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Translation to Practice: A randomised controlled study of an evidenced based booklet targeted at breast care nurses in the United Kingdom

BACKGROUND

Nursing care based on research evidence is a clinical and professional imperative that has global implications. Historically, nursing has struggled to introduce research-based interventions into routine clinical practice. Reasons for this difficulty are varied and complex ranging from poor communication between clinical and academic based nurses (Estabrooks *et al.* 2003) to individual and organisational barriers that obstruct the implementation of research evidence into practice (Parahoo 2000, Kirshbaum *et al.* 2004). Conclusions from an extensive body of literature highlight subjectively many of the same difficulties associated with the way research is communicated, the skills of nurses, the research culture of the organisation and the quality of the research itself (Walsh 1997, Dunn *et al.* 1998, Closs *et al.* 2000, Parahoo 2000, Rutledge *et al.* 1998, Kajermo *et al.* 1998, Retsas & Nolan 1999, Kirshbaum *et al.* 2004). The main barriers to research utilisation such as: not understanding research reports, insufficient time to read research and not having the authority to change practice appear to remain consistent, universal and deeply rooted in nursing culture and practice the world over. These barriers cannot be addressed easily or sufficiently in the short term. Multiple,

systematic and innovative strategies are required to remove identified barriers and to strengthen facilitating aspects.

The call for both a pragmatic and systematic approach to the promotion of research utilisation and evidenced based practice has been expressed by many (Closs & Cheater 1994, Luker & Kendrick 1995, Pryjmachuk 1996, Mulhall *et al.* 1998, Thompson *et al.* 2001, Tolson *et al* 2006) and is an objective that continues to require sustained attention. Within the context of the UK's National Health Service (NHS) but applicable worldwide, it appears that for an overall strategy to succeed, a balance of attention and resources is required to address all three requirements of clinical effectiveness: obtaining evidence, implementing evidence and evaluating the impact of changed practice (NHS Executive 1996). In light of what is already known about the obstacles faced by nurses noted above, ways of improving research synthesis, access and understanding through effective dissemination strategies need to be considered empirically.

Typically, clinical information is communicated to health care professionals through various written and electronic formats such as guidelines, protocols, evidence synthesis bulletins, meta-analyses, systematic reviews and journal articles. It has been assumed naively and erroneously in the recent past that once a research report is produced, it is accessed, evaluated for quality and relevance and then used to inform practice by an autonomous practitioner. However, this process of direct and seemingly effortless translation of research into clinical application is not a true reflection of reality (Oxman *et al.* 1995, NHS Centre for Reviews and Dissemination 1999). It is therefore

essential to consider and evaluate strategies that will promote important research driven advances.

The Cochrane Effective Practice and Organisational Care Group (CEPOCG) was established to review the effectiveness of dissemination interventions on predominately medical practitioners. In addition, critical literature includes: two comprehensive Effective Health Care Bulletins (NHS Centre for Reviews and Dissemination 1994, 1999) and several reviews on gathering, appraising and synthesising literature on effective and ineffective methods of promoting research-based changes in clinical practice (e.g. Grimshaw & Russell 1993, Closs & Cheater 1994, Thomson *et al.* 1998, Lock *et al.* 1999, Grimshaw *et al.* 2001, Thomas et al 2003).

There is universal agreement in both the medical and nursing literature that providing practitioners with valid, reliable, credible, authoritative, effective and ultimately 'useful' research evidence to inform clinical practice is a highly complex undertaking. There are many varied approaches to communicating clinically relevant information, yet few have been evaluated empirically in nursing populations. Findings from the array of published reviews (listed above) indicate that:

- Written materials such as information packs and booklets are associated with improvements in specific, topical knowledge and have the potential to have an impact on reported practice.

- Educational methods provided within acute health care institutions are varied with some programmes combining several types of educational

interventions along with practical applications. However, no generalisations about which programmes are most effective can be made.

- A collaborative and facilitative approach to dissemination of research evidence may prove to be suitable for nurses however there are insufficient data about how this can be optimally achieved.

Printed educational material is a relatively low cost and widely used strategy for disseminating clinical information, but there is an interesting inconsistency between the medical and nursing literature. In a Cochrane Review of 11 studies of physicians it was concluded that standardised printed educational materials did not produce a change in clinical practice when used on their own (Freemantle *et al.* 2001). The conclusion of the review by Freemantle and colleagues was that a largely passive mode of information exchange did not appear to be sufficient. Given that accessibility of research findings remains a barrier for some groups of nurses (MacGuire 1990, Thompson *et al.* 2001, Kirshbaum *et al.* 2004), it follows that it will be necessary to seek out explanations for why this particular form of printed materials was evaluated as being ineffective. It may be that a more personalised and targeted version of this approach to synthesised educational material might be worthy of further consideration to specifically meet the information needs of nurses.

In contrast to the conclusions reached in the medical literature, two independent, well conducted experimental studies of nurses developed and evaluated personalised and targeted strategies for disseminating research-based educational material (Luker and Kendrick 1995, Williams *et al.* 1997).

These two studies provided substantial evidence in support of the effectiveness of printed materials in improving nurses' knowledge of leg ulcer (Luker and Kendrick 1995) and continence care (Williams *et al.* 1997). Shared elements of their successful strategies that could, following further investigation, be seen as being relevant to nursing include: a preliminary assessment of the target population, an identification of local barriers and limitations and the identification and participation of local opinion leaders as potential early adopters of a research based change in practice.

Nurses share many values and priorities with their medical colleagues, yet they subscribe to a profession that has a distinctly different focus, history, culture, educational preparation, status and social dimension (Kneafsey 2000, Farrell 2001, Watts *et al.* 2001). Therefore it would follow that the qualities for successful research dissemination could very possibly be different as well. The main issue is that it cannot be assumed that the conclusions reached from the findings of predominately medically oriented reviews and studies will be directly transferable to nursing. Until more is revealed and understood about the complex relationship between research knowledge and nursing practice, patient care will continue to be deprived of effective interventions. It is evident that this deficiency in knowledge should be resolved through empirically investigating research dissemination from the nursing perspective.

In the United Kingdom, it was documented that a problem of dissemination and utilisation of research-based knowledge existed within the specialty of breast cancer (Kirshbaum *et al*. 2004), thus depriving individuals of receiving optimum care. Despite increasingly robust research evidence demonstrating

the numerous benefits of aerobic exercise for individuals affected by breast cancer (Courneya *et al*. 2003, Mock *et al*. 2005), commensurate changes to practice were not noted amongst breast care nurses (BCNs). To assist in addressing this deficiency, a 3-stage study was designed to: identify the barriers to research utilisation and preferred methods of research dissemination of BCNs; and develop and evaluate a dissemination intervention for BCNs. The preliminary stages have been published elsewhere (Kirshbaum *et al.* 2004, Kirshbaum 2005a, Kirshbaum 2005b, Kirshbaum 2007). The evaluation stage will be presented here.

AIM OF STUDY

The aim of the study was to evaluate the effect of a targeted booklet, *Exercise and Breast cancer: A Booklet for Breast Care Nurse,* on changes in knowledge, reported practice and attitudes of BCNs.

Null hypotheses:

1. A targeted booklet designed to meet the needs of BCNs will have no positive effect on changing knowledge of BCNs.

2. A targeted booklet designed to meet the needs of BCNs will have no positive effect on changing reported practice of BCNs.

3. A targeted booklet designed to meet the needs of BCNs will have no positive effect on changing attitudes of BCNs.

METHODS

Design

A longitudinal, prospective, experimental, clustered approach was chosen to evaluate a research dissemination intervention. A randomised, controlled pre-test/post-test design (Campbell & Stanley 1963) enabled comparisons to be made at two different time intervals between two groups of BCNs based on their responses to an analytical survey questionnaire. Each cluster, the unit of analysis, consisted of all BCNs working within a single hospital.

The target population

BCNs in the UK were the target population for the study. As there was no legitimate national register that could be used as a sampling frame, a systematic approach was used to construct an up-to-date and comprehensive list. A database was compiled over several months by contacting regional breast care nursing groups, consulting a national guide to breast care services (Cancer Relief Macmillan Fund 1996) and telephoning each centre directly, and encouraging known BCNs to identify newly appointed or unlisted BCNs. At the time this research began, formal approval from a local research ethics committee was not required since study participants were professional nurses.

Sample size

The size of the sample is directly determined by the outcome measures to be used (Wilson & Rose 1998). This study used a series of outcome measures, matched to the type of data (e.g. categorical, continuous, ordinal) and the objectives of statistical tests. The determination of the sample size was based on the 2 sample t-test because it is the appropriate test to compare two means from continuous data such as the comparison of knowledge scores between the Experimental and Control Groups, a key objective in the study.

A clustering approach was selected, which required the sample size to be calculated based on hospitals, rather than on individuals (see Donner *et al.* 1981). The estimate for sample size was based on detecting a change of one unit on the ranking scales used in the measurement tool, which would approximate to one standard deviation. According to Machin & Campbell (1987 p.87) the required number of subjects per study group under these circumstances is 22; however, since the calculation was based on non-parametric ranking scales, a slight increase in sample size is recommended. As a result, the target number of hospitals per group was increased slightly to 24; a sample size that was deemed possible to attain even when accounting for non-responding participants.

The sample consisted of a subset from the national population of BCNs approached previously in a national survey (Kirshbaum *et al.* 2004). The inclusion criterion was that the participant currently held a post as a BCN in one of the northern geographical regions of England. Previous contact between the researcher and BCNs within professional networks in the northern regions was recognised as a potential factor in maximising rapport and trust within the study. One hundred and thirty seven BCNs working in 76 hospitals were identified.

Randomisation

A stratified block cluster randomisation was undertaken in which the unit of randomisation and analysis was the hospital at which the BCN worked. This was planned to avoid unit analysis error (Whiting-O'Keefe *et al.* 1984, Bero *et al.* 1998). Unit analysis error can occur in health care experiments in cases

where there are numerous providers (clinicians), yet there is no recognition of individual variation and interaction between them. Instead, inferences are made about a population without accounting for individual therapeutic skill or other personal characteristics. It is important for the researcher to isolate and identify all possible experimental effects. If more than one clinician is providing the intervention under study, differences in outcome may be due to characteristics of the provider, not necessarily the intervention. Similarly, if the patient, rather than the provider of the intervention, is identified as the unit of randomisation and unit of analysis and is allocated to an experimental group, a unit analysis error may result. Under these conditions, the significance of observed effects may be overestimated (Bero *et al.* 1998). A surprising amount of clinical research has been carried out without due care being given to this issue with the consequence that authors have produced results based on flawed analysis (Whiting-O'Keefe *et al.* 1984). It was recognised that BCNs frequently work with other BCNs in the same hospital and usually in the same office. The potential influence caused by their usual day-to-day interaction was acknowledged. Differences in outcome between the experimental and control group could have been affected not just by the intervention (the information booklet) but due to other methods of dissemination such as informal discussions or team meetings. Selecting the hospital as the unit of randomisation and analysis ensured that all nurses working at the same hospital were allocated to the same study group (experimental or control), thus the likelihood of error would be reduced.

Findings from a national survey of BCNs (Kirshbaum *et al.* 2004), indicated that compared with those who are based at district general hospitals, nurses

who worked in teaching hospitals or specialist hospitals had more formal education and made more frequent use of research. This finding identified type of hospital (general or specialist) as a variable that might influence outcome. Therefore, every hospital was identified as being a general or specialist hospital prior to randomisation. As part of randomisation the sample was stratified for type of hospital and conducted separately for each group to ensure that both study groups had a fair representation from each type of hospital.

The unit of randomisation throughout was the hospital coded as the hospital number. All nurses working at the same hospital were allocated to the same group. A block randomisation procedure described by Altman (1999) was used to reduce bias between study groups and promote high levels internal validity.

The Intervention

Following a systematic search strategy, a critical review was undertaken to identify, assess and synthesise empirical data about breast cancer and physical exercise (Kirshbaum 2007). In *Exercise and Breast Cancer: A Booklet for Breast Care Nurses,* research evidence associated with the title was synthesised and applied to meet the interests and requirements of the target audience. Specific attributes and characteristics of the experimental dissemination method (the intervention) were derived from the results of two previous undertakings: a national survey of barriers to research utilisation of breast care nurses (Kirshbaum *et al.* 2004) and the development of a

conceptual framework used for selecting a targeted intervention (Kirshbaum 2005b).

A rigorous attempt was made to identify specific information requirements of the intended audience. Relevant information was gathered to describe the targeted group, identify important criteria in light of attributes of innovations/interventions and consider the applicability of the determinants of behavioural change (Ajzen & Madden 1986, Ajzen 1991, Prochaska *et al.* 1992, Rogers 1995, Tones & Tilford 2001). Descriptive data derived from the national survey of BCNs were integral to understanding the target group. A wide range of information was collected, which comprised demographic details, data surrounding perceived views of the barriers and facilitators of research utilisation, preferences for dissemination methods and BCNs' comments about their authority to change practice, autonomy in the workplace and associations within networks and multidisciplinary teams. In light of these details, it was proposed that the dissemination method needed to be accessible, understandable, time efficient, communicated clearly, research-based, critical, interesting, relevant and practical. To optimise effectiveness, the intervention should ideally acknowledge possible reservations and limitations of implementing recommended changes and integrate positive change agent characteristics (e.g. credibility, perceived expertise, rapport, respect and trustworthiness).

The resultant information booklet aimed to address proposed attributes of an effective dissemination method (as listed above). The booklet was written by the researcher who achieved credibility and expertise in breast care nursing

throughout 15 years of clinical practice and research, and had developed a substantial profile of regional, national and international conference presentations and publications. The tone of the personalised cover letters was deliberately aimed at achieving rapport and trustworthiness by specifying succinctly the background and purpose of the research, who was leading it, what it entailed and the importance of their participation to further evidence-based practice within 'the time-consuming nature of breast care nursing'. The booklet acknowledged the specialist experience of the target group (BCNs), used professional terminology accurately and stated in the title that it was intended for the use of BCNs. The booklet began with a summary of the physical and psychological needs of breast cancer patients before presenting current research evidence surrounding the benefits of exercise for this group of patients and guidance to ensure safe practice. The text was structured into eight sections: Introduction, The challenges of breast cancer, The benefits of exercise, What type of exercise is best?, Implications for nursing practice, Summary and implications, References and Table of Empirical Studies.

A panel of experts, all working in the field of breast cancer, included a consultant surgeon, a clinical psychologist and a lecturer in cancer nursing were asked to review and confirm the clinical accuracy of the booklet. In addition, the panel and several colleagues from the academic nursing department were asked to comment on the clarity and style of the language with the intent of producing text that was well written, interesting and relevant to specialist, professional nurses. Some recommendations were made and these were incorporated into the final version.

The booklet was printed using resources provided by the Macmillan Practice Development Unit within the Department of Nursing, Midwifery and Health Visiting at the University of Manchester, UK. The final version took the form of an A5 booklet and consisted of eighteen pages of text, six pages of references and a three page pullout table that displayed the details of eighteen empirical studies on the benefits of exercise for breast cancer patients. For purpose of this study, the product was viewed as being highly accessible since it was posted directly to all participating nurses.

Data collection instrument

The Exercise and Breast Cancer Questionnaire was developed to test the hypotheses that a booklet designed to be pertinent to BCNs could facilitate changes in knowledge, reported practice and attitude outcomes. Since no validated or applicable measure was identified in the literature, a questionnaire was developed to meet the specific needs of the study. This was achieved using a planned and structured process, which directed considerable attention to the purpose, type, order and wording of questions to be included in the survey (Oppenheim 1992). Exploratory investigations to determine the state of research utilisation for the study population was conducted previously (Kirshbaum *et al.* 2004), relevant evidence was gathered and appraised from the literature on the beliefs and attitudes of BCNs, role of the BCN, physical and psychological effects of breast cancer and benefits of exercise. Questionnaire items were developed following a critical review of the literature.

The *Exercise and Breast Cancer Questionnaire* was organised into four sections based on the type of data required: 1) demographic data, 2) questions about reported practice, 3) questions to test knowledge and 4) questions about attitudes. On the first page the topic and purpose of the questionnaire was presented along with a functional definition of exercise as *any type of physical activity performed at a moderate intensity (60-85% of maximum capacity), for a minimum of 20 minutes and at least 3 times a week*. Respondents were also informed about procedures to maintain confidentiality and anonymity throughout analysis and dissemination of the results. The first section consisted of nine questions about respondents' place of work, experience as a BCN, whether they worked on their own and whether they had completed courses in breast care nursing and research methods. These questions were asked directly and simply with the intention of eliciting quick and easy answers.

The second section was aimed at obtaining data on reported practice specifically to identify the conditions under which BCNs would suggest exercise to their patients. Nurses were asked to use a 5-point Likert scale (1 = always to 5 = never) to record how often they would recommend exercise to their patients for each of twelve common quality of life problems such as weight gain, insomnia and fatigue.

The third section consisted of seventeen research-based statements for which three options, 'True', 'False' and 'Don't know' were offered. A 'knowledge score' was calculated to indicate the number of correctly answered knowledge questions (maximum score = 17). Each item was carefully constructed to be

clear, unambiguous and relevant to the target population. Areas of knowledge selected for inclusion were determined by the magnitude of their clinical importance (e.g. contraindications to exercise, patient benefit) as assessed by the researcher and clinical experts consulted throughout the development phase of the questionnaire. Special consideration was taken to ensure that the factual content for every statement was backed up by undisputed, empirical evidence. The order of statements was selected randomly and followed no particular pattern associated with the level of difficulty, correct answer (‘true’ or ‘false’) or particular focus of the question.

In the last section a 5-point Likert scale was used to elicit attitudes and beliefs surrounding the topic area. The pre-test questionnaire contained nine statements and the post-test version included two additional questions to subjectively record if respondents had actually received and read the booklet. Although attitudes are notoriously difficult to assess and influence, their inclusion as key outcome indicators was considered essential to demonstrate the full effect of the dissemination method. The attitude statements were conceived with one overarching objective in mind, namely, to explore BCNs' views of promoting exercise as part of their professional role.

Drafts of the questionnaire were reviewed by academic colleagues and externally by experts in the field of breast cancer who confirmed validity of the content. The questionnaire was piloted on nurses of all grades on a breast/oncology unit, who were not BCNs, within a district general hospital and research nurses at a specialist oncology centre. Minor changes were made to improve the clarity of several questions.

Data collection procedures

All 137 identified BCNs received a pre-intervention (baseline) questionnaire that was sent through the post along with a cover letter and self addressed, stamped return envelope. A reminder was posted to all non-responding BCNs after three weeks had passed. In total, 112 BCNs responded and these were randomised into two study groups: Experimental group (n = 56) and Control group (n= 46). After six weeks from the initial mailing date, the individuals assigned to the Experimental Group were sent the booklet *Exercise and Breast Cancer: a Booklet for Breast Care Nurses.* Two further months passed before the post-intervention (follow-up) questionnaire was sent to nurses in the Control and Experimental groups. After four weeks a reminder was posted to all non-responding BCNs. After a further four weeks, a copy of the booklet was then posted to all nurses assigned to the Control Group for their personal information and use. Data collection was conducted during 2002-2003.

Statistical methods

To maintain coherence with the study design, hospital cluster, identified as the unit of randomisation, also served as the unit of analysis. Compared to unclustered, analyses of clustered samples involve an added level of statistical complexity. Most of the tests commonly used to determine statistical significance relationships between variables can not be applied because individuals within clusters can not be regarded as statistically independent (Donner 1998). Instead of possessing one numeric response for each question, several responses must be included into the calculation. In addition, the size of each cluster, the sampling distributions, standard errors,

bias and confidence levels must all be taken into account before a reliable conclusion can be expressed.

A series of clustered regression techniques based on the adaptation of standard regression methods for clustering models known as the estimation of robust standard errors was chosen for this study because it allows for the adjustment of both individual level and cluster level covariates while testing for the effects of an intervention (Donner 1998). When it is acknowledged that units within a cluster may be dependent, the requirement for observations to be independent are relaxed; this leads to a set of corrected standard errors that are more applicable to clustered data (Ukoumunne *et al.* 1999). Clustered regression techniques can be used with continuous, categorical and ordinal data and can be useful in the exploration of relationships between two or more variables. Lastly, this selected approach was also a pragmatic choice since the intensive computations could be performed on the STATA statistical package available at the university.

To correctly analyse clustered data that is *continuous* such as the score for knowledge questions, clustered regression analysis was applied (STATA 2001a). Once an associative relationship has been established between two variables, a regression analysis 'allows us to assess how accurately an independent variable predicts a dependent variable…it enables us to determine the proportion of the variation in the dependent variable that can be accounted for by the variation in the independent variable' (Allen 1997 p3). The statistical technique determines if there is a relationship between variables and uses the notion of a straight line to develop a prediction

equation to describe particular types of patterns in the empirical data. 'An estimate of the intra-cluster correlation coefficient statistic is used to account for the variation within clusters (Campbell 2001 p82).' The estimated regression coefficient represents the change in the dependent variable for a change in 1.0 in the independent variable.

Linear regression was used to estimate a linear model of the relationship between an interval dependent variable (e.g. knowledge score) and one or more interval or binary independent variables (e.g. study group). Clustered linear regression was used because it is a model that would allow for nurses to be clustered within hospitals.

To analyse correctly clustered ordinal data obtained for the practice and attitude items on the questionnaire, ologit with bootstrapping was advised by the statisticians consulted by the author. Ologit is a technique of ordered logit estimation available in the STATA statistical software package (STATA 2001b). The method of calculation is similar to logistic regression but enables relationships between ordered dependent variables and a set of independent variables to be estimated (STATA 1997).

The bootstrap is a 'data-based simulation method for statistical inference which can be used to study variability of estimated characteristics of the probability distribution of a set of observations and provide confidence intervals for parameters in situations where they are difficult or impossible to derive in the usual way' (Everitt 1995 p32). In this study the only way to arrive at a statistic of variability for the responses within clusters for the ordinal data was through the use of multiple random samples. The bootstrap procedure

utilised random samples from the original data to provide a reliable estimate for the set of observations.

RESULTS

Participants

One hundred and four baseline questionnaires were returned from eligible BCNs working in 63 hospitals (3 were excluded for not meeting the criterion). This represented a 76% response rate. Ninety-two completed follow-up questionnaires were returned, which represented an overall response rate of 69%.

Data from the national survey were used to the test external validity of the evaluation study (Kirshbaum *et al.* 2004). Five variables were selected to compare responses of BCNs from the Northern counties with those from the other areas of the UK (Table 1).

Table 1: Comparison of BCNs from Northern Counties to BCNs from Other Areas in the U.K.

Variables	Northern areas n =152 (%)		Other areas in UK n =111 (%)		Chi Square
Type of hospital	DGH	Teaching	DGH	Teaching	$\chi^{2=}$ 3.00 df =1 p = 0.083
	81 (53.3)	71 (46.7)	71 (64.0)	40 (36.0)	
Degree	yes	no	yes	no	χ^2 = 0.09 df =1 p = 0.769
	38 (25.0)	114 (75.0)	26 (23.0)	85 (76.6)	
Breast care course	yes	no	yes	no	χ^2 = 7.25 df =1 p = 0.007
	114 (75.0)	38 (25.0)	98 (88.3)	13 (11.7)	
Research course	yes	no	yes	no	χ^2 =0.32 df=1 p = 0.574
	26 (17.1)	126 (82.9)	22 (19.8)	89 (80.2)	
Work with other	yes	no	yes	no	χ^2 =1.23 df = 1 p = 0.268

Variables	Northern areas n =152 (%)		Other areas in UK n =111 (%)		Chi Square
BCNs	113 (74.3)	39 (25.7)	89 (80.2)	22 (19.8)	
Years in nursing	mean 19.0	SD 8.1	mean 19.2	SD 8.5	t= -.27 df =261 p = .783

Out of the five variables that were used in the comparison, only one (breast care course) indicated a significant difference. From these data it is apparent that overall, the two groups were similar, but that fewer BCNs from the Northern counties had been on a breast care nursing course. The potential impact of this difference on the study as a whole was noted but considered negligible in light of the overwhelming similarities between the two groups; there was also no documented evidence to suggest that the breast course variable would exert a particularly strong influence.

The sample of 92 BCNs consisted of 52 respondents from general hospitals and 40 from specialist hospitals (Table 2). Fifty-two BCNs (56.6%) had five or more year's experience in their current role. Eighty-six BCNs (93.5%) worked with at least one other BCN; of these, 18 (19.5%) worked with three or more BCNs. Ninety nurses (97.8%) completed a specialist BCN course and 52 (56.5%) also completed a separate research course or module.

After randomisation, responses from BCNs in both study groups were compared to observe equivalence based upon baseline demographic details (Table 2). Using these data the numeric values of the study groups were similar for all but one characteristic; in the Intervention group 13 BCNs worked

with three or more colleagues, whereas only five BCNs in the Control group reported this characteristic.

Table 2: Demographic Details of Breast Care Nurses N=92

Independent Variables	Experimental group n (%)	Control group n (%)	Combined n (%)
Type of hospital			
General	27 (52.9)	25 (61.0)	52 (56.5)
Specialist	24 (47.1)	16 (39.0)	40 (43.5)
Years in breast care nursing			
less than 2 yrs.	3 (5.9)	5 (12.2)	8 (8.7)
2-4 yrs	18 (35.3)	14 (34.1)	32 (34.8)
5-10 yrs	20 (39.2)	13 (31.7)	33 (35.9)
more than 10 yrs	10 (19.6)	9 (22.0)	19 (20.7)
Work with other BCNs			
yes	48 (94.1)	38 (92.7)	86 (93.5)
no	3 (5.9)	3 (7.3)	6 (6.5)
Work with how many others			
1 or 2	35 (73.0)	33 (87.0)	68 (79.1)
3 or more	13 (27.0)	5 (13.0)	18 (20.9)
Completed breast care course			
yes	51 (100.0)	39 (95.0)	90 (97.8)
no	0 (0)	2 (5.0)	2 (2.2)
Completed research course			
yes	28 (54.9)	24 (58.5)	52 (56.5)
no	23 (45.1)	17 (41.5)	40 (43.5)
Total	51	41	92

Reported practice, knowledge and attitude item scores at baseline

Baseline responses to the questionnaire were used to describe the reported practice, level of knowledge and attitudes of the sample surrounding the topic of Exercise and Breast Cancer. Comparisons were made between study groups (experimental and control) based on mean scores to determine equivalence. No significant difference between groups was observed.

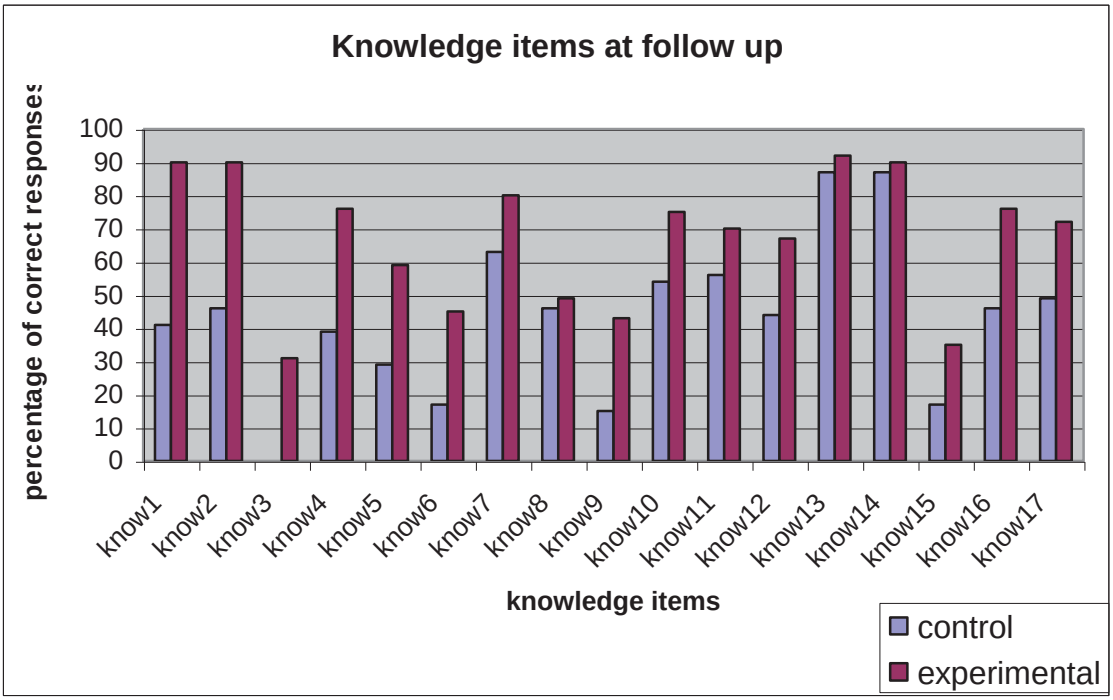
Effect of the intervention

Clustered regression analyses were conducted to determine the effect of the study group (i.e. receiving the booklet or not) on the knowledge, reported practice and attitudes of the sample using baseline and follow-up data. For each group of questionnaire items a summary table of unclustered data is presented first and followed by results from the clustered regression analyses. *Study group* (experimental or control) was selected as the primary predictor (independent) variable. Responses to reported practice, knowledge and attitude items were identified as the outcome (dependent) variables.

Effect of study group on knowledge

The intervention booklet appeared to markedly improve the knowledge of the intervention group; this was evidenced by a greater number of correct responses to each of the 17 knowledge items compared to the control group (Figure 1).

Figure 1: Comparison of study groups for knowledge items at follow up (Control n = 41, Experimental n = 51)



Following the analysis of unclustered data, 11 out of 17 knowledge items displayed a significant predictive relationship between clustered units and their responses to knowledge statements (Table 4). The odds ratio indicates the multiplicative change in the odds of a correct answer when the study group changes from experimental to control. The low odds ratios (all less than 1) are associated with improvement in knowledge because the experimental group was coded as Group1 and the control group as Group 2.

Table 3: Effect Of Study Group On Responses To Knowledge Items [Clustered Logistic Regression]

Outcome variable	Odds Ratio	95% Confidence interval	P	Robust standard error
Knowledge 1:	0.120	0.040 to 0.417	<0.001	0.078

Outcome variable	Odds Ratio	95% Confidence interval	P	Robust standard error
Exercise during the months of cytotoxic chemotherapy treatment will tend to make nausea more severe. (False)				
Knowledge 2:				
If a structured exercise programme is followed for 10 weeks, breast cancer patients can expect to experience less fatigue. (True)	0.094	0.034 to 0.259	<0.001	0.049
Knowledge 3:				
For breast cancer survivors, swimming has been shown to be the most beneficial form of physical exercise. (False)	perfect prediction	perfect prediction	<0.001	perfect prediction
Knowledge 4:				
Whatever form of exercise is selected, anxiety and depression will only be reduced when there are cardiovascular benefits. (False)	0.320	0.143 to 0.714	0.005	0.131
Knowledge 5:				
IV chemotherapy within the previous 24 hours is a contraindication to exercise for breast cancer patients. (True)	0.290	0.120 to 0.695	0.006	0.129
Knowledge 6:				
The main reason why women with breast cancer begin an exercise programme is the same as for healthy women. (False)	0.251	0.103 to 0.611	0.002	0.114
Knowledge 7:				
People who are obese, smoke or are elderly have a high risk of dropping out from exercise programmes. (True)	0.423	0.175 to 1.021	0.056	0.190
Knowledge 8:				
Breast cancer patients who participate in an exercise programme can expect to lose weight (False)	0.898	0.395 to 2.042	0.798	0.376
Knowledge 9:				
Physical activity provides increased protection against breast cancer for post-menopausal women. [False]	0.226	0.071 to 0.723	0.012	0.134

Outcome variable	Odds Ratio	95% Confidence interval	P	Robust standard error
Knowledge 10: Physical activity provides increased protection against breast cancer for post-menopausal women.(False)	0.396	0.156 to 1.005	0.051	0.188
Knowledge 11: Patients who want to continue their established exercise routines throughout breast cancer treatments should be encouraged to continue without modification. (False)	0.532	0.236 to 1.201	0.129	0.221
Knowledge 12: Dizziness and vomiting within the previous 36 hours are contraindications to exercise for breast cancer patients. (True)	0.391	0.156 to 0.982	0.047	0.184
Knowledge 13: To maintain a new behaviour such as regular exercise, it is necessary to have positive encouragement during and after the behaviour. (True)	.613	0.170 to 2.214	0.455	0.402
Knowledge 14: Breast cancer patients who participate in an exercise programme can expect to increase their self-esteem. (True)	0.783	0.221 to 2.769	0.704	0.505
Knowledge 15: If a structured exercise programme is followed for 10 weeks, breast cancer patients can expect to decrease their functional peak capacity (VO_2Max). (False)	0.377	0.149 to 0.954	0.034	0.179
Knowledge 16: Vigorous repetitive upper body exercises should not be encouraged since this will probably result in arm lymphoedema. (False)	0.266	0.119 to 0.592	0.001	0.109
Knowledge 17: Women should be advised to wait at least 2 weeks after surgery before doing any form of physical exercise. (False)	0.360	0.153 to 0.852	0.020	0.158

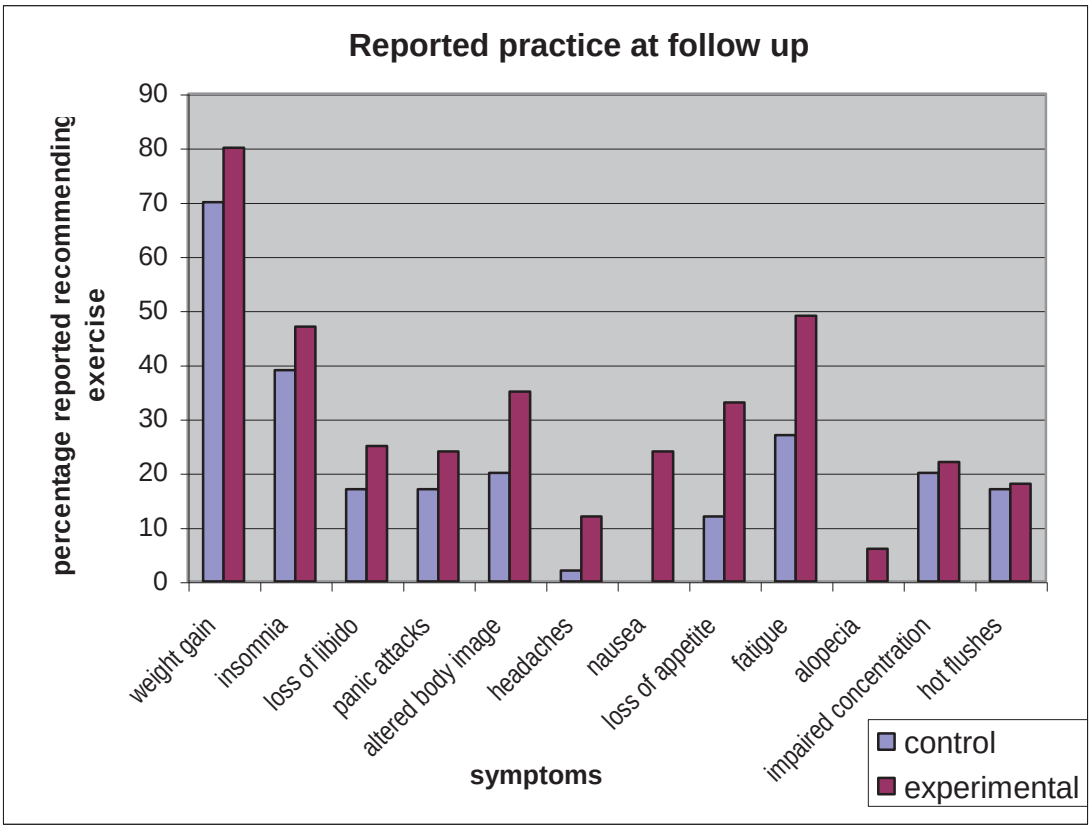
These results indicate that *study group*, emerged as a very strong predictor variable associated with improving knowledge.

Effect of the study group on reported practice

The *study group* was examined for its effect on each reported practice item. Participants were asked the same questions as at baseline. Figure 2 displays graphically the comparison between study groups using unclustered data.

Figure 2: Comparison of study groups for reported practice at follow-up

Control n = 41 Experimental n = 51 (unclustered data)



In the clustered analyses using ologit, the intervention was shown to significantly affect three out of a total of twelve practice items (Table 4).

Table 4: Can study group predict reported practice for follow-up responses? [Ologit]

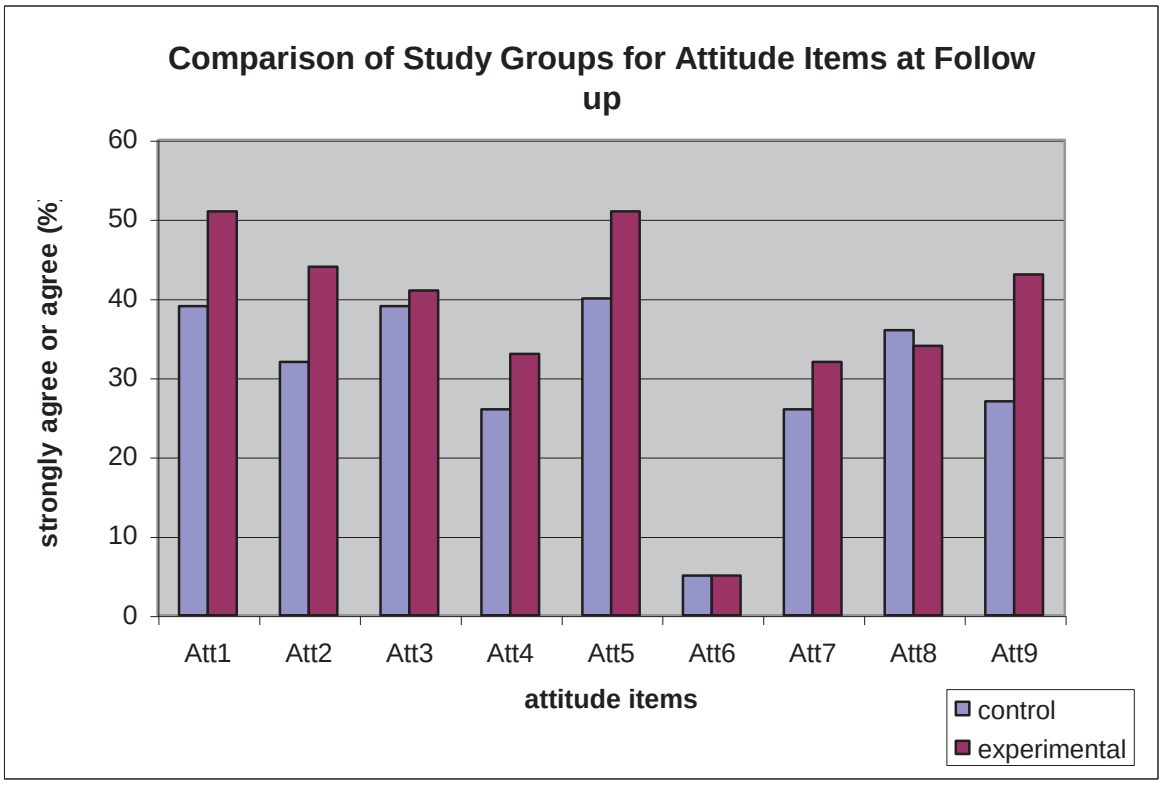
Predictor variable	Outcome variable	Odds ratio	95% confidence interval
Study group	Practice 1: weight gain	1.55	0.73 to 3.03
Study group	Practice 2: insomnia	1.46	0.64 to 3.60
Study group	Practice 3: loss of libido	1.92	0.94 to 3.64
Study group	Practice 4: panic attacks	2.23	0.89 to 5.75
Study group	Practice 5: altered body image	1.62	0.67 to 3.82
Study group	Practice 6: headaches	2.41	0.98 to 5.42
Study group	Practice 7: nausea	2.54	2.53 to 13.20
Study group	Practice 8: loss of appetite	3.67	1.82 to 8.76
Study group	Practice 9: fatigue	2.44	1.12 to 5.99

Significant results were found for the individual items in relation to: nausea, loss of appetite and fatigue.

Effect of the study group on attitude

The *study group* was examined for its effect on each reported attitude item. Participants were asked the same questions as at baseline. Figure 3 displays graphically the comparion between study groups using unclustered data.

Figure 3: Comparison between study groups on attitude items at follow-up



In testing for the effect of the intervention on changing attitudes using ologit (see Table 5), the results suggest that the responses of the clustered units could be predicted for two items: *I would promote exercise to my patients if I knew more about the associated benefits and limitations* (Attitude 3) and *I believe exercise is important for women with breast cancer* (Attitude 9):.

Table 5: Can study group predict attitude for follow-up responses? [Ologit]

Predictor variable	Outcome variable	Odds ratio	95% confidence interval
Study group	Attitude 1: Promoting health is an important part of the breast care nurse's role	2.32	0.63 to 11.25
Study group	Attitude 2: The promotion of exercise is an important part of the breast care nurse's role.	0.78	0.31 to 1.90

Study group	Attitude 3: I would promote exercise to my patients if I knew more about the associated benefits and limitations.	0.26	1.57 to 10.28
Study group	Attitude 4: I understand how exercise can reduce cancer-related fatigue.	0.89	0.35 to 2.03
Study group	Attitude 5: Any intervention than can improve a patient's sense of control should be promoted.	0.79	0.87 to 2.14
Study group	Attitude 6: It is insensitive to suggest increasing physical activity to someone who is emotionally distraught.	1.39	0.58 to 3.22
Study group	Attitude 7: I have enough time to promote exercise to my patients.	0.90	0.38 to 2.27
Study group	Attitude 8: Regular exercise is an important part of my lifestyle.	2.23	0.94 to 5.47
Study group	Attitude 9: I believe exercise is important for women with breast cancer.	2.69	0.14 to 0.92

The control group indicated a higher agreement with the belief that if they knew more about exercise, they would promote it to their patients. The results also demonstrate that study group had a strong predictive effect on believing that exercise is important for women with breast cancer.

DISCUSSION

The findings indicate that an information booklet, produced specifically in response to the expressed requirements of a targeted population, can be used to enhance clinically relevant knowledge. Within the context of promoting exercise to breast cancer patients, attitude statements that expressly mentioned health promotion, exercise promotion and the reduction of cancer related fatigue were strongly associated with greater acquisition of knowledge; this outcome was independent from the experimental variable (the booklet). In addition, there are findings that indicate that the relationships between

knowledge, reported practice and attitudes resist linear interpretation and dictate conceptualisation within theoretical models that provide multi-dimensional explanations of complex, inter-related phenomena.

This study has been set within the paradigm of the Evidence Based Practice movement, which has been identified as a 'global phenomenon' (Kitson 2004 p6). As Kitson so aptly points out, evidence-based medicine (EBM) incorporates many of the critical attributes of populations postulated by Rogers in his classical studies of Diffusion of Innovations (Rogers 1995). Qualities such as the existence of influential leaders, a strong ideology, policy support, investment in infrastructures and the actual product are observed in the growth of the Cochrane Collaboration, prominent centres of excellence such as McMaster University (Sackett *et al*. 1997) and national government imperatives such as clinical guideline development. Nursing may share with medicine a commitment to the provision of effective health-related care to individuals and use the output from EBM to inform clinical care (Harrison *et al.* 2002), but is less advanced in developing ways to promote practice that is grounded in evidence. The findings from this study have demonstrated that nurses do indeed respond positively to written educational materials (e.g. targeted information booklet).

Knowledge

The targeted information booklet was clearly effective in improving knowledge. As an intervention, it was intended to provide a credible resource for BCNs, capable of conveying the simple message that exercise should be promoted to people with breast cancer. Given the recognition that information is critical

to changing nursing practice (White *et al.* 1998), it is therefore vital that individuals in clinical practice are encouraged to obtain current research findings in an accessible format and to bring practice and theory together for patient benefit (Crane 1995, Thomson *et al.* 1998).

The results indicated that the minimal goal of achieving a basic awareness of the importance of exercise far exceeded expectations. When responses of the two groups of clustered BCNs were compared, a significant predictive relationship was demonstrated between receiving the booklet and correctly answering 10 out of 17 knowledge questions. Of the seven questions that did not display a significant effect, three were answered correctly by over 90% of the total sample. Retrospectively, it would appear that these three questions reflected knowledge of a general rather than specialised nature and were probably easier to answer correctly.

It is not surprising that educational interventions formed the basis for many research utilisation programmes (Stetler 1994, Stetler *et al.* 1995, Lacey 1996, Titler *et al.* 1999, Rodgers 2000, Howell *et al.* 2001). In these examples, the broad spectrum of approaches is apparent. The programme described by Stetler *et al.* (1995) has succeeded by following cohorts of nurses from introductory research awareness sessions through to active implementation and evaluation of innovations in practice at the bedside. In the context of a university setting, Lacey (1996) demonstrated that an introductory research course could enhance research-based practice and that the effect could continue to have an impact six months after the students completed the course. In common with the current study, Luker & Kendrick (1995) and

Williams *et al.* (1997) demonstrated previously that 'packages' of research findings in the form of handbooks or information booklets were also effective in improving nurses' knowledge of a specific body of evidence. The current study concurs with the findings from these two earlier studies and advances their contributions by investigating the impact of information on reported practice and attitudes.

Reported practice

Initiating changes to clinical practice presents a major challenge both to achieve (Kanouse & Jacoby 1988) and evaluate (Waddell 2002). The experimental booklet was found to be a predictive indicator for change in reported practice. A statistically significant increase was recorded in the promotion of exercise for the purpose of relieving nausea, fatigue and loss of appetite. The first two of these symptoms had been supported by empirical studies cited in the booklet, but not the loss of appetite. An explanation for this anomaly in the outcome might be that the nurses may understandably have made an association between loss of appetite and depressed mood state. Their experience and knowledge of the linkage between these two conditions may have led them to assume that exercise would affect both disturbances in the same positive way. Another possible though unsubstantiated explanation may be that the BCNs were incorporating aspects of their own 'life experience' into practice by making their own links between exercise and a 'healthy' appetite.

Earlier evaluations of written educational materials, where the respondents were mainly medical doctors (Freemantle *et al.* 2001), found a lack of

effectiveness. By contrast, the booklet on exercise and breast cancer has been shown to influence a moderate change in the reported practice of nurses. A reason for the disparity may be that different sorts of risks are involved in changing practice by different types of practitioners. Innovations that involve altering a medical treatment or surgical procedure may require more robust and convincing attributes than the health promotion message advocated to the BCNs in this study.

It is acknowledged within social psychology (Prochaska *et al.* 1992, Prochaska & DiClemente 1994) and health promotion (Tones & Tilford 2001) that the development of a positive attitude toward a change in behaviour is essential to its eventual adoption. To encourage movement along a recommended path, as in the cessation of smoking, there is a complex interplay between the quality of information, previous personal experience and the credibility of the health professional. Using the terminology of Diffusion Theory, it follows that the change agent (the researcher), the message (evidence contained in the booklet) and the attitudes of the sample are all significant indicators for the proposed changes in practice.

Attitude

The findings indicate that the targeted information booklet affected slight changes in the attitudes of the BCNs, which is congruent with the evaluation literature that have previously investigated the relationships between attitude change and information exchange (Howell *et al.* 1998, Messmer *et al.* 1998, White *et al.* 1998, Gass 1998). In contrast to knowledge, which is directly influenced by cognitive input, it is far more difficult to change attitudes

because they are derived from values that are often salient and deep-seated (Tones & Tilford 2001). In the context of research dissemination and utilisation in nursing, this remains a key point if the profession is to advance. In their systematic review of individual determinants of research utilisation, Estabrooks *et al.* (2003) concluded that most factors e.g. *education, information seeking*, *involvement in research activities,* did not demonstrate any consistent positive effect with the exception of *beliefs and attitudes towards research.* To change an attitude, communication must be highly persuasive and be delivered by a credible messenger. Since there was no direct contact between the respondents and the researcher, it was not an unexpected outcome to observe that the intervention influenced only one attitude item when tested as a single outcome variable. However, it is a crucial finding in terms of clinical significance. An increase in agreement with the statement, *I would promote exercise to my patients if I knew more about the associated benefits and limitations,* combined the desire for knowledge (about how to benefit patients and protect their safety) with an expressed desire to introduce an evidence-based change into practice. In this case the booklet was influential in increasing the BCNs' awareness of the exemplar topic; a result that indicates a considerable accomplishment.

Strengths and limitations

A recognised and substantiated strength, which has direct implications for practice, is the quality of *Exercise and Breast Cancer: A Booklet for Breast Care Nurses*. The information booklet was intended to be relevant and interesting to BCNs and to act as a stimulus for changing practice. In addition,

it was essential that the best available research-based evidence was included. A critical approach to the selection and synthesise of information was followed. However, the content of the booklet was limited by the effect size of many of studies available at the time that have evaluated exercise programmes involving cancer patients. The studies referred to in the booklet were all well constructed and demonstrated rigorous procedures, yet many relied on small samples of patients. Ideally more extensive and robust research leading to unequivocal conclusions about the benefits of exercise for breast cancer patients (e.g. Segal *et al.* 2001, Courneya *et al.* 2003) would have been preferable, but were not available at the time of writing the booklet.

Ideally, all instruments used in the study would have had recognised face, content, criterion and construct validity and confirmed reliability. However, as no such measurement tool existed that could be used to assess changes in knowledge, reported practice and attitude surrounding the promotion of exercise for breast cancer patients, it was necessary to develop *The Exercise and Breast Cancer Questionnaire*. A functional questionnaire was developed to assess the effectiveness of the information booklet. Content and face validity was approached through a process that included a systematic literature search and the consensus of experts in related fields and disciplines who verified the factual substance of the questionnaire. The measurement of attitude was conducted using a simplified approach, which followed the techniques described by Oppenheim (1992). The statements were based upon the theoretical and research literature. Meticulous attention was given to the details of the questionnaire's content, currency, clarity and layout.

General limitations of the instrument were: that it could only be used to collect information about reported rather than actual practice and that the BCNs in the experimental group had access to the booklet while they were asked to complete the follow-up questionnaire. The researcher did not control for the possibility that some respondents might have referred directly to the booklet while answering the knowledge questions, which could have affected outcome. The Hawthorne effect (Roethlisberger & Dickson 1939) may have also influenced some of the responses, as could the fact that the same questionnaire was used at both intervals and participants in the control group may have acquired answers to some of the knowledge questions independently during the interval between the pre and post intervention assessments. Correspondingly, there is no way of knowing for certain if the BCNs who were sent the information booklet actually read it and absorbed its information. The marked increase in knowledge, reported change in practice and response to attitude statements could have been influenced by external influences. However, realistic maturation, historical, motivational threats to internal validity were recognised during the design phase and were addressed by imposing the shortest reasonable time period between the pre and post test assessments, having a control group and further reducing bias through coded assessment forms.

An experimental design appeared to be well suited to measure the effectiveness of the intervention within the current context. The study was planned in an attempt to promote high levels of internal and external validity by removing as many forms of bias as possible throughout the research process. Double-blinding is an important feature of the randomised controlled

study that serves to reduce bias. Due to the nature of the intervention this did not occur. A ‘placebo booklet’ was not considered at the time. In retrospect, the thought of basing the content of the booklet on ‘benign (placebo) information’ would be unsound; the information would be not be current or research-based and would be ethically suspect. However, participants were not able to influence whether they received a booklet or not and their data forms were coded, which provided at least single-blinding.

Further depth of knowledge could have been obtained within the positivist paradigm through the inclusion of additional outcome measures. It would have been worthwhile to determine: how the BCNs promoted exercise, the duration of behaviour change and the patients’ perspective. Direct inquiries about documented changes in physical activity for patients and any measurable declines in reported patient problems could have been pursued. The study would have benefited from mirroring the standard clinical trial framework, where the Pre-clinical (theoretical), Phase I (modelling) and Phase II (exploratory trial) sequence promotes thorough exploration, identification of key components and development of a feasible protocol (Medical Research Council 2000). To some extent, aspects of all three phases were achieved, but not as fully as they could have been. For example, Phase 1 was achieved by developing the Conceptual Framework in Stage Two. It served to develop an understanding of the intervention and delineation of an intervention’s components of the study, but would have been more valuable if it would have gone further to include how the components of the framework related to final outcomes (Medical Research Council 2000). This could possibly have

identified additional outcome measurements that may have led to more pertinent and applicable findings.

Implications and conclusions

The study's main contribution is to the knowledge base of research dissemination and to clinical nursing. In contrast to findings from the mainly medical literature (Freemantle *et al.* 2001), it would appear that written materials have a beneficial role as vehicles for effective transmission of research evidence to a specific group of nurses. In addition to influencing changes in knowledge, as demonstrated previously within nursing literature (Luker & Kendrick 1995, Williams *et al.* 1997), the information booklet was also associated with changing reported practice and related attitudes.

The main reason for the success of the information booklet was attributed to its suitability to the identified task through presenting a relevant research-based message that was targeted to meet the expressed needs, professional qualities and social context of the definable audience. The booklet appeared to be well received by BCNs, served to increase their awareness of the benefits of exercise for their patients and influenced reported changes in clinical practice.

An awareness of the social and professional context in which the audience existed was thought to be a particularly influential aspect of developing dissemination interventions derived from the tools of persuasion delineated in the social science literature (Ajzen 1991, Prochaska *et al.* 1992, Prochaska & DiClemente 1994, Tones & Tilford 2001). The study demonstrated not only a successful choice of format for dissemination of 'the message' but also

concluded that nurse researchers can be effective change agents in this process. Professional attributes of the researcher, such as having clinical credibility and an ability to develop rapport with nursing colleagues in the absence of direct face-to-face interaction, were considered important prerequisites for success.

The focus of the booklet was another decision that was taken to meet the needs, professional qualities and social context of the target group; the benefits of exercise for breast cancer patients was thought to be directly relevant and of interest to the BCNs. Familiar background information about the side effects of breast cancer treatment was deliberately included at the beginning of the document as a way of introducing the subject of exercise promotion and placed it into a meaningful context. The content of the booklet was clearly written, with numerous references provided throughout. Direct access to the research evidence was ensured since the booklet was posted directly to the BCN's place of work.

To further the clinical contribution of the current study, the benefits of exercise could be promoted strategically within the context of relieving cancer-related fatigue. This type of fatigue is known to be the most prevalent symptom for cancer patients (Richardson 1995) and also one that can be reduced by physical exercise in many circumstances (Mock *et al.* 2005). The current study discovered that BCNs would be more likely to promote exercise to their patients if they knew more about its associated benefits and limitations. Further advertising of the benefits of exercise for breast cancer patients could be achieved through presentations to BCN networks, conference

presentations, publication of articles in popular and academic journals. A consumer-oriented version could be written to address the interests of the general public and web-based hyperlinks could be made to authoritative and popular cancer information networks and charities.

The approach evaluated here can be replicated and applied to other groups of nurses who are members of specialist professional networks and work within provider organisations. Similar booklets could be produced and distributed to other groups of nurses at a relatively low cost.

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