Lessons learnt: complementing good clinical renal questions with an appropriate research strategy

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Adams, J. & Bonner, A (2008) Lessons learnt: complementing good clinical renal questions with an appropriate research strategy *Ren Soc Aust J 4*(3) 91-94

Submitted December 2007 Accepted September 2008

Abstract:

The purpose of this article was to present lessons learnt by nurses when conducting research to encourage colleagues to ask good clinical research questions. This was accomplished by presenting a study designed to challenge current practice which included research flaws. The longstanding practice of weighing renal patients at 0600 hours and then again prior to receiving haemodialysis was examined. Nurses believed that performing the assessment twice, often within a few hours, was unnecessary and that patients were angry when woken to be weighed. An observational study with convenience sampling collected data from 46 individuals requiring haemodialysis, who were repeatedly sampled to provide 139 episodes of data. Although the research hypotheses were rejected, invaluable experience was gained, with research and clinical practice lessons learnt, along with surprising findings.

Key Words

haemodialysis, dialysis, research design, nursing, ideal weight

Introduction

The purpose of this article is to reveal lessons learnt by nurses when conducting research relevant to (and arising from) renal clinical practice. Some time ago an enthusiastic effervescent nursing colleague conducted a series of workshops to generate interest in nursing research. The workshops identified a number of clinical research questions and at the conclusion of the workshops one of the research questions developed into a written proposal. As no interventions were planned and current practice was being reviewed, the study was processed as an audit of current practice rather than an observational study by the hospital's human ethics committee. Very soon the budding researchers developed a data gathering tool and began collecting data. Several faux pas have already occurred, but rather than digress we will continue with the main narrative.

The issue of concern identified for this research project was the current practice in the renal ward of weighing haemodialysis patients twice per day, once at 0600 and then again immediately prior to being dialysed. The research question being asked challenged a long standing practice. The practice was disliked as it was perceived to be 'double handling' with the 0600 weight taken at a very busy time when nursing resources were scarce. Nightshift nurses were responsible for the first weight and perceived that they needed to wake renal patients, disturbing a group already known to have sleep disorders (Hanley, 2004; Hanley et al., 2003). In addition, the nightshift nurses were under the impression that most patients were angry when awoken and not happy to be weighed. Furthermore it was believed that the 0600 and the pre-dialysis weights would be the same. Previous discussions with the renal physicians had not been successful in doing away with one of the weighing sessions, as the physicians used the 0600 weight to monitor weight trends, and the pre-dialysis weight was needed to calculate the fluid to be removed at haemodialysis in order to achieve a patient's optimum weight. A study to demonstrate there was no difference in the weights seemed perfect.

While not identified as one of the vital signs in the Joanna Briggs Best Practice Sheet ("Vital signs," 1999) weighing renal patients is simple, cheap, non-invasive and has become an accepted method of monitoring fluid balance. Weighing renal patients is a routine and prominent aspect of their management and numerous studies have demonstrated risks associated with interdialytic weight gains and the need to remove excess water (Jaeger & Hehta, 1999; Kimmel et al., 2000; Pierratos, 2004; Purcell et al., 2004; Savage et al., 1997). A literature review was unable to find evidence to support the practice of twice daily weighing, and a study was designed to gather data and explore the necessity of weighing patients twice within the short timeframe. The underlying premise was to investigate the possibility that a well-established practice has become an unnecessary ritual, overlooking the patients' welfare and depriving them of sleep.

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Methods

Using an observational design and convenience sampling, data was collected from a review of patients' charts for early morning and pre-dialysis weights over an eight week period on a 21 bed renal ward at an inner city teaching hospital. As dialysis is usually conducted three times per week, participants could be repeatedly sampled and included in the study. Additional information recorded included the date, time of first weight, if the patient was awake or needed to be woken and their response to being woken-up. Patient consent was not required as it has become acceptable practice within healthcare to not obtain the consent of patients when reviewing records in the process of audit (Morrell & Harvey, 1999). While not entirely sound and in hindsight short-sighted, the project had been identified as a quality improvement exercise, on the premise that it did not involve a change of practice.

Data was collected by nurses working the nightshift; although the pre-dialysis weights were recorded by nurses in the haemodialysis unit. Prior to commencing the project it was realised that three different scales were used in the ward and dialysis unit. As it was not possible (or practical) to use only one scale for the duration of data collection, the three scales were checked to ensure they weighed the same. This was done by weighing the same object on each scale to make certain the study wasn't biased by difference between the scales.
A collaborative arrangement between renal ward nursing staff and research nurses located within the hospital enabled the renal nurses to gather data, while the research nurses assisted with the creation of the data collection tool and data base, along with the data entry and analysis.

Table 1. Summary of Mean Weight Difference Statistics

Observed mean weight difference (repeat measures)	p <0.0001
Observed mean weight difference	_ = 0.5196794
Standard error	SE = 0.1068032
Between patient - standard deviation	_ = 0.3506134
Within person standard deviation	_ = 0.9941436

Data Analysis

In the planning stage little consideration was given by the research team to potential problems related to analysing the data. In fact, the subsequent complexity of the study had not been anticipated. Analysis was complicated by both the composition of the sample and the distribution of the data. In addition to being a convenience sample, data was obtained from the same dialysis patients on more than one occasion, and is termed a repeat measures sample (Hopkins, 1997; Kenneth, 2008). Furthermore, when the distribution of the patient's weights was displayed on a histogram, it demonstrated bimodal distribution, rather than being normally distributed. While repeat sampling is legitimate it was not able to be analysed with the statistical program available (SPSS), and when combined with the bimodal distribution of the weights, required expert statistical assistance. A statistician was consulted to analyse the data using a statistical program with repeat measures functions (S-PLUS 2000). The analysis used an extension of linear regression assuming the hypothesis that there is no relationship between the variables.

Results

The study collected data from 46 individuals and resulted in 139 records of both early morning and pre-dialysis weights. Thirteen people were included in the sample on one occasion and 33 included in the sample more than once. Analysis was approached in several steps to account for the repeated measures for some patients, and required mixed effects models or repeated measures models. These models demonstrate there is no way of accurately predicting the weight difference from knowledge of 1) initial weight (0600 weight) and 2) time difference (difference between 0600 and pre-dialysis weight). A linear mixed effects model did reveal a significant mean weight difference between the 0600 and the pre-dialysis weight of 0.52 ($p < 0.0001$), with a standard error of 0.107, an estimated between patient standard deviation of 0.351, and an estimated within person standard deviation of 0.994. These details have been summarised in Table 1.

When interpreting the results, it can be stated that it is not possible to predict changes in a patient's weight between the first weight and the pre-dialysis weight by using the variables gathered during the study. Further more, the 0600 and the pre-dialysis weights are not the same.

The mean difference between the two weights for the sample was just over half a kilogram at 0.52kg with a 0.35kg variation between people. The variation increased to almost one kilogram (0.99kg) for the individual variations within patients. Therefore it must be concluded that the hypotheses for this study, must be rejected.

Separate concerns of the nursing staff were the need to wake patients at 0600 to weigh them and the perception that the patients were angry when woken at this time of the day. Two questions were included to gather data on the sleep status of patients and their demeanour when weighed. The majority of the sample (69%) was awake when approached to be weighed at 0600; with 31% asleep and needing to be awoken. Hand-in-hand with this concern was the demeanour of the patients at the time of the early morning weigh-in. Surprisingly 89% of the sample were 'happy' to be weighed, even though 20% of them needed to be woken-up. Eleven percent of the sample were categorised as either 'not happy' or 'angry' at the time they were weighed at 0600. A Fishers exact test was used to determine if the proportion of patients who were woken up and angry was significantly different to the proportion of those who were not woken but were angry. There was no difference between the two groups of angry patients ($p = 0.1091$); there were people who were already awake and angry, and those that needed to be woken-up and were angry.

Discussion

The premise underlying this study was the belief that is was unnecessary to duplicate work by weighing patients at 0600 and again prior to haemodialysis, as there would be no real difference between these weights. In addition it was the perception of the nursing staff that the patients who needed to be woken up to be weighed at 0600 were angry when their sleep was interrupted. However, the findings of the study are unable to substantiate either hypothesis. Rather than rush to criticise the underlying supposition of the study or the methodology used, valuable lessons can be gained from the research process. Although some research gaffes were included in the study there was also opportunities to learn and findings worth noting.

One pleasure from research is the surprises that are frequently unearthed. In this study the two weights were not the same, the majority of patients were not asleep at 0600 and the majority of patients were not angry at being woken-up.

Initial analysis of the data used numerous sophisticated statistical tests to see if the weights were the same and if there was a way to predict the difference between the 0600 and the pre-dialysis weight. Although it was not possible to predict the weight gained, an average weight gain of 0.52kg between the first and second weight was demonstrated. This result was unexpected and translates clinically to patients consuming an average of more than 500 mls after being woken at 0600 and prior to being weighed again just before starting a haemodialysis session. We correctly rejected the research hypothesis for the study, that there would be no difference between the weights taken at 0600 and the pre-dialysis weight.

Research gaffes that stand out include choosing to process the study as an audit to expedite approval of the study and also by designing a study to prove that there wasn't a difference between the two weights. While audits are an essential aspect of health (Morrell & Harvey, 1999), audits focus on counting frequencies and can result in a process conducted with less rigour than a research study. So while a short route was appealing, in this case it was a disservice as a longer time of preparation and pondering in the development of the initial proposal may have identified and addressed glitches (i.e. research flaws). Certainly when designing the study, specifically the data collection tool, it would have been advantageous to identify how the data would be analysed, what specific statistical tests would be required, could we do the analysis and whether the available computer program could undertake the analysis required.

A fundamental flaw of any study is when it is approached with an agenda. In this case the study was designed to backup the belief that there was no difference between the two weights and therefore weighing the patients at 0600 as well as prior to haemodialysis was unnecessary. Rather than designing a study to find out what the situation was, it was designed to prove a point. A valuable lesson is to approach each study with an open mind and to expect to be surprised. Starting with an open mind is essential. Possibly if time had been taken to reflect, it would have been realised that it was highly unlikely the two weights would be the same. In the time between 0600 and whenever haemodialysis was scheduled there would be activities such as breakfast, voiding, defecating, drinking etc that would influence the weight. Nevertheless, this study found an average weight gain of 0.52 kg, and this was a surprise.

As this study used a convenience sample from one renal unit, the findings can not be generalised. Numerous studies, however, have clearly demonstrated the risks associated with interdialytic weight gains (Jaeger & Hehta, 1999; Kimmel et al., 2000; Pierratos, 2004; Purcell et al., 2004; Savage et al., 1997) and therefore, it may be valuable to know if your patients

consumed the equivalent of a day's quota of fluid before their haemodialysis session (Ormandy, 1997).

For the nightshift nurse intent on completing their work at the end of their shift, it must have been a surprise to find the majority of patients in this study were awake at 0600 and that very few displayed anger when weighed. Maybe the explanation for the nurses' incorrect perception is linked to the increased workload in the last hours of a night duty shift. Nevertheless, regardless of the demeanour of the patient, the need to routinely weigh patients at this time represents poor planning of activities and allocation of resources.

While there were flaws in the design of this study, the initial idea to challenge a long standing practice which has become an accepted norm, should be applauded. The intentions were honourable. Clinical questions are not necessarily easy to answer, but the asking of the questions should be encouraged. Subsequently an appropriate design can be formulated to employ rigorous methodology. For this research issue, maybe consistently weighing patients at another time of the day when there were more nurses is an option that could be explored.

Conclusion

At the end of each research study the question should be asked; 'will these findings change clinical practice?' Without doubt the answer for this study is no; as the findings do not provide the grounds to change clinical practice. Another question that could be asked is; 'was the study a waste of time and resources?' Again the answer is no, as there were numerous benefits from the study, which included unexpected findings, evidence of the amount of fluid consumed before dialysis and the opportunity the study provided to gain research experience. Research is like a jigsaw, it doesn't arrive as a complete flawless picture. Rather it comes piece by piece, as a repertoire of skills gradually develop into invaluable expertise. It may be a slow process; however, it starts by challenging current practice and asking questions.

Acknowledgements

We are grateful for the support of Olive Harvey (Renal Nurse) and Eileen MacKenzie (Research Nurse) both from Royal Perth Hospital.

References

Hanley, P. (2004). Sleep apnoea and daytime sleepiness in end stage renal disease. *Seminars in Dialysis, 17*(2), 109-114.

Hanley, P.J., Gabor, J.Y., Chan, C., & Pierratos, A. (2003). Daytime sleepiness in patients with CRF: Impact of nocturnal haemodialysis. *American Journal of Kidney Diseases, 41*(2), 1-13.

Hopkins, W. (1997). Repeated measures models. *A New View of Statistics* Retrieved September 10, 2008, from http://www.sportsci.org/resource/stats/repanova.html

Jaeger, J.Q., & Hehta, R.L. (1999). Assessment of dry weight in haemodialysis. *Journal of the American Society of Nephrology, 10*(2), 392-404.

Joanna Briggs Institute. (1999). Vital signs. Best Practice Evidence Based Practice *Information Sheets for Health Professionals, 3*(3), 1-6.

Kenneth, H. (2008). Repeated-measures ANOVA examples Stata: *data analysis and statistical software* Retrieved September 10, 2008, from http://www.stata.com/support/faqs/stat/anova2.html

Kimmel, P.L., Varella, M.P., Peterson, R.A., & Weihs, K.L. (2000). Interdialytic weight gain and survival in haemodialysis patients: Effect of duration of ESRD and diabetes mellitus. *Kidney International, 57,* 1141-1151.

Morrell, C., & Harvey, G. (1999). *The clinical audit handbook: Improving the quality of health care.* China: Bailliere Tindall.

Ormandy, P. (1997). Dialysis (part 2): Haemodialysis. *Nursing Standard, 11*(23), 48-56.

Pierratos, A. (2004). Daily nocturnal home dialysis. *Kidney International, 65*(5), 1975-1986.

Purcell, W., Manias, E., Williams, A., & Walker, R. (2004). Accurate dry weight assessment: Reducing the incidence of hypertension and cardiac disease in patients on haemodialysis. *Nephrology Nursing Journal, 31*(6), 631-638.

Savage, T., Fabbian, M., Giles, M., Tompson, C.R.V., & Raine, A.E.G. (1997). Interdialytic weight gain and 48 hour blood pressure in haemodialysis patients. Nephrology *Dialysis Transplant, 12,* 2308-2311.