

## Rapid assessment of psychosocial well-being: Are computers the way forward in a clinical setting?

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Accepted in revised form 1 November 2001

### Abstract

**Objective:** To compare the agreement between anxiety, depression and supportive care needs data obtained using a touchscreen computer survey with traditional pen-and-paper surveys. **Methods:** The sample consisted of 1304 consecutive patients attending the medical or radiation oncology outpatient department in two public cancer treatment centres. Of the 357 eligible patients, 355 (99%) consented to participate and 350 (98%) completed both touchscreen computer and pen-and-paper versions of the Hospital Anxiety and Depression Scale (HADS) and short-form Supportive Care Needs Survey (SCNS-short). **Results:** Simple  $\kappa$  values indicated moderate agreement ( $\bar{\kappa} = 0.57$ ) between the two modes of survey administration for most HADS items. Simple  $\kappa$  coefficients indicated only fair agreement ( $\bar{\kappa} = 0.28$ ) when a simplified response option format was used in the computerised SCNS-short. When the paper and computerised survey used the same response format, simple  $\kappa$  coefficients increased and indicated moderate agreement ( $\bar{\kappa} = 0.44$ ) for most SCNS-short items.  $\kappa$  Coefficients indicated at least moderate agreement ( $\kappa > 0.41$ ) in identifying patients with elevated levels of anxiety and depression; there were no significant differences in the proportion of patients identified with elevated levels of anxiety and depression according to computer survey compared to paper survey. Prevalence-adjusted bias-adjusted  $\kappa$  (PABAK) coefficients indicated at least moderate agreement ( $\bar{\kappa} = 0.79$ ) in identifying participants with moderate/high levels of unmet needs. However, participants tended to report lower levels of unmet needs with a simplified response format in the computerised SCNS-short compared to the paper survey. This was not observed when the response format of the computerised SCNS-short replicated the paper survey. **Conclusions:** Despite the advantages that computerised surveys offer for simplifying survey presentation, current results suggest the need to exactly replicate the question and response option format of the original paper survey to ensure the data collected are equivalent. This finding is particularly important given the potential application of computerised surveys in the clinical setting to quickly assess and identify patients' concerns requiring intervention by health care providers.

**Key words:** Anxiety, Cancer, Computer, Depression, Psychosocial assessment, Unmet needs

### Introduction

It has been demonstrated that patients living with cancer experience high levels of anxiety, depression [1–5] and unmet needs [1, 6–10]. Furthermore, physical and psychosocial problems can have a

negative effect on patients' quality of life and compliance with treatment regimes [11, 12]. For example, it has been estimated that up to one-third of patients will abandon chemotherapy prematurely because of physical and psychosocial symptoms, despite the potentially life-threatening

consequences of such action [12]. Clearly, it is important for oncologists to detect these issues in their patients and to address them as they occur. However, several studies have shown that oncologists' awareness of their patients' psychosocial well-being is less than optimal [3, 13, 14]. For example, Newell et al. [13] found that medical oncologists tended to overestimate their patients' levels of perceived needs and to underestimate their patients' levels of anxiety and depression.

The availability of self-reported measures assessing cancer patients' anxiety, depression [15] and supportive care needs [16], provides an opportunity to increase oncologists' awareness of their patients' psychosocial well-being. For example, patients could complete a survey about their psychosocial well-being while waiting to see their oncologists, with a summary of their responses available to the oncologists at the start of the consultation to facilitate clinical interactions and discussions. However, for such a strategy to be adopted in routine clinical practice, efficient data collection and feedback strategies need to be identified.

Adapting traditional pen-and-paper surveys to touchscreen computer is a potentially efficient approach to data collection in the clinical environment. The main advantages of this form of survey technology include instant data entry and processing [17], reduced occurrence of missing data [17–19], tailored question branching and automatic report production [20]. Previous research also suggests that despite an overall lack of computer experience and older age, oncology patients are highly accepting of a touchscreen computer survey to assess psychosocial well-being [18–21].

However, before the widespread application of automated methods of data collection can be recommended, it is essential to ensure that the quality of the data collected using this form of computer technology are comparable to those collected by traditional pen-and-paper surveys. A literature search produced conflicting results when comparing computerised and pen-and-paper surveys. For example, studies with patients having cancer [18, 20], gastrointestinal disease [17, 22], diabetes [23] and in psychiatry [24] found the data comparable. However, other studies have reported differences between the two modes of survey administration [25, 26]. It is unknown whether these findings are survey specific. Therefore, this study

aimed to: (1) compare cancer patients' responses to individual items of a touchscreen computer version of the Hospital Anxiety and Depression Scale (HADS) and the short-form Supportive Care Needs Survey (SCNS-short) with validated pen-and-paper versions of the surveys; and (2) compare the two modes of survey administration with respect to their accuracy in identifying patients in need of intervention to address high levels of anxiety, depression or unmet supportive care needs.

## Methods

### *Sample*

Respondents consisted of people diagnosed with cancer who were in consecutive attendance at either the medical or radiation oncology outpatients clinic at two major public cancer treatment centres in the state of New South Wales, Australia. Patient eligibility criteria included: being aged 18 years or over, attending the clinic for a second or subsequent visit, able to speak and write English, physically and mentally capable of completing a survey and not having completed the survey at a previous visit to the clinic.

### *Procedure*

Patients considered eligible by clinic staff were given a written project information sheet and consent form upon their arrival at the clinic and asked to provide a trained research assistant with their written consent to participate. Consenting patients were asked to complete a pen-and-paper survey and a touchscreen computer version of the same survey on the same day. The study received approval from the University of Newcastle's Human Research Ethics Committee and the ethics committees of participating hospitals.

### *Measures*

#### *Hospital Anxiety and Depression Scale*

The 14-item HADS contains two sub-scales, containing seven items each [15]. Scores range from 0 to 21 on each sub-scale and classify patients' anxiety and depression levels as low (0–7), borderline (8–10) or clinically significant (11–21). The

instrument has demonstrated validity with cancer patients [27–29].

#### *Short-form Supportive Care Needs Survey*

The SCNS-short was developed from the existing SCNS [16] and contains 31 items measuring cancer patients' unmet need for help across four domains: psychological (8 items), health systems and information (13 items), patient care and support (7 items), and physical and daily living needs (3 items). For each item, patients are asked to indicate their level of need for help over the last month as a result of having cancer, by choosing one of the following response options: 'no need: not applicable'; 'no need: already satisfied'; 'low need'; 'moderate need' or 'high need'. To preserve the detail of the information collected, an overall score is not calculated; rather, specific issues where patients require the most help are identified. The SCNS-short has demonstrated internal reliability and construct validity and takes approximately 10 min to complete.

#### *Demographic and cancer descriptors*

An additional 14 questions asked about age, gender, marital status, level of education, time since diagnosis, remission status, primary cancer site, time since last received treatment and treatments received in the last month.

Original pen-and-paper and computerised versions of these measures were used. For the HADS, the instructions, questions and response options were presented exactly the same in both the pen-and-paper and the computerised survey, with the computerised version presenting one item and its four response options per screen. In the case of the SCNS-short, two computerised versions were developed. Consistent with the question and response format of the pen-and-paper survey, one of the computerised versions presented one item and its five response options per screen. The other computerised version utilised the flexibility offered by this form of survey administration by simplifying and tailoring the presentation of questions and response options; initially presenting one item on a screen to assess whether an unmet need for help was present and if so, presented a second screen to assess whether the level of need for help for that item was 'low', 'moderate' or 'high'.

For all computerised surveys, respondents entered their answers by touching the corresponding button on the screen. Participants could not move to the next question without answering the previous one, although it was possible to go back one question and change the response. Three modes of survey administration with varied order and format were used:

1. CM-P: Computer survey (modified version SCNS-short; original version HADS) followed by the paper survey;
2. P-CM: Paper survey followed by computer survey (modified versions SCNS-short; original version HADS);
3. CO-P: Computer survey (original version SCNS-short and HADS) followed by the paper survey.

#### *Analyses*

##### *Item comparisons*

To assess the agreement between participants' responses to each item of the pen-and-paper version and touchscreen computer version of the HADS and SCNS-short, simple  $\kappa$  coefficients and the proportion of exact agreement were calculated for each item. Values of  $\kappa$  range from 0 to 1. To interpret the  $\kappa$  coefficients we adopted the widely accepted but arbitrary indicators where  $K = 0$ : poor agreement; 0–0.2: slight agreement; 0.21–0.4: fair agreement; 0.41–0.6: moderate agreement; 0.61–0.8: substantial agreement and 0.81–1.0: almost perfect agreement [30].

##### *Categorical comparisons*

To assess whether the classification of participants as having high levels of anxiety, depression and supportive care needs varied according to the mode of survey administration,  $\kappa$  analyses were undertaken. For each sub-scale of the HADS, participants' responses were scored and categorised according to the published scoring framework [15] of low (0–7), borderline (8–10) or clinically significant (11–21). Simple  $\kappa$  coefficients and the proportion of exact agreement were calculated for each sub-scale. For the SCNS-short, participants' responses were dichotomised as some need vs. no need. To correct for the effect of bias (unbalanced marginal totals) and prevalence (differences in the distribution of data across the categories), prevalence-adjusted bias-adjusted  $\kappa$  (PABAK) co-

efficients and the proportion of exact agreement [31] were calculated for each item of the SCNS-short.

## Results

### *Sample*

Overall, a total of 1304 outpatients were approached to participate in the study. Of these, 947 (73%) were considered ineligible to participate because they were too ill ( $n = 84$ ), had insufficient English skills ( $n = 71$ ), were attending the clinic for their first visit ( $n = 63$ ), were aged less than 18 or greater than 85 years ( $n = 22$ ) or had previously completed this survey due to regular visits to the clinic ( $n = 707$ ). Of the 357 eligible patients, 355 (99%) consented to participate and 350 (98%) completed computer and pen-and-paper surveys.

Table 1 summarises the demographic, disease and treatment characteristics of participants. Given that participants were recruited at various stages of the treatment continuum, some differences in the distribution of these characteristics between the three groups is expected but unlikely to affect the way in which participants respond to different modes of survey administration.

### *Item comparisons*

#### *HADS*

The agreement between participants' responses to individual items of the computerised and pen-and-paper versions of the HADS is summarised in Table 2. Overall, the simple  $\kappa$  coefficients indicated moderate agreement for most items with values ranging from 0.39–0.88 ( $\bar{X} = 0.57$ ) and exact agreement from 60 to 95% ( $\bar{X} = 74\%$ ). For each of the three groups, the mean  $\kappa$  values showed moderate agreement ( $\kappa > 0.41$ ) or better for both the anxiety and depression sub-scales.

#### *SCNS-short*

The agreement between participants' responses to individual items of the computerised and pen-and-paper versions of the SCNS-short is also summarised in Table 2. Overall, the simple  $\kappa$  coefficients for groups CM-P and P-CM indicated fair agreement for most of the 31 items with values ranging from 0.09 to 0.45 ( $\bar{X} = 0.28$ ) and exact agreement

from 45 to 72% ( $\bar{X} = 55\%$ ). At the domain level, mean  $\kappa$  values showed only fair agreement ( $\kappa \leq 0.4$ ) at best. In contrast, the simple  $\kappa$  coefficients for group CO-P were generally higher overall and indicated moderate agreement for most items with values ranging from 0.28 to 0.55 ( $\bar{X} = 0.44$ ) and exact agreement from 52 to 70% ( $\bar{X} = 62\%$ ). Furthermore, the mean  $\kappa$  value showed moderate agreement ( $\kappa > 0.41$ ) for three of the four domains.

### *Categorical comparisons*

#### *HADS*

Table 3 shows the overall level of agreement between the two modes of survey administration in classifying participants' levels of anxiety and depression. This is based on a three by three contingency table comparing participants' classification as low, borderline or clinical according to mode of survey administration. For each sub-scale, the  $\kappa$  coefficients showed moderate agreement ( $\kappa > 0.41$ ) or better between the two modes of survey administration in categorising participants' levels of anxiety and depression as low, borderline or clinical.

This is demonstrated further in Table 4 which shows the proportion of participants classified as clinically anxious or depressed based on responses to the computer survey compared with the pen-and-paper survey. The proportion of patients identified as having elevated levels of anxiety and depression according to computer survey responses was similar to that obtained with the pen-and-paper survey.

#### *SCNS-short*

In order to identify the issues where patients require the most help, participants' responses to the SCNS are usually dichotomised (moderate/high need vs. low/no need) [6]. Table 5 shows the overall level of agreement between the two modes of survey administration in classifying participants' level of need for help after dichotomising their responses. This is based on a two by two contingency table for each item, comparing participants' classification as moderate/high need or low/no need according to mode of survey administration. Overall, the PABAK coefficients for individual items showed moderate agreement ( $\kappa > 0.41$ ) or better between the two modes of

**Table 1.** Demographic and treatment characteristics of participants

	Group 1 (CM-P) N = 140 (%)	Group 2 (P-CM) N = 110 (%)	Group 3 (CO-P) N = 100 (%)	Total sample N = 350 (%)
Sex				
Male	41	46	46	44
Female	56	52	54	54
Age				
<20	1	0	0	<1
20–39	8	4	10	7
40–50	42	32	38	38
60–79	42	58	44	48
80+	3	5	8	5
Marital status				
Married	53	67	72	63
Defacto/living with a partner	5	2	3	3
Separated/divorced	15	8	7	11
Widowed	12	15	9	12
Never married	11	5	8	5
Level of education				
School	54	60	63	58
Trade/technical diploma/certificate	24	27	27	26
Degree/postgraduate degree/diploma	19	9	9	13
First diagnosed				
Within last month	9	8	13	10
1–6 Months ago	25	44	36	34
7–12 Months ago	15	10	8	11
1–2 Years ago	14	15	21	16
3–5 Years ago	16	14	10	13
More than 5 years ago	18	7	11	13
Type of cancer				
Bowel, colon or rectum	19	6	4	11
Breast	31	33	30	31
Lung	9	7	8	8
Lymphoma	12	4	8	8
Melanoma	2	4	1	2
Prostrate	0	19	8	8
Other	21	24	34	26
Remission				
Yes	42	45	37	41
No	28	27	32	29
Don't know	22	25	27	24
Purpose of visit				
Treatment	53	70	79	66
Follow-up consultation	39	28	19	30
Last received treatment				
Within the last week	18	70	76	51
1–2 Weeks ago	17	2	2	8
3–4 Weeks ago	26	3	2	12
1–2 Months ago	7	4	2	5
3–6 Months ago	4	1	5	3
More than 6 months ago	21	18	11	17
Treatment received*				
Surgery	67	64	61	64
Radiotherapy	48	93	90	74
Chemotherapy	81	29	35	52
Hormone treatment	14	22	19	18
Other treatment	12	8	10	10

Totals may not add up to 100% due to missing data.

\*Totals do not add up to 100% as participants may have received more than one treatment.

**Table 2.** Agreement between participants' responses to individual items (grouped by sub-scale) of touchscreen computer and pen-and-paper versions of the HADS and SCNS-short

	Group 1 (CM-P)				Group 2 (P-CM)				Group 3 (CO-P)			
	Simple $\kappa$ coefficients		Percent exact agreement		Simple $\kappa$ coefficients		Percent exact agreement		Simple $\kappa$ coefficients		Percent exact agreement	
	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)
<i>HADS</i>												
Anxiety (7 items)	0.43–0.69	0.57 (0.09)	60–81	72 (7.43)	0.47–0.71	0.56 (0.09)	67–83	73 (6.15)	0.39–0.54	0.48 (0.05)	60–72	66 (4.10)
Depression (7 items)	0.50–0.88	0.67 (0.12)	68–95	82 (9.16)	0.47–0.79	0.63 (0.11)	62–90	80 (9.96)	0.45–0.67	0.52 (0.07)	62–82	72 (6.34)
<i>SCNS-short</i>												
Psychological (8 items)	0.19–0.38	0.29 (0.06)	51–60	54 (3.23)	0.22–0.36	0.30 (0.04)	51–58	54 (2.90)	0.37–0.52	0.45 (0.05)	53–63	58 (4.03)
Health systems and information (13 items)	0.09–0.28	0.16 (0.07)	45–59	50 (4.91)	0.25–0.39	0.31 (0.07)	55–62	55 (5.91)	0.28–0.51	0.40 (0.07)	52–70	62 (4.94)
Patient care and support (7 items)	0.14–0.22	0.17 (0.03)	52–64	58 (4.26)	0.26–0.43	0.33 (0.06)	55–72	61 (6.08)	0.31–0.51	0.42 (0.07)	54–70	64 (4.72)
Physical and daily living (3 items)	0.27–0.34	0.32 (0.04)	50–61	56 (5.69)	0.34–0.45	0.37 (0.06)	53–58	55 (2.52)	0.44–0.55	0.49 (0.06)	58–68	62 (5.29)

**Table 3.** Agreement between touchscreen computer and pen-and-paper survey responses in classifying participants' levels of anxiety and depression

	Group 1 (CM-P)		Group 2 (P-CM)		Group 3 (CO-P)	
	Simple $\kappa$	Percent exact agreement	Simple $\kappa$	Percent exact agreement	Simple $\kappa$	Percent exact agreement
Anxiety	0.71	87	0.58	81	0.54	75
Depression	0.75	93	0.59	86	0.54	80

**Table 4.** Prevalence of elevated levels of anxiety, depression and unmet supportive care needs: Computer vs. pen-and-paper survey

	Touchscreen computer (modified format) % (95% CI)	Pen-and-paper % (95% CI)	Touchscreen computer (original format) % (95% CI)	Pen-and-paper % (95% CI)
<i>HADS</i>				
Anxiety	N/A	N/A	N = 335	N = 335
Clinical			13.4 (9.8–17.1)	13.7 (10.0–17.4)
Clinical/borderline			31.3 (26.3–36.3)	31.0 (26.0–36.0)
Depression	N/A	N/A		
Clinical			11.3 (7.9–14.7)	11.0 (7.6–14.4)
Clinical/borderline			20.9 (16.5–25.3)	21.5 (17.1–25.9)
<i>SCNS-short</i>				
Psychological	N = 250	N = 250	N = 100	N = 100
Psychological	8.6 (5.1–12.1)	15.8 (11.3–20.3)	26.0 (17.4–34.6)	26.0 (17.4–34.6)
Health systems and information	4.8 (2.1–7.5)	10.2 (6.4–14.0)	21.5 (13.4–29.6)	25.9 (17.3–34.5)
Patient care and support	3.2 (1.0–5.4)	5.7 (2.8–8.6)	10.1 (4.2–16.0)	10.0 (4.1–15.9)
Physical and daily living	8.5 (5.0–12.0)	20.4 (15.4–25.4)	14.6 (7.6–21.6)	15.2 (8.1–22.3)

N/A as HADS was presented in its original format in both the touchscreen computer and pen-and-paper surveys.

**Table 5.** Agreement between touchscreen computer and pen-and-paper survey responses in classifying participants' levels of need

	Group 1 (CM-P)				Group 2 (P-CM)				Group 3 (CO-P)			
	PABAK		Percent exact agreement		PABAK		Percent exact agreement		PABAK		Percent exact agreement	
	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)
Psychological (8 items)	0.77–0.86	0.82 (0.03)	88–93	91 (1.64)	0.63–0.85	0.75 (0.07)	81–93	87 (3.74)	0.59–0.71	0.66 (0.04)	80–86	83 (2.00)
Health systems and information (13 items)	0.81–0.96	0.89 (0.05)	90–98	95 (2.55)	0.72–0.89	0.80 (0.06)	86–94	90 (2.63)	0.62–0.86	0.76 (0.07)	81–93	88 (3.30)
Patient care and support (7 items)	0.91–0.97	0.95 (0.02)	96–99	98 (1.13)	0.83–0.93	0.88 (0.03)	92–96	94 (1.57)	0.67–0.92	0.85 (0.08)	84–96	92 (4.04)
Physical and daily living (3 items)	0.67–0.77	0.73 (0.05)	83–89	87 (3.21)	0.65–0.74	0.68 (0.05)	82–87	84 (2.65)	0.62–0.74	0.68 (0.06)	81–87	84 (3.00)

survey administration in categorising participants level of need as moderate/high or low/no with values ranging from 0.59 to 0.97 ( $\bar{X} = 0.79$ ) and exact agreement from 80 to 99% ( $\bar{X} = 89\%$ ). Furthermore, for each of the three groups, the mean PABAK values showed substantial agreement or better ( $\kappa > 0.61$ ) for each domain.

This is demonstrated further in Table 4 which shows the prevalence of moderate/high needs by domain for each mode of survey administration. When the modified two-screen question and answer format was used, participants reported lower levels of need with the computer survey compared to the pen-and-paper survey. However, when the format of the questions and responses on the computer survey exactly replicated that of the paper survey, the proportion of respondents reporting a moderate/high need for help with the computer survey were similar to that obtained with pen-and-paper survey, with the exception of the health information domain where participants tended to report slightly lower levels of need with the touchscreen computer survey.

## Discussion

This study assessed the equivalence of cancer patients' responses to touchscreen computer versions of the HADS and SCNS-short with pen-and-paper versions of the same surveys. In keeping with other similar studies [18, 20], the results of the current study suggest that the collection of data about

cancer patients' psychosocial well-being using computerised surveys is comparable to that collected by pen-and-paper surveys.

Given that one of the advantages of touchscreen computer surveys is the ability to simplify and tailor the presentation of questions and response options, we developed a modified computerised version of the SCNS-short. This computerised version presented one item on a screen to assess whether an unmet need for help was present and if so, presented a second screen to assess the level of need for help. Surprisingly, compared to the original pen-and-paper survey, the simplified two-screen per item format resulted in lower coefficients of agreement at both the item and domain level, and a tendency for participants to report fewer moderate/high unmet supportive care needs. In contrast, when the presentation format of the questions and response options in the computerised SCNS-short replicated the pen-and-paper survey, agreement coefficients increased overall and the prevalence of moderate/high unmet needs was similar between the two modes of survey administration. Furthermore, the computerised version of the HADS, which replicated the question and response option format of the original pen-and-paper survey, also showed good agreement coefficients at both the item and sub-scale level and similar prevalence rates of elevated levels of anxiety and depression.

These findings suggest that the presentation of computerised survey questions and response options influences participants' responses. This is in keeping with Velikova et al. [18] who found that

patients reported fewer emotional and physical problems when using the touchscreen computer survey and suggested that this could be due in part to the different format of presentation. This suggests that despite the advantages that touchscreen computer surveys offer for filtering and simplifying the presentation of questions and their responses, it is important to exactly replicate the question and response format of the original paper version to ensure that the integrity of the instrument is maintained and the data collected are equivalent.

It is without doubt that computerised assessment has great potential in the clinical setting. One of the most valuable applications of this form of technology is the ability to rapidly assess and identify patients with high levels of psychological morbidity who may require intervention from the treatment team. The current study demonstrates that computerised versions of the HADS and SCNS-short are as accurate as their paper counterparts in identifying patients with clinical and/or borderline levels of anxiety and depression and moderate/high unmet supportive care needs, but only when the computerised version exactly replicates the original pen-and-paper survey. This finding is particularly important to health care providers and other researchers considering using touchscreen computer surveys as a tool to screen patients on a routine basis.

Some limitations must be kept in mind when considering the present study. Firstly, a randomised cross-over design is superior to the methodology used in the current study. Furthermore, the inclusion of a fourth group (P-CO: Paper survey followed by computer survey (original version SCNS-short and HADS)) may have provided additional information. It should be pointed out however, that previous research comparing computerised assessment with pen-and-paper survey administration found that the order of survey administration did not significantly affect the data obtained [18]. Secondly, although the study was conducted in only two major cancer treatment centres in NSW, the high response rate (98%) achieved maximises the representativeness of the results.

In conclusion, in light of these findings and those of similar studies, and the considerable benefits of touchscreen computer technology, we recommend the use of this methodology to collect data about cancer patients' levels of anxiety, de-

pression and unmet supportive care needs. We also emphasise the need for exact replication of the format of questions and response options when computerising a survey instrument that has been psychometrically tested in a pen-and-paper format. Having established the touchscreen computer methodology as a comparable means of obtaining these data, we are finalising a trial of the feasibility of introducing routine computerised assessment of cancer patients' needs, anxiety and depression in the hospital setting, including providing a summary report of individual patients' responses to their clinician for appropriate intervention.

### Acknowledgements

This project was undertaken by the Cancer Council New South Wales' Cancer Education Research Program. The views expressed are not necessarily those of the Cancer Council. The authors are grateful to Professor Michael Friedlander and staff of the medical oncology unit at Prince of Wales Hospital, Professor John Kearsley and staff at the radiation oncology unit at St George Hospital for their cooperation, the patients who generously gave their time to participate, Cheryl Meiners, Bev Kevill and Brian Swain for their assistance in undertaking this research, and Sally Burrows and Ian Clare for statistical advice and support.

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