Writing in health science: How to use evidence effectively to support your claims

Southern Cross University

Studying in the Sciences

What is in this guide

Using evidence

When writing in health science, as in any academic field, you need to use credible sources of information to support what you are stating or claiming. This should go beyond stating author X says…. and author Y says…. . You need to provide details of the evidence that supports what you claim. In health science this is frequently in the form of data or conclusions drawn from data. It is also important to make a judgement about the quality of the evidence provided by that data.

When writing about topics related to clinical practice, it is important to consider the source of the information you have found in terms of the hierarchy of evidence (or evidence pyramid) relating to evidence based practice (EBP) and best practice. You need to source the best level of evidence available, particularly when referring to the effectiveness of treatments or interventions and information on diagnosis (including interpretation of assessment findings) and prognosis (or predicted likely outcome or response of a condition/ situation). For more information on these concepts, go to the SCU LibGuide on EBP via the active links.

What you need to do

1. **Support the claims you make with the work of others.** Don't make a claim or statement that asserts something without the support of evidence from a credible source.
2. **Give details of the evidence supporting these ideas, claims or assertions by reporting the data or key findings.** Emphasise the magnitude or the impact of these findings, giving specific details. Provide data to back up the claim, don't just state that the author/s state this or claim that. Where possible, use data or details to support what is being said.
3. **Report the relevance and quality of the information in the context of evidence based practice.** In health science it is important to understand and apply evidence based practice principles; this includes clinical practice as well as when writing for academic purpose. For example, when talking about the effectiveness of an intervention for a health condition you can refer to the level of evidence (as classified from the evidence based hierarchy). Where possible, consider the findings from the highest possible source/ sources. The highest levels of evidences come from systematic review of randomised controlled trials (RCT) with meta-analysis with lowest levels of evidence coming from case studies and animal experiments (see glossary for explanation of terms and the SCU LibGuide for explanations of these concepts). Consider this example; if one study, a non-randomised controlled trial, shows that ***treatment A*** helps ***condition Z*** but a systematic review of randomised controlled trials on the same ***treatment A*** for the same ***condition Z*** shows no benefit, you could report that from the best available evidence, a systematic review of randomised controlled trials, shows that treatment A is not effective in the management of ***condition Z***. This would be in preference to saying that the effectiveness of ***treatment A*** for ***condition Z*** has mixed results if you consider the findings of the systematic review and the nonrandomised controlled trial. Where the source information you are using is from the upper levels of the hierarchy pyramid it is good to emphasis this, because it provides the reader with information on the strength of the evidence that you are presenting to support what you are saying.

The next step is to see how the concepts discussed above are applied in an example. Two approaches present the same example in two different ways:

1. Example

In the next section, an academic text on falls and falls prevention in older Australians is given. Accompanying notes explain features of the text that demonstrate the three points discussed above. (Click here for examples with explanations.)

2. Learning activity

Alternatively, a self-directed learning activity, covering the same concepts, with follow-up answers is provided. **This option is recommended as it will allow you to engage more actively with the material by applying the information** discussed above. (Click here for self directed learning activity.)

Example with explanations	Explanations
Falls are highly prevalent, particularly amongst older people in Australia, contributing significantly to the burden of disease and associated healthcare costs.[1] It is estimated that nationally over thirty per cent of people aged 65 and older fall at least once a year and 10 per cent of these falls result in serious injury[2, 3] (Pointer, Harrison, & Bradley, 2004).* Consequently, falls are the single biggest reason for hospital admission and presentation to accident and emergency for people in this age group[2] (AIHW, 2008).* Injuries resulting from falls, such as hip fractures, contribute to reduced mobility and independence and increased risk of premature death (National Aging and Research Institute, 2004).* For older persons living in the community, falls (after adjusting for other risk factors) [2, 3] triple the risk for placement in nursing homes (Tinetti, & Williams, 1997).* Given the predicted continued growth in our aging population (Commonwealth of Australia, 2010),* falls rates and the associated health concerns are likely to increase. As a result, if further prevention strategies are not adopted, the total cost of healthcare associated with fall injuries is expected to rise three times from 498.2 million dollars (in 2001) to 1375 million dollars by 2015 (Muller, 2004).*	[1] Topic sentence stating the ideas that will be discussed in the paragraph. * Sources are referenced in-text to support claims/ assertions. [2] Magnitude of problem detailed putting the problem in context. [3] The provision of data rather than just descriptors (for example, increased risk or rising cost) provides clarity of the extent of the problem.
The serious nature of falls on health and wellbeing of the individual, as well as the impact on the healthcare system prioritises the need for effective falls prevention strategies. There is clear evidence that implementation of appropriate interventions can prevent falls (Gillespie et al., 2009).* The implementation of exercise programs is one such approach. Exercise programs are varied, for example, they can include strengthening exercises and balance training (Gillespie et al 2009; Sherrington et al., 2011),# brisk walking (Ebrahim, 1997),# Tai Chi (Harmer & Li, 2008),# virtual games (Mathew et al., 2012)# and delivery via electronic device apps (Struyk, 2012).# Additionally, programs can be individualised or group based and delivered in the community, at home or in a healthcare facility (Shubert 2011).*	#Sources that report on different types of exercise are cited at the point where each exercise component is stated rather than collectively at the end of the sentence. This identifies what reference/s specifically refers to what exercise type. It is inaccurate to put all the references collectively at the end of the sentence as each source does not cover all of the exercise types.

Example with explanations	Explanations
Findings from a recent Cochrane systematic review[4] demonstrated that exercise programs reduce both the risk and rate of falls by up to 35 and 37 per cent respectively (Gillespie et al., 2009).* More specifically, evidence from a recent meta-analysis of randomised controlled trials[4] by Sherrington et al. (2011)* shows that implementation of high dose exercise (defined as two hours, twice per week) involving challenging balance training and no prescribed walking tasks appears to be the best approach to reducing the incidence of falls. The benefit of this combination of exercise was to reduce falls by 38 % (95% confidence interval: 27% to 46%) compared to a falls reduction estimate of 16 % (95% confidence interval: 9% to 33%) when all types of exercise[5] were considered. As such, based on the best available evidence, clinical practice involving exercise programs for falls prevention should include exercise of high intensity to challenge balance, prescribed at a high dose.[6]	[4] Emphasises the level of evidence (EBP hierarchy or evidence pyramid) by identifying the type of source document. In this case, evidence is from highest level of the hierarchy (systematic reviews with meta-analysis of randomised controlled trials). [5] Impact of the effectiveness of a specific exercise intervention compared to other types of exercise. Not just stating that this type of exercise is better but detailing the magnitude of the additional benefit. (For more information about confidence intervals follow this link) [6] Concludes with a statement about best practice derived from the best available evidence (in terms of the EBP hierarchy).

Learning activity

The following examples are excerpts of academic text on falls and falls prevention in older Australians. With each example, focus on: 1) where references need to be added; 2) where data could be added and 3) where more detail of the relevance of the information and source could be added. Instructions and sample answers are provided with each activity

Activity 1

Identify where a claim is made and an in-text citation or a source reference is required to support the claim (*then check with the answer to see how you have gone*)

Falls are highly prevalent, particularly amongst older people in Australia, contributing significantly to the burden of disease and associated healthcare costs. Consequently, falls are the single biggest reason for hospital admission and presentation to accident and emergency for people in this age group. Injuries resulting from falls, such as hip fractures, contribute to a reduction in mobility and independence and increase the risk of premature death (National Aging and Research Institute, 2004). For older persons living in the community, falls increase the risk for placement in nursing homes (Tinetti, & Williams, 1997). Given the predicted continued growth in our aging population, falls rates and the associated health concerns are likely to increase. As a result, if further prevention strategies are not adopted, the total cost of healthcare associated with fall injuries is expected to rise.

Check answer

While providing source references, to some extent, backs up what you are saying, they do not provide the full picture. For example, take this sentence extracted from the above: ***For older persons living in the community, falls increase the risk for placement in nursing homes*** (Tinetti & Williams, 1997).

The source reference is provided, but from what is written we do not know the magnitude of the increased risk. Although the risk is increased it may be quite small and not necessarily clinically meaningful, or conversely, it may be large and a serious threat. By providing data, rather than just a statement that the risk is increased, you provide clearer insight into the problem.

As an example, the following two sentences both represent increased risk but have quite different implications:

*For older persons living in the community, falls **increase the risk** of placement in nursing homes **by 1.9%*** (Tinetti, & Williams, 1997).

*For older persons living in the community, falls **triples the risk** of placement in nursing homes* (Tinetti, & Williams, 1997).

Tripling the risk is a very large and meaningful increase in risk whereas a less than **2%** increase does not have the same impact.

This example demonstrates how, by providing the detail of the increased risk, the relevance of this information is clarified.

Activity 2

Next, identify where details of evidence and of what type could be added to support and clarify the ideas or claims put forward. (*A sample answer is provided at the end*).

Falls are highly prevalent, particularly amongst older people in Australia, contributing significantly to the burden of disease and associated healthcare costs. Consequently, falls are the single biggest reason for hospital admission and presentation to accident and emergency for people this age group (AIHW, 2008). Injuries resulting from falls, such as hip fractures, contribute to a reduction in mobility and independence and increase the risk of premature death (National Aging and Research Institute, 2004). For older persons living in the community, falls increase the risk for placement in nursing homes (Tinetti, & Williams, 1997). Given the predicted continued growth in our aging population (Commonwealth of Australia, 2010), falls rates and the associated health concerns are likely to increase. As a result, if further prevention strategies are not adopted, the total cost of healthcare associated with fall injuries is expected to rise (Muller, 2004).

Check your answer

The next sample paragraph continues on from the above.

Activity 3

Read the following text and identify i) where citations need to be provided to support claims (*); ii) where additional information or data could be added (#) to clarify and detail the ideas expressed (*then check the answer to see how you have gone*).

The serious nature of falls on health and wellbeing of the individual, as well as the impact on the healthcare system prioritises the need for effective falls prevention strategies. There is clear evidence that implementation of appropriate interventions can prevent falls. The implementation of exercise programs is one such approach. Exercise programs are varied, for example, they and can include strengthening exercises and balance training, brisk walking, Tai Chi, virtual games and delivery via electronic device apps. Additionally, programs can be individualised or group based and delivered in the community, at home or in a healthcare facility.

Findings from a recent review demonstrated that exercise programs reduce both the risk and rate of falls. More specifically, evidence from a recent article by Sherrington et al. (2011) shows that implementation of high dose exercise (two hours, twice per week) involving challenging balance training and no prescribed walking tasks appears to be the best approach to reducing the incidence of falls. …….

Check your answer

In addition, the paragraph can be further developed by providing comment on quality and relevance of the evidence – particularly with reference to the main idea of this paragraph – the use of exercise programs to improve issues associated with older Australians falling. Think about the levels of evidence and how you can identify, to the reader, the type of source the information is from. In terms of relevance, what is the take home message with regards to implementation of exercise to minimise the effects of falls on health?

To identify to the reader the type of source and infer information about the level of evidence provided, you can include this detail when discussing the findings from the sources. From the above example paragraph, the two key papers on interventions are systematic reviews, both with meta-analysis. One is a Cochrane systematic review Gillespie et al., (2009), the international benchmark of systematic reviews in healthcare, and the other, Sherrington et al., (2011) a high quality meta-analysis of randomised controlled trials also provides practice

guidelines. By informing the reader of type of source in this instance, it gives them insight into the level of evidence provided. A statement on what is known from the best available evidence provides the relevance of this in the context of the main idea of the paragraph:

For example:

Findings from a recent Cochrane systematic review demonstrated that exercise programs reduce both the risk and rate of falls by up to 35 and 37 per cent respectively (Gillespie et al., 2009). More specifically, evidence from a recent meta-analysis of randomised controlled trials by Sherrington et al. (2011) shows that implementation of high dose exercise (defined as two hours, twice per week) involving challenging balance training and no prescribed walking tasks, appears to be the best approach to reducing the incidence of falls. The benefit of this combination of exercise was to reduce falls by 38 % (95% confidence interval: 27% to 46%) compared to a falls reduction estimate of 16 % (95% confidence interval: 9% to 33%) when all types of exercise were considered. As such, based on the best available evidence, clinical practice involving exercise programs for falls prevention should include exercise of high intensity to challenge balance, prescribed at a high dose.

Gillespie, L. D., Robertson, M. C., Gillespie, W. J., Lamb, S. E., Gates, S., Cumming, R. G., et al. (2009). Interventions for preventing falls in older people living in the community. *Cochrane Database Systematic Reviews*, CD007146. Retrieved from http://www.mnfallsprevention.org/downloads/Review-Interventions-for-preventing-falls.pdf

Sherrington, C., Tiedemann, A., Fairhall, N., Close, J. C. T., & Lord, S .R. (2011). Exercise to prevent falls in older adults: an updated meta-analysis and best practice recommendations. *NSW Public Health Bulletin*, 22(3–4), 78-83. Retrieved from http://www.publish.csiro.au/?act=view_file&file_id=NB10056.pdf

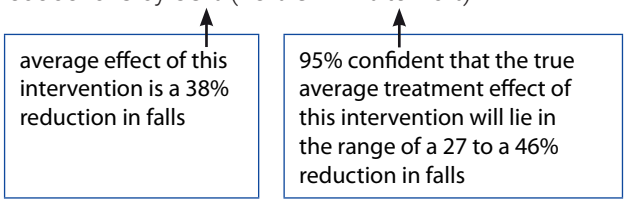
Glossary

Many of these definitions have been adapted from the Cochrane Collaboration Glossary: http://www.cochrane.org/glossary\

Best practice: The term best practice is often used in association with evidence based practice (see below). Best practice implies the best possible implementation of evidence within the context of a particular healthcare system. For example, the availability of healthcare resources may affect what treatments, in reality, can be implemented.

Confidence interval: The amount of uncertainty associated with the effect of a treatment can be described by a confidence interval. Conventionally, a 95% confidence interval (CI) is used. This represents the range of treatment effects within which we can be 95% certain that the true, average treatment effect lies. The 95 % confidence interval is usually reported following the mean (or average) treatment effect as such:

The benefit of this combination of exercise was to reduce falls by 38% (95% CI: 27% to 46%)



Evidence based practice (EBP): 'the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient' (Sackett et al., 1996). Note: systematic or high quality research is not always available to tell us, with certainty, what is the best treatment or the best diagnostic test for a certain patient with a certain clinical problem. As such, clinical practice needs to be informed by professional knowledge, patient preferences and lower quality research.

Randomised controlled trial: An experiment to determine the effect of an intervention where participants are randomly allocated to an intervention (experimental) group or a control group. Random allocation minimises bias allowing the researcher to evaluate whether the intervention itself, as opposed to other factors, cause the observed outcomes.

Systematic review: A review that critically assesses and evaluates original research papers identified on a specific topic. The researchers use an organised method of locating and evaluating the body of literature using a set of specific criteria.

Meta-analysis: Statistical methods used to pool and analyse numerical data extracted from individual studies included in a systematic review. As such, findings of the meta-analysis represent the collective results of all eligible, individual studies.

Other related guides (on CTL website)

Studying in the sciences: Reading scientific papers

Academic integrity: Practising academic integrity: reporting verbs

Other helpful resources

For information about different types of clinical studies see:

Himmelfarb Health Sciences Library (2011). *Study design 101*. Retrieved from http://www.gwumc.edu/library/tutorials/studydesign101/index.html

For information about Evidence Based Practice and the Hierarchy of Evidence Pyramid see the SCU LibGuide on this topic

References

Sackett, D. L., Rosenberg, W. M., Gray, J. A., Haynes, R. B., Richardson, W. S. (1996). *Evidence based medicine: what it is and what it isn't*. BMJ, 312, 71-2. doi: 10.1136/bmj.312.7023.71

Cochrane Collaboration Glossary: http://www.cochrane.org/glossary

Suggested answers to learning activities

Activity 1

Falls are highly prevalent, particularly amongst older people in Australia, contributing significantly to the burden of disease and associated healthcare costs.* Consequently, falls are the single biggest reason for hospital admission and presentation to accident and emergency for people this age group.* Injuries resulting from falls, such as hip fractures, contribute to a reduction in mobility and independence and increase the risk of premature death (National Aging and Research Institute, 2004). For older persons living in the community, falls increase the risk for placement in nursing homes (Tinetti, & Williams, 1997). Given the predicted continued growth in our aging population*, falls rates and the associated health concerns are likely to increase. As a result, if further prevention strategies are not adopted, the total cost of healthcare associated with fall injuries is expected to rise.*

*in-text citation or a source reference is required to support the claim

Activity 2

Topic sentence states the main idea. Here no reference is provided but the next sentence expands on this point and provides the reference and data to support the claim.

Falls are highly prevalent, particularly amongst older people in Australia, contributing significantly to the burden of disease and associated healthcare costs. It is estimated that nationally #over thirty per cent of people aged 65 and older fall at least once a year and 10 per cent of these falls result in serious injury (Pointer, Harrison, & Bradley, 2004). Consequently, falls are the single biggest reason for hospital admission and presentation to accident and emergency for people this age group (AIHW, 2008). Injuries resulting from falls, such as hip fractures, contribute to reduced mobility and independence and increased risk of premature death (National Aging and Research Institute, 2004). For older persons living in the community, #falls (after adjusting for other risk factors) triple the risk for placement in nursing homes (Tinetti, & Williams, 1997). Given the predicted continued growth in our aging population (Commonwealth of Australia, 2010), falls rates and the associated health concerns are likely to increase. As a result, if further prevention strategies are not adopted, the total cost

of healthcare associated with fall injuries is expected to rise [#]three times from 498.2 million dollars (in 2001) to 1375 million dollars by 2015 (Muller, 2004).

[#]evidence is provided and includes data that identifies the extent and impact of that evidence

Activity 3

The serious nature of falls on health and wellbeing of the individual, as well as the impact on the healthcare system prioritises the need for effective falls prevention strategies. There is clear evidence that implementation of appropriate interventions can prevent falls.[*] The implementation of exercise programs is one such approach. Exercise programs are varied, for example, they and can include strengthening exercises and balance training,[*] brisk walking,[*] Tai Chi,[*] virtual games[*] and delivery via electronic device apps.[*] Additionally, programs can be individualised or group based and delivered in the community, at home or in a healthcare facility (Shubert 2011).[*]

Findings from a recent review demonstrated that exercise programs reduce both the risk and rate of falls by up to 35 and 37 per cent[#] respectively.[*] More specifically, evidence from a recent article by Sherrington et al. (2011) shows that implementation of high dose exercise (two hours, twice per week) involving challenging balance training and no prescribed walking tasks appears to be the best approach to reducing the incidence of falls. The benefit of this combination of exercise was to reduce falls by 38 % (95% confidence interval: 27% to 46%) compared to a falls reduction estimate of 16 % (95% confidence interval: 9% to 33%)[#] when all types of exercise were considered. As such, based on the best available evidence, clinical practice involving exercise programs for falls prevention should include exercise of high intensity to challenge balance, prescribed at a high dose.

[*]citations need to be provided to support claims; [#]additional information or data added to clarify and detail the ideas expressed; *A statement on what is known from the best available evidence provides the relevance of this in the context of the main idea of the paragraph*