

Developing evaluative skills through critiquing quantitative research



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Nursing is becoming a progressively evidence base profession. Arguably, Nightingale first popularised the link between nursing theory, nursing practice and research to inform an appropriate evidence base, and progress towards this goal has been ongoing ever since (Graham 2003).

In nursing, a critique is often seen as a first step in learning the research process. However, conducting a critique is not a basic skill (Burns and Grove 2004). The Nursing and Midwifery Council (NMC, 2008) ruled it mandatory for the pre-registration nursing curriculum to teach EBP as a fundamental principle of proficiency. Research has become a priority for nurses of all specialities.

This paper seeks to demonstrate how these evaluative skills can be developed by critiquing a quantitative research study. An acknowledgement of the credibility of the authors, the publishing journal, and the methods used the data collection and analysis, findings, ethical issues and the strengths and weakness of the research is made. The paper will be considered using the CASP critique tool for methodological consistency and ease of presentation (CASP 2000); shown in appendix 1; a copy of the tool is enclosed.

The article, on which this critique research is made, was published in the journal of Advanced Nursing. The title of the article is, "Tablet-splitting: a common yet not so innocent practice". The title of this article outlined above, is seemingly clear and explicit, although not as concise as Frances et al, (2007) would prefer; between ten and fifteen words. The title of this paper suggests that tablet splitting is a common practice, which is probably true,

but it suggests that it is 'not so innocent', which smacks more of journalism than an academic paper. It is possible that the original Belgian text does not translate perfectly into English and this may be a translational syntactical inaccuracy.

The article was accepted on 6 August 2010 and it was published in the Journal of Advanced Nursing 67(1), pages 26-32. Elsevier (2009) State that they only print manuscripts that have been peer reviewed with any necessary revisions made. This is favourable for the credibility of the article as the reader is assured that it has been scrutinised by an independent body of a similar field to the author/s. Elsevier also clarifies that the author must have the appropriate clinical and educational credentials for the research study.

The four authors are all highly qualified, each with a PhD, three in academic pharmacology and a fourth who is a professor of geriatrics. A substantial literature search does not show any other publications by these authors.

Quantitative research is formal and objective research that is concerned with collecting and analysing data that focuses on numbers and frequencies, rather than meaning or experience, it examines cause-and-effect interactions among variables using a systematic process (Burns and Grove, 1997; Ogier, 1999). The research that has been carried out for this published paper is an example of quantitative research and has been carried out using a randomised control trial method. A randomised control trial (R. C. T.) is a true experiment characterised by the manipulation of the independent variable, random assignment of individual subjects to the conditions and all

other factors being controlled (Ogier, 1999). The R. C. T. was carried out as a small study in which five volunteers were asked to split eight tablets of different sizes and shapes, including medicines for Parkinson's disease, heart failure and arthritis. Participants used three different methods to split their pills: a splitting device, scissors or manual spitting for scored tablets, and a kitchen knife.

In the article under scrutiny, the authors point out the fact that it is observed to be common clinical practice, particularly in nursing homes, to split tablets so that a proportion of the tablet dose can be conveniently given. This can be for economic or purely practical reasons as tablets are often supplied 'from stock' and not always in the exact form or dose prescribed. They cite a German study in support (Quinzler et al 2006) which found that nearly 25% of administered drugs were split. It should however, be noted that on closer inspection, the Quinzler study is not particularly relevant to the UK situation, has a number of serious methodological errors and also did not consider a wide spectrum of clinical applications, nor is it in close agreement with other studies in this area. Its findings therefore are not particularly generalizable and are a poor choice of evidence in support of this paper.

There is no doubt however, from taking a further overview of the available literature, that tablet-splitting does occur with a degree of regularity in clinical situations, and as such, the authors consider this investigation justified.

The Abstract in this case is perfectly adequate, outlining the main points of the study. The main contentious issue is a comment in the Abstract

conclusion which states that ' Large dose deviations.... occurred when splitting tablets' (Verrue et al 2011, p. 26), a comment which is not actually borne out by the findings of the study.

Close inspection of the results suggest that deviations of more than 25% of the original tablet mass occurred in 19% of cases, but the authors included those cases where one half spontaneously split further, and therefore would have no real clinical or practical significance.

It has also to be noted that there is no indication in the abstract, of the methods of sample selection or whether this was in any way a controlled trial. It does however; serve the prime objective of an Abstract, which is to offer the reader sufficient information to determine whether further reading of the article would be appropriate (Robson 2006).

The Introduction is comparatively short. The point about the citation of the Quinzler study has already been made, but the rest of the Introduction effectively sets out the rationale for the study, together with the justification for clinical relevance. It has to be observed that the literature review is comparatively brief with some comparatively old papers being cited (Barker et al 1982 and Babbington 1997) when there are a number of perfectly respectable authorities to make the same points that are much newer and would therefore be considered both more relevant and appropriate (Coombes et al 2009).

The aims of the study are clearly stated, although the actual study design is not. It requires further reading through the paper to actually determine the methodology used (this is found under ' data collection'), the sample
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selection, (this is found under ' Discussion' which is really quite inappropriate) and also the means of determining the results (also found under ' data collection').

It is also the case that the clinical significance of the rationale for the study is neither explicitly set out nor addressed. This is very relevant to the issue of tablet-splitting as if, as the cited literature suggests, there is a 25% variance in actual dose administration after splitting, then the degree to which it could be clinically important should be presented. One could suggest that in all but the most extreme cases, a 25% variation in the dose of Aspirin given is not likely to be hugely clinically significant, whereas a 25% variation in the dose of a cytotoxic drug may have profound consequences for the patient. There is no real consideration of this point, nor any concession to its absence (Polgar et al 2000). This element of the review of the literature in the introduction therefore has major deficiencies.

The study design is quantitative in nature. The authors have used five healthcare professionals for the task of tablet-splitting. One has to read through to the ' study limitations' segment to determine that the authors used an administrative co-worker, a laboratory technician, a pharmacy student and two pharmacists as the study cohort. On reflection, this seems a strange choice, as it is neither homogenous nor rational, as none of these groups are likely to be involved in tablet-splitting in the situation of the nursing home, which the authors have chosen to investigate (nor many other clinically relevant situations, in all probability). This choice seriously weakens both the generalizability of the findings and also the applicability of the study to the clinical evidence base for nursing.

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Another major shortcoming of the methodology of this paper is the fact that the authors included cases where the tablet split into more than two pieces as 'deviations from the mean'. In most clinical situations the administration of a tablet, which has split into two halves, and one half has then broken further, is no less accurate if the pieces are administered as one piece or as several. The authors make no concession on this point and therefore are likely to significantly overestimate the inaccuracies in their findings. (Schulz et al 2005)

Issues of sample selection have already been addressed above. Sample size appears to be completely arbitrary with a total of 1, 200 operations spread over the group being considered a 'reasonable sample size'. It is usual, in academic studies such as this to see calculations of minimum sample size to determine the power of significance. Its omission further reduces the applicability of the study (Rosenthal 2004).

The ethical considerations are explicitly addressed, as ethical committee approval was not required because patients were neither involved nor personal details recorded (Bowling 2002).

Some of the elements of bias and limitation have already been addressed. The results obtained have been subjected to a modest degree of statistical analysis with a one way ANOVA and a Turkey's post hoc analysis being carried out. One has to observe however, that the nature of the study is such that a more sophisticated data analysis is not really appropriate (Argyrous 2000). The results are presented in a clear and logical fashion, with 5 tables showing how the results were distributed. It is clear from the presentation of

the results exactly what the authors have found; for example using a splitting device was the most accurate method. It still produced a 15 to 25 per cent error margin in 13 per cent of cases, but this was lower than the 22 per cent for scissors and the 17 per cent for the knife. Further critical reading is not necessary in this respect.

An interesting feature of the study is the fact that weight loss of the tablet occasioned by the splitting process has also been determined, for example some tablets were much easier to split accurately than others. The easiest to split produced an overall error margin of 15 per cent deviation or more and the most difficult tablets produced an error margin of 19 per cent. Closer examination of the results however, shows that this does not just reflect the amount of material lost as powder or small fragments, as one might initially consider, but also the amount of the tablet that was inadvertently dropped on the floor. The authors rationalised this on the basis that a tablet, once having been on the floor, would not be subsequently given to the patient, which although undoubtedly true, does rather distort the results that are presented (Rosner 2006).

The discussion element of this paper is something of a disappointment. The first element is a consideration of the study limitations, which entirely appropriate (Gomm et al 2000). The authors spontaneously point out the fact that the clinical effects or consequences of their findings are not presented (Verrue et al 2011 p. 29). This is a major detraction from the usefulness of this paper and would make the interpretation of the results by a non-clinician more difficult.

The authors also concede that no nurses were selected for the experimental splitting group. This is quite remarkable, as one could intuitively suggest that it would be nurses, of various grades, who would actually be responsible for tablet-splitting in the vast majority of clinical circumstances. It is actually of little practical relevance for nursing homes to be able to understand how effective a Professor of Pharmacology is at splitting tablets.

The authors go on to compare and contrast their findings with other work in the area (Mcdevitt et al 1998, Birton et al. 1999, Peek et al. 2002, Teng et al. 2002, Cook et al 2003) and point out the similarities and differences in their findings. This is an entirely appropriate and useful segment with the authors pointing out the specific fact that this type of study has not been done before and also that much of the similar work in this area is already a ' few years old' (Verrue et al 2011 p. 30)

The discussion segment also notes that " we aimed at providing nursing homes with advice for the best tablet-splitting technique in daily practice" (Verrue et al 2011, p. 30). One would suggest that this is not in congruence with the stated aims of the study (although it is tangentially relevant). One could also observe that the one thing that this study does not do, is to offer nursing homes a suitable evidence base on which to base their practices, as no clinically relevant staff were involved in the study. Some of the participants are unlikely to have a concept of the clinical significance of exactly halving the dose of the medication.

This is a low grade study which had the potential to make an impact on the evidence base in an important clinical area. The methodological

shortcomings and a lack of generalizability, greatly reduce any possibility of such an impact. The paper, although superficially well presented, with an admirable display of tables and easy to interpret data, has major flaws which become apparent on even the most superficial levels of critical analysis.

The initial interest generated by a reading of the Abstract, did not translate into clinically useful data which could be applied into everyday nursing practice. An overview of the methodology suggests that the authors might have made a significant contribution to the evidence base in this area with a little more forethought and pre-study design consideration. This belief is given credence by the fact that the authors criticise themselves in the 'Study limitations' segment, in areas which could quite reasonably have been considered before the actual investigation took place.

This study does not materially contribute to the evidence base in this area.

Appendix 1

Quantitative Research Papers Critiquing Tool

A Framework for Critiquing Quantitative Research Papers Include full

reference of paper here: (i. e. Author/s (date) Title of article. Journal title.

Volume, Number, page numbers.) Critiquing Framework Title of Paper Is the

aim or purpose of the study clear? Are the main variables of interest

indicated? Is the study design or research method clear from the title? Is

there any reference to the population from whom the data are collected?

The Abstract/Summary Does this summarise the whole study? Is information provided regarding background, literature, aim/and objectives, hypotheses

(if RCT), methods, sample size, measures used etc, results and conclusions?
Does it suggest that a more detailed reading of the rest of the paper would be worthwhile?

Introduction/Literature Review Background/rationale Why was the topic chosen, what is the background to the study? Is there a critical review of previous literature and related theoretical concepts? Are gaps in the literature identified? **Aim and objectives** What problem or issue is being investigated? How clearly is this problem or issue defined or explained? Is there a clearly stated aim? Do the research objectives or research questions support this aim? Are the variables of interest clearly defined and are relationships between these evident and clearly stated? Which are the independent and dependent variables? Are hypotheses (if RCT) stated in a way that makes them testable?

Method Research design What is the study design and is it clearly explained and appropriate for the research questions? Could the design be improved? Was there a pilot study?

Research questionnaires What measures are used? Are validity and reliability reported for these measures either in the paper or clearly referenced? Have the authors dealt appropriately with any unreliable questionnaires or scales?

Sample Is the population appropriate for the research question? How were the sample chosen? What is the sample size? Are statistical power considerations discussed? Are inclusion and exclusion criteria described? Can the results be reasonably generalised on the basis of this sample?

Ethics Are ethical considerations presented. Is it suggested that ethical approval was granted?

Results/Findings/Data analysis Does the paper explain clearly how the data are analysed? Are statistical techniques clearly and adequately described? Are the statistics presented at a simple descriptive level or are inferential statistics also included? How are the results presented? Does the text adequately explain any tables or graphs? Have any tests of significance established whether differences, or associations, between groups could have happened by chance? What p values are used? Are non-significant results clearly indicated?

Discussion Is the discussion an accurate account of the results? Could there be other ways of interpreting the data? Does the discussion address the research aim and objectives? Are all the research questions answered?

Conclusion Are the conclusions of the study consistent with the results of the statistical analyses? Are alternative conclusions suggested? Are theoretical and practical implications of the results adequately discussed? Are the recommendations suggested feasible?

Limitations What are the limitations and are these acknowledged by the authors? Overall impression

(CASP 2000)