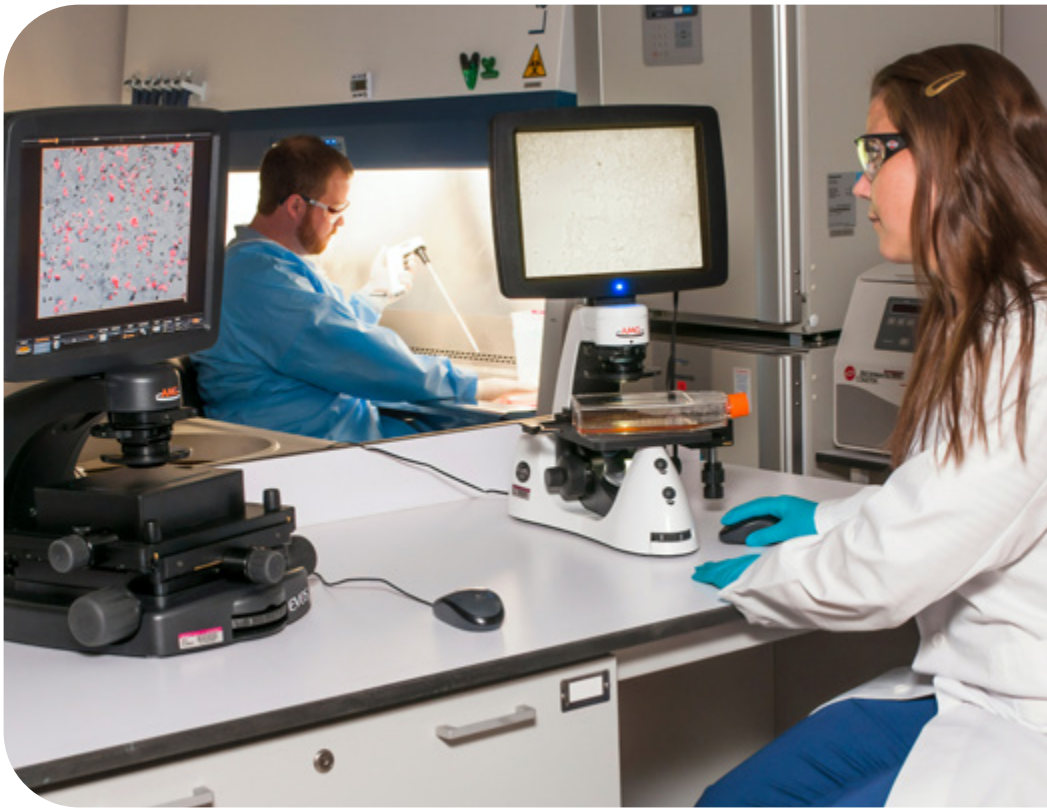
Clinical relevance and effectiveness measures in trials

Different clinical studies use different measures of effectiveness. Readers must be able to understand their meaning and interpret their value and precision in order to understand the strength of the association between treatment and outcome. This will allow the nurse reading the study to see whether the intervention is effective and work out how it could help their own patients.

The data will include different types of variables. For continuous variables, such as blood sugar, blood pressure, temperature, the results will include specific values or ranges before, during and after treatment. For discrete or dichotomous variables (yes or no, dead or alive, fracture or no fracture, infection or no infection), the results will include how often these events occur.

The reader should look at the results and see:

- if the data in the text matches the data in the tables and figures;
- whether the paper includes all of the outcomes that were discussed in the methods section;
- if the results show clinical or statistical significance;
- whether the results are consistent;
- whether the results are intent to treat or per protocol.



Measures of association and risk rations

Measures of association show how closely things are related. These can be absolute or relative, and examples include (BU 2023):

- Relative measures of association – show the relative frequency of disease in an exposed group compared to an unexposed group; measure the strength of association between exposure and disease
    - Risk ratio
    - Prevalence ratio
    - Incidence rate ratio

- Absolute measures of association – describe excess risk, prevalence, or rate of disease; show the impact of prevention, or how many people would benefit from treatment
    - Risk difference
    - Prevalence difference
    - Incidence rate difference

The relative risk ratio (RRR) can be calculated using the experimental event rate (EER) and the control event rate (CER). If it is equal to 1, the risk is similar in the two groups.

In a study looking at a negative outcome, if the relative risk ratio is less than one, the treatment reduces the risk of something happening (e.g., relative risk of 0.60 means a 40% relative risk reduction), and if it is greater than 1 the treatment increases the risk of something happening (e.g. relative risk of 1.20 means a 20% increase in risk). The percentage is **the relative risk reduction (also RRR).**

As an example, in a study investigating physical activity in patients with chronic renal failure, if the EER was 0.29 and the CER was 0.404, the relative risk ratio would be 0.72 (0.29/0.404). These results would confirm that physical activity in patients with chronic renal insufficiency would reduce the risk of bone fractures by 28%.

Conversely, looking at a favorable endpoint for the participants (e.g., resumption of walking without assistance after a hip fracture), the relative risk ratio is interpreted as beneficial if it is represented with a value greater than 1 and as a worse outcome if it is represented as a value less than 1. The associated percentage is **the relative risk increase (RRI).**

The attributable risk ratio (ARR) shows readers how much an intervention affects the treated population. A value of 0 represents no difference between the study groups.

The number needed to treat (NNT) shows how many patients need to receive a treatment in order to prevent one occurrence of an outcome, e.g., a stroke. An NNT value of 1 indicates a beneficial outcome for each patient treated; an NNT of 100 means that 100 patients must be treated to see that benefit for one patient. An NNT representing a harmful outcome is expressed as a negative number.

The odds ratio represents the chance of an outcome happening when a patient is exposed to something (e.g. a treatment) compared with the chance that outcome will happen if they are not exposed (e.g. getting a different treatment). It is often used in case-control studies (Szumilas 2010).

As an example, patients admitted to a nephrology unit had a silk patch or a transparent dressing for fixing peripheral venous catheters. The paper looked at

whether the silk patch increased their risk of dermatitis.

In the 100 patients who had the silk patch, 15 had dermatitis – this was a relative risk ratio of 15%. The odds ratio is the ratio of the patients who had dermatitis and those who didn't, so is 15/85 or 0.18.

- OR=1 Exposure does not affect odds of outcome
- OR>1 Exposure associated with higher odds of outcome
- OR<1 Exposure associated with lower odds of outcome

Statistical significance and p-values

Papers may refer to results as statistically significant and give these results a p value. This means that there is a low probability that the difference in outcome between two groups of patients (e.g. rates of urinary tract infections in patients where nurses use chlorhexidine or normal saline before inserting a urinary catheter) is due to the intervention being studied. The p value is between 0 and 1, and the closer to 0, the less likely it is that the result occurred by chance (Dahiru 2008).

A cut off p value of ≤0.05 is commonly used means that there is a 5% chance of the results happening by coincidence. Studies may also cite p values of ≤0.01 or ≤0.001, which are of greater statistical significance. Whether or not the results are statistically significant, the researchers may say that they are clinically significant, which shows an improvement in a patient's symptoms or quality of life (Sharma 2021).

Confidence intervals

Clinical studies cannot include every single patient in a specific population, so include a sample of patients. The confidence interval (CI) shows the probability that a result fits between a set of values. The smaller the confidence interval, the more powerful the study, and the greater likelihood that the results are reliable. Smaller studies will have a larger CI. The CI threshold is commonly set at 95%.

As an example, an educational intervention for peritoneal dialysis therapy at home demonstrates a 20% reduction in the risk of re-hospitalizations at 30 days compared to standard treatment (therefore RR: 0.80). the figure of RR=0.80 is not enough for the reader to understand whether the result of a 20% reduction in the patient's risk of re-hospitalization is actually due to the educational intervention or whether it is due to chance. The data needs to be supported by a confidence interval and p value.

The 95% CI is 0.70-0.95: the data is statistically significant because both ends of the range are below 1. The result would have been not statistically significant if the CI was 0.70 to 1.15, as the range is both below and above 1.

SYSTEMATIC REVIEWS AND META-ANALYSIS

Systematic reviews and meta-analysis

Interpretation of data in systematic reviews

Nurses interested in expanding their knowledge in order to improve the care provided to their patients, may come across, in reading systematic reviews, which to date represent the highest level of scientific knowledge within the research pyramid. In fact, the systematic reviews come to relate the results of numerous studies on a given topic, and through a detailed and statistical system, called meta-analysis, it is possible to evaluate the results of agglomerations of the results of the individual studies that the authors themselves of the review they considered. It can be easily understood that a single study cannot satisfy the knowledge needs of a clinical nurse, but that instead, through the reading of a meta-analysis, the nurse or other health professional can easily come into contact. with ready-to-use results that involved important work, often done by many people. Obviously, just like the results of a single study, they must be critically analysed by the nurse who reads them.

PRESENTATION OF RESULTS

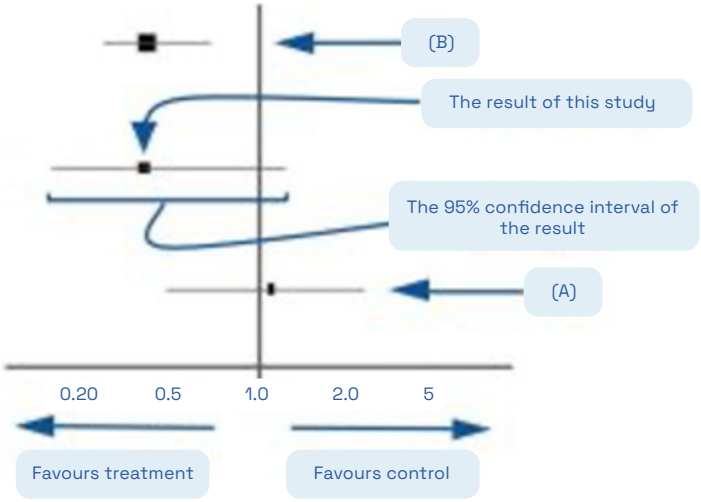
Presentation of results in a systematic review of literature with meta-analysis

After assessing whether the review methods are clearly documented, the review question is clear and the protocol is reported in detail, the reader needs to look at the results. A systematic review carried out correctly should provide the reader with tables or grids showing the results from each study, allowing them to evaluate the interventions and outcomes as for each study, including whether the data is statistically significant.

Forest plots

Many meta-analyses will include a forest plot, which allows readers to compare studies. A forest plot takes the same statistic (point estimate) from a number of studies and displays them in a single graph (Cantley 2016).

The vertical line shows the line of null effect, for example where there is no difference between interventions. The horizontal lines represent the 95% confidence interval for study A and study B, and the size of the square represents the number of participants in the study (Source: Cantley 2016 Figure 3).



Source: Cantley 2016

Figure 3: Introducing the forest plot

Looking at a forest plot (Figure 4):

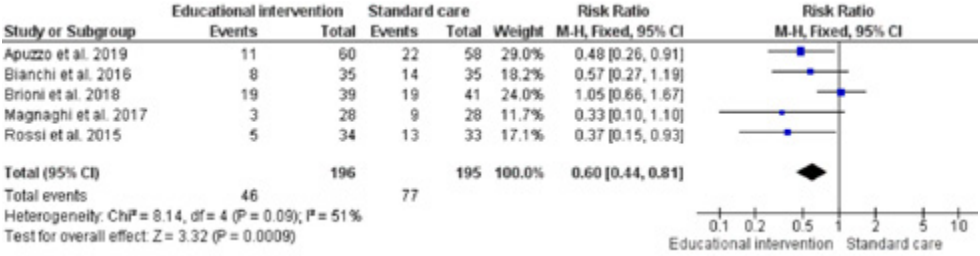


Figure 4: Example forest plot

- **Weight**
  - The influence the study has on the overall pooled results
- Confidence interval
  - The greater the value for the confidence interval (so the longer the line in the forest plot), the more variation there is in the results of the study
  - If the confidence interval crosses the line of null effect, that study probably isn't statistically significant
- **Risk ratio**
  - The chance of an event happening in one group compared with the other (e.g. chance of getting better in a treatment group compared with getting better in a control group)
- **Diamond**
  - The diamond in a forest plot shows the value when all the studies are combined together
  - The centre is the point estimate and the width is the confidence interval

Heterogeneity

Heterogeneity is a measure of the similarity of the results in the review. The heterogeneity measure is important, because it helps the readers to see how the results can be applied to their patients. If a meta-analysis shows strong heterogeneity the reader needs to question the results.

- I^2 is used as a measure of heterogeneity:
  - Low heterogeneity: less than 40%
  - Moderate: 30-60%
  - Substantial: 50-90%
  - Considerable: 75-100%.
- The p-value, if it is less than 0.05 or 0.10, confirms that the heterogeneity is real.
- There is still heterogeneity if the value of Chi2 (x2) is greater than the value of the degrees of freedom (df). The data of a meta-analysis that presents strong heterogeneity must be questioned.

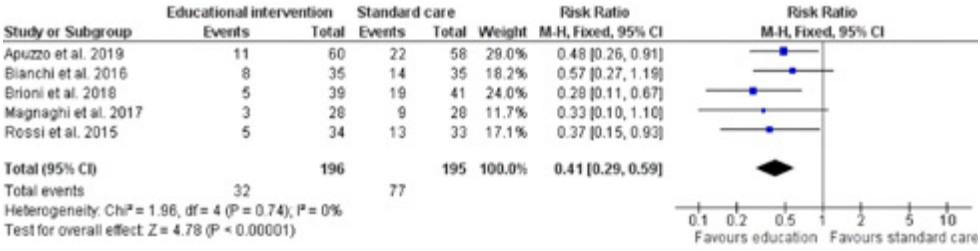


Figure 5: A forest plot without heterogeneity

In Figure 5, Chi^2 1.96 is less than the value of df (4), the p value is greater than 0.05, the confidence intervals of the individual studies are superimposable, and I^2 is 0%.

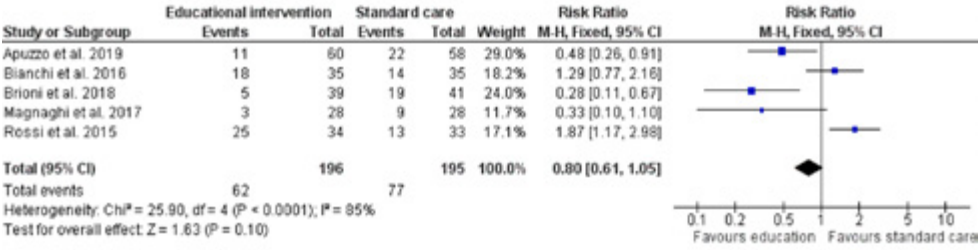


Figure 6: A forest plot that shows high heterogeneity

In Figure 6, Chi^2 is 25.90, so is greater than the value of df (4), the p has is less than 0.05, the confidence intervals of the individual studies are not superimposable and I^2 is equal to 85% - the heterogeneity is high.

The forest plot may also include a figure that shows any systematic bias present in the studies in the with meta-analysis (Figure 7).

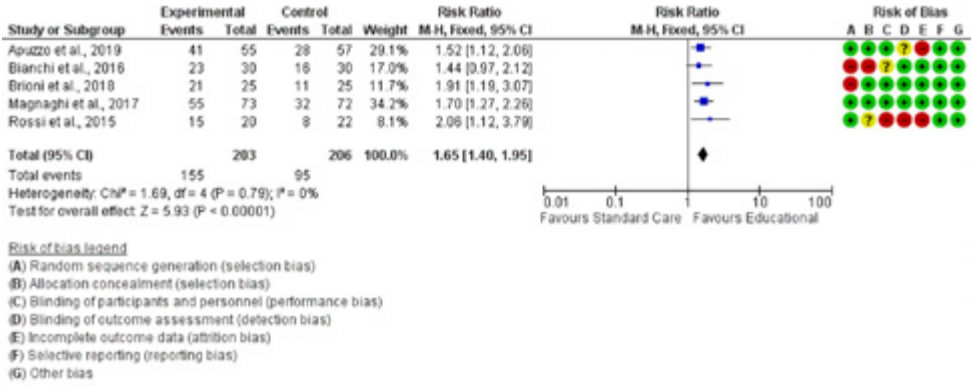


Figure 7: Risk of bias

Funnel plots

Publication bias happens when researchers do not publish studies that go against their previous conclusions, or where the results are not statistically significant. Because these results are not published, they do not appear in meta-analyses or literature reviews, resulting in biased conclusions (Simmonds 2015).

Funnel plots (Figure 8) are used to look for possible publication bias in metanalyses (Simmonds 2015). Where there is no bias, the plot is funnel shaped and symmetrical. Where there is bias (Figure 8, cases 1-4), the plot is asymmetrical.

> **A key difference between scoping reviews and systematic reviews is that the former is generally conducted to provide an overview of the existing evidence regardless of methodological quality or risk of bias. Therefore, the included sources of evidence are typically not critically appraised for scoping reviews.**
>
> *Munn 2018*

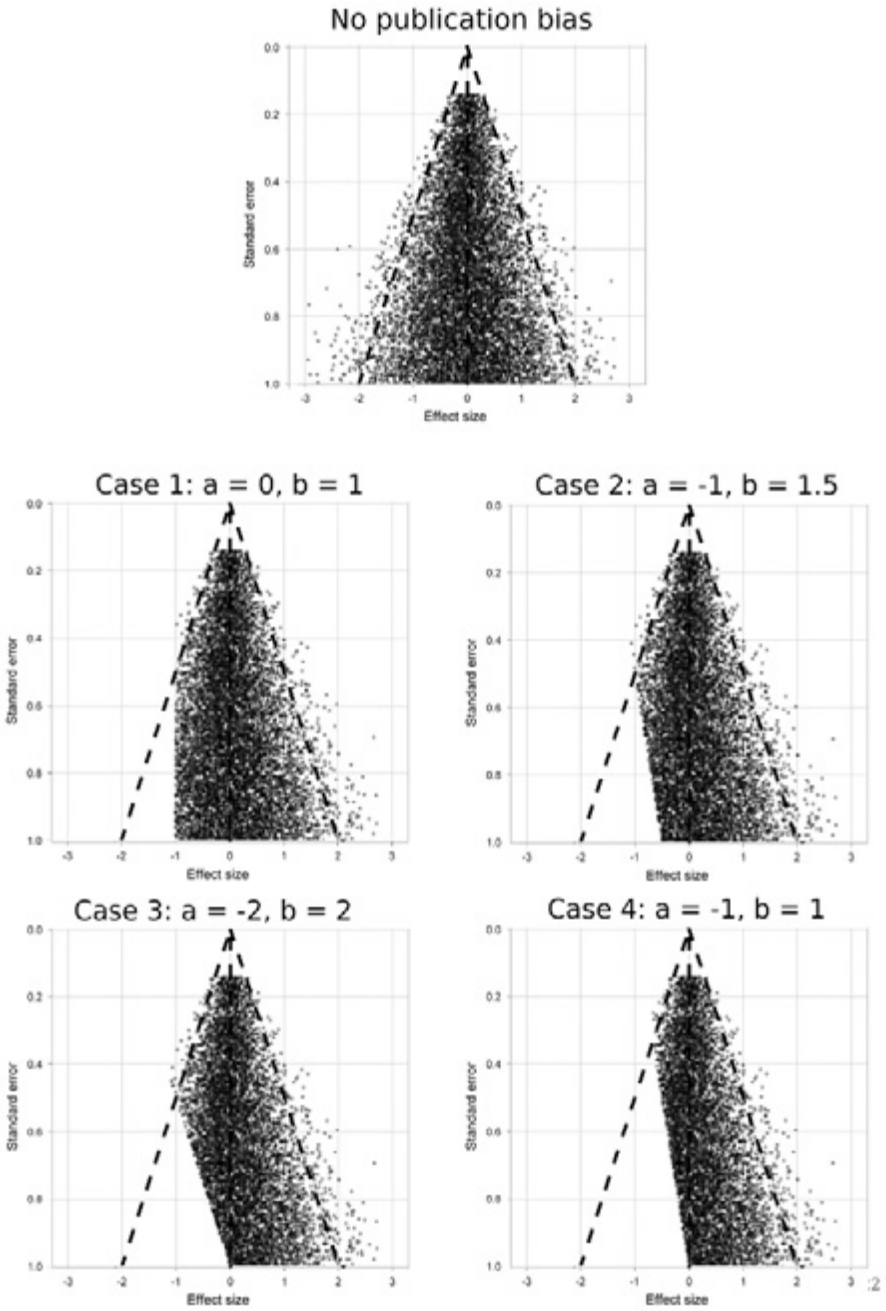


Figure 8: Funnel plots with and without asymmetry

DISCUSSION

Discussion

In the discussion, the authors interpret the research, putting it in the context of what is already known and underlining the relevance of the results from the new research. obtained thanks to this new research. It helps to understand the results, but it is a subjective reading by the authors. The ideal is to first draw your own conclusions by reading the results and then compare them with those of the authors to check their agreement. It expresses the authors' opinion on what is being brought up again with respect to the already known literature. Thanks to the critical reading of this section, it is possible to understand if the results and representations of the study just examined can be useful in one's daily clinical practice.

The discussion section may be combined with the conclusions section.

What's in the discussion section of a research paper?

In the discussion section you analyse the findings and put them into context. You should discuss how your findings compare to other studies, what they mean for the research field, and how they can be applied to clinical practice. You should also highlight any limitations of your study so that future researchers can build on your work. Finally, you should suggest directions for future research based on your findings

(Chambers 2021)

LIMITATIONS OF STUDY

Limitations of the study

In this section, the authors describe and recognise the limitations of their research. This helps readers to interpret the data within these limitations. It also helps researchers that want to continue the work, so that they can avoid running into similar types of limitations. The presence of this section supports the attention given to the study by the researchers. Some journals make this section compulsory.

The limitations of the study section may be part of the discussion.

CONCLUSIONS

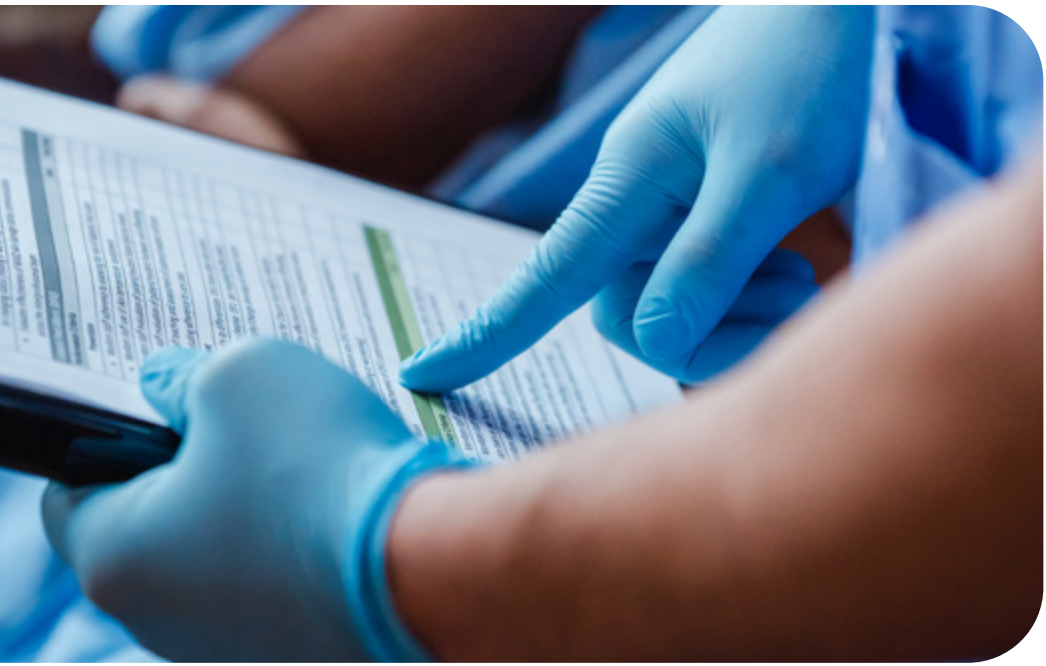
Conclusions

The conclusions provide the key message that the authors want to give to the reader. They provide a subjective interpretation of the data, helping the reader to grasp the meaning of the work from the author's perspective. However, the reader needs to assess the conclusions critically and in detail, and ask themselves questions in the light of the results:

- Are the conclusions supported by the data reported in the study?
- Are the conclusions supported by previously reported data?
- Are there suggestions for further research?

It may be appropriate to re-read the study after reading the conclusions to assess whether there are discrepancies between any of the sections of the paper.

The conclusions section may be part of the discussion.



CONFLICTS OF INTEREST

Conflicts of interest

A conflict of interest is a situation when for example, a sponsor included data or materials in favour of the paper and also influenced the outcome with the result that the outcome is not neutral. The 'conflict-of-interest' section is often the section that takes up the least space in the paper, it remains very important. If this is not well addressed, it can have influence on the status of the paper but also impact the author, even after a longer period of time. Authors need to declare their conflicts of interest to ensure impartiality and transparency. Conflicts of interest include (Sharma 2020):

- research or educational grants
- payments for services such as speakership
- stock options
- board membership
- consultancy
- employment
- travel/accommodation/meeting expenses
- nonfinancial considerations such as advancement of professional career or personal relationships.

The presence of conflicts of interest, particularly those showing links with a company developing a drug or medical device, mean that the conclusions should be checked very carefully. This is because the data, albeit unintentionally, could be presented in a way that enhances the positive effects of an intervention. This alerts the reader to be aware of the possibility of publication bias and check the published results with other published and unpublished materials.

REFERENCE LIST /BIBLIOGRAPHY

Reference list/bibliography

References allow the reader to read further around the topic, and also check if what is stated is correct. The reference section or bibliography is the final section of a scientific paper. A reference list includes all the papers cited in the paper and vice versa.

The reader can use the reference list to check whether citations are from journals with high or low impact factors. The impact factor of a journal shows the importance of a journal within its field, as well as the frequency that papers from that journal are cited in other journals (Sharma 2014). It will also show up whether the authors are citing their own work more than expected, which could mean that it is a new or under-researched area of study, or that it is an area where the researcher's interest is in the research for its own sake, rather than its practical outcomes for patients.

The refence list will also show the timeliness of the evidence reported, which should ideally be within the last five years, or within 10 years for research topics with few publications and studies. The accuracy of the reference list will also reflect on the editorial quality and peer review standards of the journal where the paper is published.

Note: a bibliography includes the reference list and any background materials that have been used but that are not cited.

In academic research, the bibliography shows the authenticity and amount of hard work put into the researcher, helps navigate through a vast and unfamiliar ocean of knowledge and information, and provides supplementary information to a curious reader. The report from a 1950 UNESCO conference on bibliography noted that the purposes of the bibliography included contributing to cultural development, enabling readers to become acquainted with publications recording developments in their fields of interest, and promoting applications of existing knowledge.

(Shera 1950)

THE PEER REVIEW PROCESS

The peer review process

The peer review process is part of the publisher's decision process. Peer review is defined as **"the critical assessment of manuscripts submitted to journals by experts who are usually not part of the editorial staff. Because unbiased, independent, critical assessment is an intrinsic part of all scholarly work, including scientific research, peer review is an important extension of the scientific process"** (ICMJE 2023b).

Peer review ensures the integrity of science by excluding invalid or low-quality research. According to the Sense About Science 2019 survey, 75% of authors were satisfied with the current evaluation system and 90% feel that peer review improves the quality of research published (Sense About Science 2019).

Papers received for publication are sent to referees, who are specialists in the field. They critically evaluate the content of the paper and determine if it is suitable for publication. Referees check whether the paper and the study correctly follow the scientific method, and that there is consistency between the premise, methodology and final result. Once this is completed, the paper is accepted, needs to be modified in order to be accepted, is not suitable for publication and is rejected. This is often a double-blind approach, where the authors do not know the identity of the reviewers and vice versa. This reduces the risk of bias based on gender, location or reputation).

THREE TAKE AWAY MESSAGES

Three take away messages

After reading this Nurses Guide we hope

1. **It has encouraged the nurses entering the science domain,** with taking time to start learning to read scientific papers and even start contemplating writing an article themselves. Afterall, each single day at the clinic, working in the nursing domain, cannot done properly without questioning them self: how does it work. With contributing to evidence based and science, you might influence the future outcome of patient care and contribute to the improved status of the nurse in all specialisations without realising in this stage.

2. Next take away, **don't go alone on this pathways**, as you need friend, peers, colleagues or patients. It should not been forgotten that it's all about communication, and more than double checking what it is what you have found out. The human being is a very special create, and without realising it might be that you, when not communicated well, or you are so wrong from the start, or so very right. When on the wrong side, there are 2 sides: one is that you learned a lot but without result, and the other one, you learned a lot but not realising how special it is. Only with friend giving honest feedback and you can check this.

3. Last take away is to **find a good mentor**. A mentor you trust, who is honest to you and support you even when all is getting so complex that you lost in a spaghetti of data, outcomes, articles and other one opinions.

APPENDIX

Appendix

About the authors

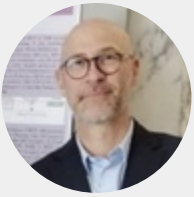
The authors are Italian nurses who, after years spent in direct contact with patients in Italian hospitals, have specialised in various areas of advanced nursing expertise and carry out research, teaching and planning within the Italian national health service.

Luigi Apuzzo

Luigi Apuzzo, after working for several years in the hospital in the pediatric emergency setting, in the operating room, in palliative care (hospice), in cardiac intensive care and in the psychiatric field, Luigi Apuzzo now works at the Italian Agency for Regional Health Services where he works with the Italian Ministry of Health and with support functions in the organization of Italian regional health services. He is a lecturer in various Italian universities including the University of Campania "Vanvitelli" and the Universities of Rome "Sapienza" and "Unicamillus" where he teaches Nursing in Paediatrics Science, Nursing in Mental Health and the advanced management of ultrasound-guided central vascular access. He works with various nursing journals and is the author of a number of scientific publications. He is involved with ESNO and with FONSE, where he is an observer in the board.

Elena Brioni

Elena Brioni has worked for twenty years as a clinical research nurse with renal patients in both nursing care and in the coordination and management of clinical trials. She is a mentor at «Vita Salute San Raffaele University» in Milan where she where she currently teaches in the master's degree course in clinical research for nurses and midwives and the bachelor's degree in nursing. She is the author or co-author of a number of publications as author and works with several scientific journals. She has been involved in the revision of scientific papers in impact factor journals. She has taught on many higher education courses for nurses and other health professionals. She is involved with ESNO and FONSE.



Cristiano Magnaghi

Cristiano Magnaghi, after working for almost twenty years in contact with patients on haemodialysis, peritoneal dialysis and kidney transplantation, Cristiano Magnaghi is involved in research at the San Raffaele University Hospital in Milan. He is co-author and author of a number of nursing scientific publications and works with nursing scientific journals. He is thesis advisor for nursing students and research nursing students at the San Raffaele University and at the University of Milan. He is currently serving in the Scientific Secretariat of the Ethics Committee of the San Raffaele Hospital in Milan. He is involved with ESNO and FONSE.

Abbreviations

AB	Abstract
ARR	Absolute risk reduction
CCP	Clinical care practice
CER	Control event rate
CI	Confidence intervals
COI	Conflicts of interest
CP	Clinical practice
COPE	Committee On Publication Ethics
CR	Case report
DB	Double blind
DO	Drop-out
DS	Discussion section
E-BNP	Evidence-based nursing practices
EBP	Evidence-based practice
EC	Ethics committee
EER	Experimental event rate
FP	Forest plot
GP	Good practice
HCW	Healthcare worker
LTE	Letters to editor
LR	Literature reviews
ICMJE	International Committee of Medical Journal Editors
IF	Impact factor
IMRAD	Introduction, methods, results, and discussion
MA	Meta-analysis
MM	Materials and methods

MESH	Medical subject headings
MIG	Main international guidelines
MS	Multicentre study
NNT	Number needed to treat
OD	Odds ratio
PICOM	Population intervention comparison outcome method
ROB	Risk of bias
PRP	Peer review process
RSP	Randomised selection process
RR	Relative risk
RRI	Relative risk increase
RRR	Relative risk reduction
RS	Research study
SA	Statistical analysis
SR	Systematic review
TI	Title

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- Suzanne Elvidge

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ABOUT ESNO

ESNO: The European Specialist Nurses Organisation (ESNO) is a non-profit organisation, and the goal is to provide and facilitate an effective framework for communication and co-operation between the European nursing organisations and the individual members. ESNO also represents the mutual interests and benefits of these organisations to the wider European community. ESNO contributes to health themes and threats, and puts together innovative activities, all in the interest of European public health.

Notes

Notes

ESN

EUROPEAN SPECIALIST
NURSES ORGANISATION

SPONSORING PARTNER

medicines for europe

better access. better health.