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FORUM: Nutrition and cancer

Australian behavioural research in cancer

News and announcements

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Nutrition and cancer

Overview of nutrition and cancer

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Evidence-based nutrition practice began in Australia in the late 1990s. An editorial by Truswell addressed the issue of quality of nutrition information.[1] In 2010 the Board of Directors of the International Confederation of Dietetic Associations approved the following definition of evidence-based dietetics practice as a new international standard: "Evidence-based dietetics practice is about asking questions, systematically finding research evidence, and assessing the validity, applicability and importance of that evidence. This evidence-based information is then combined with the dietitian's expertise and judgment and the client's or community's unique values and circumstances to guide decision-making in dietetics."[2]

Ideally, nutrition recommendations should be based on the highest level of evidence. For example, high quality randomised control trials showing the intervention has a beneficial and clinically important effect on relevant outcomes. This is often difficult, if not impossible to achieve in nutrition interventions. In contrast to drug trials, nutrient trials do not involve xenobiotics. This has particular importance for the design of nutrition trials for several reasons. Ethical practice requires, during the informed consent process, that the dietary component under examination be revealed to study participants. A unique difficulty encountered in nutrition trials is that the dietary component being studied may be readily available to participants. This is illustrated in a large international trial evaluating the effect of eicosapentaenoic acid (EPA) in pancreatic cancer.[3] From analysis of plasma EPA levels, 18% of participants in the control group had high levels of EPA, indicating they consumed fish oil and in the active group, 26% maintained they were taking the supplement when EPA levels indicated they were not. This is entirely understandable given the prognosis of pancreatic cancer. However, such circumstances do not help the intent to treat analysis of such studies.

Observational epidemiological studies have been used to associate dietary intake with diseases such as cancer. It has often been the case that nutrients of promise have not shown to be of benefit, or indeed have been found to be harmful in subsequent randomised control trials. The ß-carotene and lung cancer trials fall into this category. ß-carotene, alone or in combination with vitamin E or retinyl palmitate, increased the incidence of lung cancers and the total and cardiovascular mortality rates.[4,5] Diets are complex and the addition of one dietary component may affect the bioavailability of other dietary components. The form of the nutrient under study, whether consumed as a supplement or as a whole food, may also influence results. Any test diets must be matched for energy and macronutrients and can be difficult to construct. It may therefore be difficult to demonstrate a therapeutic effect for a nutrient in comparison to a drug, as the effect size of the nutrition intervention may be quite small. The choice of a reliable placebo for comparison purposes may be very difficult, if not impossible to achieve.

Despite these methodological challenges, Australian dietitians have made a substantial contribution to the body of evidence in oncology. The Malnutrition Screening Tool, developed to identify patients at risk of malnutrition, is now the most common nutrition screening tool used in Australia and is recommended as the nutrition screening tool of choice by the American Dietetic Association.[6] The nutrition assessment tool, the Patient Generated Subjective Global Assessment, was validated by Australian dietitians and is used internationally as a nutrition assessment tool for oncology patients.[7] One of the key features of this tool is the inclusion of symptoms which may impact on dietary intake, such as poor appetite, taste changes, constipation, vomiting, diarrhoea, etc. Taste and flavour disorders in patients with cancer are discussed in this issue by Boltong et al.[8] They recommend a taxonomy of taste, flavour and food hedonics be developed to improve identification and better inform intervention strategies. In 2004, the first randomised control trial to demonstrate nutrition intervention improves outcomes for patients receiving radiotherapy to the head, neck and gastrointestinal region was published.[9] Several studies have confirmed associations between nutritional status, weight loss, treatment toxicities and outcomes.[10-12] Evidence-based guidelines for the nutritional management of malnutrition, cancer cachexia and radiation therapy have been published.[13-15] Isenring et al highlight there is high level evidence to

demonstrate that nutritional counselling of patients receiving radiation therapy improves nutritional status and quality of life outcomes.[16] They also review the role of specialised nutritional support using immunonutrition.

New ground has been broken with the online publication using the wiki platform of *Evidence Based Guidelines for the Nutritional Management of Head and Neck Cancer.*[17] The wiki platform will ensure the guidelines are accessible and remain current. Brown and Findlay report on the current Australian situation in regard to the nutritional management of head and neck cancer patients.[18] As expected, there is a diversity of practice as well as diversity of staffing, both of which will impact the implementation of the new guidelines.

Chapman and colleagues describe the role of nutrition for cancer survivors.[19] The evidence in relation to body weight, dietary factors and alcohol are presented with emphasis on adoption of a healthy lifestyle. Breast cancer risk and outcomes for breast cancer survivors are known to be influenced by body composition. McDonald et al discuss body composition and breast cancer prognosis, emphasising the potential role that lean body mass and omega-3 fatty acids intake may play.[20] In continuing with this theme, Wright and colleagues review the limited evidence supporting the role of diet on prostate cancer progression.[21]

Improving the dietitian's knowledge of evidence-based practice related to complementary therapies formed the basis for the Morey and Brown review regarding nutritional supplementation as a complementary and integrative therapy during oncology treatment.[22]

Mentoring and professional support are essential for healthcare professionals in rural and remote locations. Kiss et al demonstrate how support programs in cancer nutrition have improved confidence, facilitated skill development and built professional networks for rural and remote dietitians in Victoria, Queensland and Western Australia.[23]

This is the first edition of *Cancer Forum* to be devoted to nutrition. The papers demonstrate the diversity of oncology nutrition research currently being undertaken, which encompasses nutrition intervention during treatment and survivorship, the application of evidence to practice and the role of mentoring. There is growing interest in the role of nutrition throughout the cancer journey from patients and their carers. Aspects of nutrition are likely to be a topic of conversation with many members of the multidisciplinary team. All health professionals can play a role in advocating for evidence-based nutrition choices and healthy lifestyle modification.

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TALKING ABOUT TASTE: HOW DO ONCOLOGY CLINICIANS DISCUSS AND DOCUMENT TASTE PROBLEMS?

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Abstract

Taste changes are frequently reported by patients undergoing cancer treatment. Taste problems are difficult to assess and treat in the clinical oncology setting. This two-part study aimed to determine the use of terminology in the verbal and written assessment and treatment of taste problems in oncology patients. Two research methods were utilised: a retrospective audit of dietitians' medical note entries (n=200) for 30 patients with head and neck cancer and; a qualitative interview study of oncology clinicians (n=23). The word 'taste' was used by the researcher as a generic term for taste and flavour. Clinicians use the word 'taste' when referring to issues concerning the wider pheonema of flavour and food hedonics. Dietitians documented the presence of taste or flavour problems in 73% of patients, but did not distinguish between taste and flavour. Specific management strategies were documented in only 23% of patients, indicating a disconnect between symptomatology and clinical management. Oncology clinicians report that patients use a total of 34 terms to describe taste and flavour problems, whereas oncology clinicians themselves use a total of 13 terms. Oncology clinicians identified gaps in current knowledge of predictors and classification of taste or flavour problems and in evidence-based supportive strategies to best manage these problems. For taste or flavour problems associated with cancer and its treatment to be effectively treated, the problem must first be accurately classified. A taxonomy of taste, flavour and food hedonics for application in the clinical setting is needed.

Taste is one of the five senses and refers to the perception derived when chemical molecules stimulate receptors in the areas of the tongue, soft palate and oropharyngeal region of the oral cavity.[1] The taste system plays a role in food selection and in a biological sense is subserved by five basic taste qualities: sweet, salty, sour, bitter and umami (savoury).[1] These taste qualities allow humans to identify safe and nutritious foods appropriate for metabolic needs, or serve as a warning system for harmful foods, thereby increasing the chance of survival. The sense of taste also contributes to the pleasure or enjoyment experienced as part of eating and drinking (hedonics). The ability to perceive taste sensations guides food choice, which in itself is a determinant of health.[2]

Although the words 'taste' and 'flavour' have specific and distinct meanings in the sensory science literature,[3] they are often used interchangeably by patients and clinicians.[4] The perception of flavour includes the sense of taste together with the senses of smell and touch. Flavour also includes inputs from temperature of food and drink or oral pain sensations (for example chili burn).[5] Any problems with these sensory or hedonic elements of flavour can affect the enjoyment of food.

Cancer treatment can affect taste via several proposed physiological and psychological routes, including: an alteration in the number of normal taste cells; interruption in neural transmission of signals from taste receptors to the taste processing centre in the brain;[5] secretion of chemotherapy drugs into saliva; and learned food aversions as a result of negative association between nausea inducing chemotherapy and certain foods.[6] This can manifest in: altered sensitivity to specific taste qualities (eg. sweet, salty); foods tasting different from usual; a bitter taste or metallic sensation in the mouth; or the rejection of particular foods as aversive to the patient.[7]

In addition to a possible influence on the chemical sense of taste, cancer and its treatment is known to affect the senses of smell and touch, as well as cognition and hedonic experience of food and drink. Hedonic experience refers to a psychological determination of the extent to which eating and drinking is pleasurable.[8] Food hedonics encompass food liking and appetite. These effects are associated with reduced food enjoyment, altered nutritional status and quality of life due to: reduced energy and nutrient intake;[9] weight loss;[3,10,11] impaired or altered desire to procure food; diminished food appreciation;[12] changed patterns of food intake and rituals and social activities linked to eating and drinking;[13,14] and emotional distress and interference with daily life.[15-17] Disorders of taste are generally difficult to diagnose and treat, often because of a lack of routine assessment practices, as well as limited knowledge and understanding of this sense and its disease states.[10] Whether, or to what extent,

changes to taste function play a role in reduced food enjoyment among people receiving chemotherapy is unknown. It is hypothesised however, as a result of a recently conducted systematic review,[18] that problems with food liking and appetite occur independently of taste in people receiving chemotherapy. Additionally, the language of taste and flavour is important. Patient descriptions of how they experience particular sensations may provide the key to diagnosis of specific problems and can even suggest the course of therapy.[19] For example, a constant unpleasant oral sensation such as a "metallic taste" in the mouth may warrant different treatment to an increase in the perceived intensity of sweetness expressed as "food tastes really sweet". The use of agreed terminology is fundamental to standardising words used to name a patient's health problems or needs, and to enable clear descriptions of terms used by researchers.[20] It is not until a clinical problem is adequately identified and described that it can start to be monitored and managed.

The objective of this study was to determine whether and how taste or flavour problems are discussed with patients in the clinical oncology setting and to explore the needs of the cancer clinicians to better manage these symptoms.

Methods

Part A: Dietitian's documentation audit

A retrospective audit of dietitians' medical note entries for 30 patients with head and neck cancer receiving nutritional care during the time period January to August 2008 was conducted at Peter MacCallum Cancer Centre in Melbourne. The sampled documentation pertained to patients chronologically registered for treatment within the head and neck unit who were under the care of a dietitian. The hard copy medical history for each of these patients was examined by the researcher to isolate entries made by a dietitian during the study period. From each dietetic entry (n=200), the following data was extracted: whether taste or flavour problems were documented; the terms used by dietitians to document such problems; and any specific strategies documented to address the problems listed. Data was analysed using descriptive statistics and frequency counts.

Part B: Oncology clinician qualitative interview study

Purposive sampling was utilised to recruit oncology nurses (n=6), medical oncologists (n=6) and oncology dietitians (n=11) with different levels of experience (table 1) from two health care facilities to participate in face to face interviews. A semi-structured interview framework developed by an oncology dietitian and oncology nurse researcher was used as a basis to explore clinician practice. Two issues investigated during interview are reported in this publication:

1. The language used by clinicians and patients to describe taste or flavour related problems. To investigate this issue, clinicians were asked: "What words do you actually use when you discuss taste? What words do patients use?" In this context, 'taste' was used by the researcher to determine if taste was being used as a defacto term for taste and flavour by clinicians. Interview data was analysed using content analysis based on a modified version of Melzack and Torgerson's language of pain framework.[19] In adapting this framework for relevance to taste and flavour, consideration was given to the sensory and hedonic elements associated with taste and flavour perception in humans. Categories and subcategories for patient and clinician descriptors of taste and flavour were identified. Reported terms and phrases were assigned to these categories.
2. The needs of oncology clinicians to better manage taste or flavour problems. To investigate this issue, clinicians were asked: "If there was one thing you had at your disposal which helped patients with taste problems, what would it be?" Responses were categorised into themes identified by two independent researchers.

Table 1: *Sample characteristics of clinician participants in qualitative interview study.*

Variable	Oncology Nurses	Medical Oncologists	Dietitians	Overall
Gender				
Male	2	3	0	5
Female	4	3	11	18
Age (years) (mean ± SD)	53.2 ± 3.2	45.3 ± 10.4	29.7 ± 4.7	39.9 ± 12.0
Professional experience in oncology (years) (mean ± SD)	21.2 ± 7.1	15.1 ± 10.6	3.6 ± 3.6	11.2 ± 10.1

For each issue investigated, data items were highlighted and coded. Coded data items were then collated and sorted into potential categories in tabular form. Appropriateness of categories was discussed and refined in consultation with the supervising researcher (an oncology nurse), resulting in redefinition and collapse of some categories. Repeat categorisation of all coded data items were then conducted blindly by two authors, resulting

Table 2: *Terms used by dietitians to document taste and flavour problems.*

Documented term used to describe taste and flavour problems	Number of instances term documented (n)
Taste changes[1]	30
Dysguesia	17
Lack of taste	12
Limited taste	7
Poor taste	5
Improving taste	4
Loss of taste	3
Fluctuating taste	3
Taste[2]	3
Limited sense of taste	2
Altered flavour perception	1
Hypoguesia	1
No sense of taste	1

1. On eight occasions, the description of taste problems was further characterised: "salty taste" n=6; "metallic" n=2
2. The word 'taste' was used as follows: "finds some foods unpalatable due to taste", "still finds taste an issue", and "taste OK"

Table 3: *Management strategies documented by dietitians in medical notes.*

Management strategy documented (actual wording)	Number of instances phrase documented (n)
Discussed strategies to manage taste changes	2
Discussed with patient taste changes may take many months to return and it is important despite this to eat well in order to maintain adequate nutrition	1
Discussed loss of taste	1
Encourage HPHE [high protein, high energy foods and fluids] despite lack of taste	1
Continue trying different foods while taste changes improve	1

in 83% agreement after the first pass. Assignment of data items into categories were then compared and discussed among all authors. This process resulted in agreement of further sub-categorisation and re-assignment of data items until consensus for categorisation of each data item was attained.

Ethical approval to conduct these studies and publish the results was granted by the Ethics Committees of Peter MacCallum Cancer Centre and Eastern Health.

Results

Part A: Dietitian's documentation audit

The documentation of 10 dietitians across 30 patients was examined in this audit. A total of 89 of the 200 medical entries included some documentation of taste or flavour problems, made by nine dietitians. This represented 73% (22 of 30) of patients whose notes were audited. In total, 13 different terms were used by dietitians to describe taste and flavour problems in this head and neck cancer patient group (table 2). Only six of the 89 medical note entries which referred to taste or flavour clearly referred to the sense of taste (one of the five basic tastes). It was unclear whether the remaining entries referred to taste or other elements of flavour of food hedonics (sense of smell or touch, liking, appetite or cognitive processing), despite all but one phrase containing the word 'taste'. Management strategies addressing taste or flavour problems were documented by four different dietitians on six occasions for five patients. Overall, while taste or flavour problems were documented for 73% of patients, only 23% also had documented plans for management of the problem. The wording of the documented strategies was non-specific (table 3).

Part B: Oncology clinician qualitative interview study

Terms used by oncology clinicians and patients to describe the qualities and dimensions of taste and flavour problems fell into three distinct categories (sensory, hedonic and intensity). 'Sensory' refers to the human senses and 'hedonics' refers pleasure and displeasure. 'Intensity' may refer to sensory or hedonic properties. These categories were further broken down into seven sub-categories

Table 4: *Patient and clinician descriptors of taste and flavour problems.*

Category and subcategory	Category definition	Terms used by patients (clinician reported)	Terms used by clinicians
Sensory taste	Reference to the sensory properties of the five basic taste qualities: sweet, salty, sour, bitter or umami	(Food tastes) really sweet (Food tastes) really salty Bitter	
Sensory smell	Reference to the sense of smell	Metallic (food) Metallic (taste in the mouth) (Food tastes like) cardboard Straw (Food tastes like) crap (Food tastes like) shit (Food tastes like) wet carpet (Food tastes like) dirty socks	Metallic
Sensory touch	Reference to the sensory properties of touch and texture (eg. dryness)	Sandy Chaff	Cardboard
Hedonic wanting	Reference to appetite, desire or motivation to eat food	Gone off foods	No desire for food
Hedonic liking	Reference to the experience or anticipation of pleasure or displeasure from the oro-sensory stimulation of eating a food.	Don't like sweet foods anymore Can't stand the taste of food Bad Yukky Awful Foul Poison Horrible	Loss of food enjoyment Food tastes bad
Hedonic preference	Reference to the selection of a food over relevant alternatives at the point of choice	Prefer sweet foods Prefer salty foods Prefer savoury foods	
Intensity	Reference to the relative magnitude of a sensory or hedonic element of flavour or the experience of eating	Food lacks flavour Tasteless Tastes of nothing No taste Lack of taste Loss of taste Everything tastes the same Can't taste anything Like eating nothing Bland	Hypergeusia Hypogeusia Bland No taste Flat taste Strong taste Less strong taste Food has lost its taste

(sensory-taste, sensory-smell, sensory-touch, hedonic-wanting, hedonic-liking, hedonic-preference, intensity). Table 4 shows the assignment of reported terms to these categories and gives further detail of category definitions. Clinicians reported 34 terms used by patients and 13 terms used by clinicians to describe taste or flavour problems. Only three terms referred to true taste function and the remainder referred to elements of flavour (32), appetite (2) or food liking (10). The most common terms reported to be used by patients were "metallic", "cardboard" and "no taste". The range of terms used by clinicians was more limited than patients. There were many commonalities in terms used by clinicians and patients, but dietitians and doctors tended to also use more technical terms (such as 'dysgeusia'), which are reportedly reserved for discussion among clinicians rather than by clinicians with patients.

In coding clinicians' responses to the question of what is needed to better manage taste problems experienced by their patients, the central themes of 'evidence' and 'information' were identified. Evidence referred to reliable and credible scientific data required to inform practice. Information referred to practical and credible resource material which could be given to patients.

Clinician responses pertaining to evidence and information were categorised in three main ways (characterising, supportive strategies and therapeutic devices). Table 5 shows the assignment of participant responses to these categories by the profession and gives further detail of category definitions. One of these categories (characterising) was further broken down into three sub-categories, characterising-assessment (does the problem exist), characterising-diagnostic tool (measurement techniques to determine which patients will experience what symptoms) and characterising-predictors (who is at risk of a particular problem).

Clinicians often specified the type of supportive strategy they were seeking, which included referral pathways, symptom relief, improved nutrition and food enjoyment. Nurses and dietitians (half of each group) most frequently identified supportive strategies which related to symptom relief, improved nutrition or enhanced food enjoyment to better support patients with taste or flavour problems. Supportive strategies identified by medical oncologists were linked to referral

Table 5: *Clinician identified mechanisms to improve management of taste and flavour problems.*
Key: Participant unique identifier follows individual quotes. D=Dietitian, N=Nurse, M = Medical Oncologist

Category	Category description	Clinician responses
Characterising - assessment	Characterising dimensions of the problem through better assessment techniques to determine whether one specific problem exists over another.	Glossary or classification of the different types of taste problems. D4 Specific information about the type of taste problem and specific strategies to try for each. If we knew which patients these ideas did work for then it would help us tailor better what we tell patients. D5 Being better equipped to classify the specific taste problem. D7 Test to pinpoint exactly what the taste problem was to enable the provision of an appropriate solution (eg. a diagnostic tool or an examination). D11
Characterising – diagnostic tool	Characterising the problems dimensions through better diagnostic tools – the development of measurement techniques which enable diagnosis of specific problems and their underlying causes or aetiology.	Measurement of whether chemotherapy drugs are being secreted in the saliva and whether these are affecting taste. M6
Characterising - predictors	Characterising the problem trajectory through a better understanding of what problems are likely to arise at what time and of what nature for whom.	Better understanding of predictors of taste problems – which patients are more likely to experience certain types of taste changes – in order to forewarn patients of their likely symptom pattern in regards to taste. N1 Evidence of which chemotherapy regimens are more likely to cause taste alterations so we can forewarn patients. M1

Table 5: *continued*

Category	Category description	Clinician responses
Supportive strategies	Any supportive mechanism used in response to the problem, usually underpinned by evidence to guide practice or information for patients or clinicians. Typically in the area of referral pathways, symptom relief, improved nutrition or enhanced food enjoyment.	Resource folder including tips for different strategies depending on the nature of the taste problem. N3 Strategies which we knew worked. N4 More evidence, or a summary of findings (a collective body of knowledge) of things which have worked for some people. This info could be given to patients, but mostly for nurses to use to inform patients – i.e. for advice giving pre chemotherapy and also to revisit during treatment (when taste problems become an issue). N5 Referral to a dietitian. M1 A checklist of specific strategies to give to patients which might help. This would include creative tips for trying new foods and appropriate, cancer specific websites for recipes. M2 Access to a dietitian. M5 Information for patients which helped provide symptom relief, improved nutrition and improved food enjoyment. D3 Suggested strategies that could address each type of taste problem. D4 Good evidence on strategies which are helpful in supporting patients to achieve good nutrition for the taste changes they experience - I want to be able to sit with a patient who tells me they have this problem and be able to say something that is actually going to help. D6 Strategies to help depending on what the specific taste problem is. For example, having some strategies which assist in making food more edible for patients. D7 Evidence of what works. D10 Evidence-based practical solutions to whatever taste problem the patient raises. D11
Therapeutic device	A medical tool to treat symptoms or cause of the problem.	Some type of available commercial product (eg a mouthwash) which was 1) effective in enhancing flavor or 2) stopping the metallic taste. N1 Some type of mouthwash or a longer course of steroids to be effective in getting patients to eat and enjoy their food. N2 Something magic to suck on which overrode the broken (taste) stimulus pathway – i.e. caused the new stimulus to trigger the neural pathway responsible for normal taste function. M3 A spray for the mouth that patients could use when they get the bad taste. M4 A (non-specified) therapeutic item. M6 A food additive which made food taste good during treatment. D8 A preventative – a way of protecting or preserving the function of taste before it is lost. D8 Something which knocked off taste function altogether – this would be preferable to having all foods a patient eats tasting horrible. D9

pathways (dietitian referral) rather than to symptom relief, improved nutrition or enhanced food enjoyment. Medical oncologists were more likely to identify therapeutic devices (50% of medical oncologist participant group) on their 'wish list' than were nurses (33%) or dietitians (27%). Therapeutic devices included a mouth spray or mouthwash (Table 5).

Discussion

From the dietitians' documentation audit, it was clear that taste and flavour related complications in patients are frequently identified by this group of professionals, but with little or no distinction between the various aspects of flavour that might be affected by cancer therapies. Specific management strategies to address the identified problems were not observed. The qualitative interviews with oncology clinicians revealed that problems with taste, flavour or hedonics are currently all classified as 'taste problems'. Taste and flavour complications include: changes to the sense of smell or touch (texture); reduced or heightened taste sensitivity; food aversions; offensive or phantom sensations (metallic); or the flavour of food perceived differently to what it previously did or resembling some other item or object. Additionally, food may taste the same but that taste is no longer pleasant.[7] Both the audit and the interviews demonstrated that dietitians and other clinicians have limited capacity to distinguish between these differing side-effects of treatment.

Some clinicians cited a lack of evidence-based practice as a reason that discussing (and therefore treating) taste and flavour problems with their patients was difficult. Oncology clinicians report that strategies to manage taste and flavour problems are less concrete, or lack evidence, compared to strategies used to manage other toxicities of cancer treatment. For example, evidence-based clinical practice guidelines exist for mucositis and nausea and vomiting.[21, 22] Routine methods of assessing taste and flavour related complications are not employed in the clinical oncology setting and no clinical guidelines exist for the management of problems with taste or flavour.

Regardless of whether problems pertain to taste, flavour or food hedonics, the end result for patients is likely to be decreased food enjoyment, which has implications for nutritional, gastronomical and social domains of life quality. Further research is now needed to develop a taxonomy of taste, flavour and food hedonics, which may give clinicians better diagnostic clues to the precise nature of these problems and inform the design and testing of interventions to ameliorate specific symptoms.

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NUTRITIONAL MANAGEMENT OF PATIENTS WITH CANCER IMPROVES NUTRITIONAL AND QUALITY OF LIFE OUTCOMES

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Abstract

As new anti-cancer therapies continue to evolve it is important that supportive care, including effective nutrition support, also improves to ensure best patient care and outcomes. Several sets of evidence-based nutritional management guidelines have been developed for patients with cancer. There is strong evidence to suggest that nutritional counselling by a dietitian and/or dietary supplementation is beneficial by improving nutritional status and quality of life in some patients with gastrointestinal and head and neck cancer. There is also some evidence to suggest that specialised supplements including omega-3 fatty acids and/or immunonutrition may be beneficial in particular patient groups. In order to provide early and appropriate nutrition intervention and improve patient outcomes, early and ongoing nutrition screening and assessment need to be implemented. As cancer care centres and treatments become available, it is important that evidence-based nutritional care is provided in order to achieve best patient outcomes.

Patients with cancer are one of the diagnostic groups at greatest nutritional risk.[1] A recent observational study in 191 oncology patients receiving cancer services at a public Australian hospital found that almost one half of patients were malnourished. Common symptoms impacting on dietary intake included taste changes, poor appetite and nausea.[2] Inadequate dietary intake and unintentional weight loss may be directly related to the tumour (eg. obstruction) or as a side-effect of treatment. Strong evidence supports the prevention and early detection of malnutrition, as nutrition intervention can significantly improve patient and clinical outcomes.[1]

Nutrition intervention has been shown to be beneficial

Evidence-based practice guidelines for the nutritional management of patients receiving radiotherapy presents strong evidence that nutrition support improves outcomes in patients receiving radiotherapy to the gastrointestinal or head and neck region.[3] Dietary counselling by a dietitian and/or use of supplements are effective methods of nutrition intervention and have been found to improve dietary intake, nutritional status and quality of life in patients receiving radiotherapy (National Health and Medical Research Council grade of recommendation A).[3] However, due to a lack of quality studies, there is currently insufficient evidence to routinely recommend dietary counselling in oncology patients receiving chemotherapy. Further research needs to be conducted in this area.[4] The goals and outcomes of nutrition intervention will be dependent on the diagnosis, the clinical need and prognosis of the patient. The type of nutrition intervention will therefore range from intensive nutrition support for patients with a long-term prognosis, to patients with end-stage disease where the focus should be on comfort and quality of life.[3] Patients with minimal dietary intake may require tube feeding (depending on prognosis and in consultation with the patient and multidisciplinary team).[3]

Many patients are interested in nutrition and seek advice external to the cancer centre. It has been reported that 40% of cancer patients are seeking extra nutrition resources and would like further information regarding dietary tips for managing side-effects and the use of supplements.[2] Therefore it is important that health professionals feel comfortable answering common nutritional queries using an evidence-based approach, have access to appropriate resources eg. Cancer Council brochures, or can refer to a dietitian. The *World Cancer Research Report* recommends that all cancer survivors receive nutritional care from an appropriately trained professional (physician and/or qualified nutrition professional eg. dietitian) if able to do so, and unless otherwise advised, aim to follow the recommendations for diet, healthy weight and physical activity.[5]

Early identification of nutritionally at risk patients

Firstly, in order for patients with cancer to be appropriately identified and referred to the dietitian, nutrition screening

should be routinely used in healthcare settings.[6] The Malnutrition Screening Tool (MST)[7] (see figure 1) is a valid and reliable tool in the oncology setting and is therefore the most appropriate nutrition screening tool for this patient group.[8,9] It is a very simple tool which consists of two questions enquiring about unintentional weight loss and poor intake and can be administered by nursing or administration staff or by the patient.

In absence of a formal screening system, malnourished patients can be overlooked, especially if they appear normal or overweight.[6] Patients identified as at nutritional risk by the MST can then be referred to the dietitian for a comprehensive nutrition assessment, eg. using the Patient Generated – Subjective Global Assessment (PG-SGA) which is the preferred nutrition assessment tool in oncology patients.[10] Regular nutrition screening, early and appropriate referral and assessment and intervention by the dietitian, as part of the multidisciplinary team, offers the best nutritional care for patients.

Figure 1: *Malnutrition Screening Tool (MST)[7]*

1. Has the resident/patient lost weight recently without trying?		
No	0	
Unsure	2	
Yes, how much?		
	1-5kg	1
	6-10kg	2
	11-15kg	3
	>15kg	4
2. Has the resident/patient been eating poorly because of a decreased appetite?		
No	0	
Yes	1	
	Total score_____	
Score of ≥2 refer to Malnutrition Action Flowchart		

Cancer cachexia

The complex clinical syndrome known as cancer cachexia differs from malnutrition in that it is characterised by a negative protein and energy balance, progressive loss of skeletal body mass (sarcopenia), anorexia and metabolic derangements.[6,11,12] The weight loss seen in patients with cachexia is from both muscle and fat, which is distinct to that seen in patients with starvation or anorexia, where weight loss is predominantly from fat.[6,13] This variation is due to the metabolic alterations and inflammatory state that occurs in cachexia.[14] Cancer cachexia is a "multifactorial syndrome defined by an ongoing loss of skeletal muscle mass (with or without loss of fat mass) that cannot be fully reversed by conventional nutritional support and leads to progressive functional impairment".[12] Cancer cachexia is most commonly exhibited in patients with advanced disease, particularly in solid tumours such as pancreatic, lung, gastric and colorectal cancer.[6,11] Symptoms may include severe weight loss, anorexia and early satiety, with associated fatigue and weakness.[6,11] Cachexia has a significant impact upon patient morbidity, reduced quality of life and is implicated in 30-50% of all cancer deaths.[15] The mechanism of cancer cachexia is not particularly well understood. Therefore, finding an objective definition and classification system for diagnostic criteria for this syndrome is of growing interest.[16] The most recent published international consensus of agreed diagnostic criterion of cancer cachexia is: weight loss > 5%; weight loss >2% in those already showing depletion (with body mass index (BMI) <20kg/m^2); or sarcopenia, with the degree of energy and protein store depletion and weight loss determining the severity.[12] However, without validated diagnostic criteria currently available, clinical judgement must be considered in order to effectively manage a patient with cancer cachexia.

The nutritional goals and outcomes of patients, particularly those with advanced cancer, need to be realistic, individualised and synonymous with the overall goals for the patient.[6] The patient's prognosis and own wishes must be considered, with the nutrition intervention adjusted accordingly for those requiring palliative supportive care. *Evidence-based practice guidelines for nutritional management of cancer cachexia* provides a clear and evidence-based framework to effectively guide nutritional intervention in patients with cachexia.[6]

Weight stabilisation is an appropriate nutrition intervention goal for patients with cancer cachexia, as it has been shown this can lead to improved quality of life and prolonged survival compared to patients who lose weight.[17,18] In order to accomplish weight maintenance in patients with cancer cachexia, it is important to ensure that patients have optimal symptom control and can achieve adequate energy and protein intakes. It has been estimated that an energy intake of approximately 120kJ/kg/day and protein intake of approximately 1.4g/kg/day should be prescribed to patients with

cancer cachexia, in order to maintain weight.[6,18] Frequent nutrition counselling (weekly to fortnightly) by a dietitian has shown to improve nutritional and clinical outcomes in cancer patients and although commonly thought, the consumption of high protein energy supplements does not appear to negatively impact upon the amount of food consumed.[10,19] In addition, a multidisciplinary approach in order to effectively manage patients with cancer cachexia, has shown to be beneficial and further investigation into novel service delivery models is warranted.[20] The supplemental use of an omega-3 polyunsaturated fatty acid, eicosapentaenoic acid (EPA), in order to improve patient outcomes in patients affected with cancer cachexia, has been a topic of interest for many years. A 2007 Cochrane review aimed to determine the effectiveness and safety of EPA to alleviate cachexia and related symptoms in patients with incurable or advanced cancer.[11] This group concluded that there was insufficient evidence to support the routine use of EPA for the management of cancer cachexia in patients with advanced cancer, specifically that an EPA nutritional supplement held no benefit over a non-EPA nutritional supplement.[11] However, given the challenges of conducting high quality research in patients with cancer cachexia and advanced disease, the favourable results seen in other studies may still offer important conclusions regarding EPA use.[18,21] It will be interesting to see if the National Health and Medical Research Council grade of C (some evidence to support the use of EPA for cachexia, but care must be taken in its application) will change upon updating of the cachexia guidelines.[6]

Immunonutrition

For many cancer types, surgery is the best treatment option available. However, there is morbidity associated with this procedure. Surgical outcomes are negatively impacted by pre-existing malnutrition, as well as by a patient's immune response to surgery; with surgical patients experiencing greater rates of infectious complications as well as extended hospital stays.[22,23] These poor surgical outcomes can then lead to poor oncological and quality of life outcomes.

There is good evidence from the European Society of Parenteral and Enteral Nutrition that optimising nutrition prior to surgery, through nutrition support, can improve a patient's surgical outcome.[14] To assist further with improving a patient's surgical outcome there are now novel nutrition formulae available to modulate the immune response. These formulae, commonly known as immunonutrition, can modulate the immune and inflammatory responses, as well as gut function, and may contain any combination of modulating nutrients, including arginine, omega-3 fatty acids, RNA and glutamine.[24-26]

Immunonutrition has been studied for over 25 years, predominantly in the gastrointestinal cancer patient population, however it has been difficult to draw conclusions from these studies due to the poor quality of many of the studies. There have been issues with the use of inappropriate control groups, different nutrition formula and volume of formula prescribed, small study samples, as well as heterogeneity within the study groups.[27,28] This has meant that despite many studies finding immunonutrition to be beneficial, its use has not become standard practice.

A number of meta-analyses have been conducted to attempt to overcome the issues with individual studies to determine if immunonutrition is beneficial and provides better surgical outcomes.[27,29-31] Zheng and Waitzberg found that the use of immunonutrition produced a reduction in post operative infectious complications and length of hospital stay, but had no effect on mortality.[29,30] These meta-analyses, despite improving on the individual studies, still have issues due to inadequate control groups, the possibility of duplicated data, as well as small numbers for the mortality data. More recent meta-analyses conducted by Marick and Cerantola have attempted to overcome these flaws, in particular only including studies that had used an appropriate control group, along with more recently published randomised control trials.[27,31] They too found that the use of immunonutrition significantly decreases post-operative infectious complications and length of stay, but has no effect on mortality, again due to small mortality rates. They both conclude that immunonutrition use should be considered for surgical patients.

Despite the recommendation for use of immunonutrition in surgical patients, the recommendations for the volume and timing of administration remain relatively unclear. Varying formulations of immunonutrition have been studied, with some formulations containing only one immune modulating nutrient and others containing four, and all in different compositions, making it difficult to make a general recommendation regarding the volume of immunonutrition required. Many studies have used either 1000mL per day or 25kcal per kg per day, however the actual amount of immunonutrients per day will differ depending on the formulation used.[24-26,28,32,33] There is currently no firm recommendation for the most appropriate time to administer immunonutrition with pre, post and peri-operative all being considered. Recent meta-analyses suggest that the pre-operative administration is the most important, but also that peri-operative administration, where possible, may be optimal.[27, 29-31]

Implications for practice

In order to provide early and appropriate nutrition intervention, practitioners are recommended to consider:

- Regular nutrition screening using a validated, quick and easy tool which can be administered by any staff or patient themselves eg. MST
- Follow-up nutrition assessment by a nutrition professional eg. Accredited Practising Dietitian using a validated nutrition assessment tool eg. PG-SGA

- Providing appropriate nutrition support for those identified as having nutritional problems eg. dietary counselling to modify diet, nutrition supplements
- Specialised nutrition products such as EPA or immunonutrition may provide patient benefits in some groups
- Ongoing multidisciplinary review for best patient care.

There is high level evidence to support the benefits of nutrition counselling, with or without nutrition supplements, in improving nutritional status and quality of life in patients receiving radiotherapy. There is some evidence to support nutritional management in patients with cancer cachexia, or using specialised nutritional support such as immunonutrition. Further research is required to demonstrate the benefits of dietary counselling in patients receiving chemotherapy. All cancer treatment centres should include access to an accredited practising dietitian for best patient care. This highlights the importance of early identification and management of nutrition-impact symptoms with adequate follow-up, in order to provide optimal care for people with cancer.

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CURRENT ISSUES IN THE NUTRITIONAL MANAGEMENT OF PATIENTS WITH HEAD AND NECK CANCER IN AUSTRALIA

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Abstract

The aim of this study was to provide a baseline measure of current dietetic practice throughout Australia in the care of patients with head and neck cancer. An online survey was distributed to members of the Dietitians Association of Australia Oncology Interest Group. Questions covered parameters including service structure and workforce arrangements, as well as the clinical care pathway for the patient continuum of care. There were a total of 81 sites identified. Sites with incomplete data, duplications or without dietetics services for patients with head and neck cancer were excluded, leaving a final dataset of 60 sites. Of the 60 sites, 47 provided surgical services and 43 provided radiotherapy services with dietetic services for 96%, and 91% of these sites respectively. Other dietetic services were provided in pre-treatment (62%), post-treatment (85%) and palliative care (87%) settings. Nutrition screening, referral processes and clinical practice, during and post-treatment, were varied as were staffing levels. Nutrition assessment was performed using validated tools in 62% of centres. Dietetic practice in managing patients with head and neck cancer is varied. These findings will provide baseline data for comparison once the national *Evidence Based Practice Guidelines for the Nutritional Management of Patients with Head and Neck Cancer* are implemented in 2011.

Malnutrition is common in patients with head and neck cancer, with rates reported between 30-50%.[1] The causes of malnutrition are multifactorial and include tumour location and burden, pre-morbid nutritional status and intake, lifestyle factors such as tobacco and alcohol abuse and side-effects of multi-modal treatment regimens.[2] Furthermore, malnutrition can have a significant adverse impact on immune function, post-operative infection rates, treatment interruptions, unplanned admissions, length of stay and quality of life.[3,4,5] Consequently, nutrition support plays a crucial role in the provision of best practice care to this population.

Nutrition has been recognised as the second most important factor in predicting long-term prognosis in head and neck cancer.[6] While recently developed guidelines exist for some aspects of primary treatment,[7] there are currently no comprehensive evidence-based guidelines for the nutritional management of this patient population. Hence there is no uniform model of care. In the absence of current Australian guidelines, other international standards, such as the United Kingdom's National Institute for Health and Clinical Excellence *Guidance on Cancer Services: Improving Outcomes in Head and Neck Cancers,* provides a best practice framework. It includes aspects of multidisciplinary team care such as service requirements for nutrition intervention.[8,9] While this document does not provide clinical practice guidelines regarding specific nutrition management of patients with head and neck cancer, it does indicate the resource framework required for optimum multidisciplinary team care and highlights the importance of timely and appropriate dietetic intervention at all points in the head and neck cancer patient care pathway.

Some areas of nutrition intervention for patients with head and neck cancer remain controversial in current literature. For example, the use of immune modulating formulae as pre-operative immunonutrition is well supported in patients undergoing upper gastrointestinal surgery, but a recent systematic review was unable to conclude that strong benefits can be extrapolated to head and neck surgical patients.[10] The optimal route of tube feeding (nasogastric versus gastrostomy) is also unclear for this patient group,[11] as is the use of prophylactic tube feeding. Whilst a recent systematic review concluded that prophylactic feeding tubes may improve or maintain nutritional status in some groups,[12] a recent UK study found there was no national consensus among healthcare professionals with regard to gastrostomy insertion in these patients.[13]

The lack of standardised practice indicates a need for clear evidence-based guidelines. Accordingly, the Cancer Institute NSW Oncology Group (Head and Neck) has supported development of *Evidence Based Practice Guidelines for the Nutritional Management of Patients with Head and Neck Cancer.*[14] The aim of this study was to provide a baseline measure of current dietetic practice for patients with head and neck cancer throughout Australia, prior to the implementation of these guidelines.

Method

A web-based questionnaire was developed to collect demographic and dietetic practice data focusing on key aspects of the guidelines framework.[15,16] The survey was promoted to members of the Dietitians Association of Australia Oncology Interest Group through an email

discussion group. To capture departmental trends rather than individual practice, it was requested that one dietitian represent each hospital or community centre when completing the survey. The survey was distributed in September, 2010. Descriptive statistics were used for data analysis. Categorical variables are presented as counts (percentages). The continuous variables are presented as median (range) for not-normally distributed variables.

Results

There were a total of 81 sites responding from a possible 202 cancer treatment centres identified by the Clinical Oncological Society of Australia, including private hospitals and regional community healthcare centres. Responses were excluded: if the hospital did not treat head and neck cancer patients; if the data was submitted incomplete; or if responses were duplicates within one hospital. After these exclusions, 60 centres were included in the data analysis (table 1).

Dietetics services are currently provided across the patient continuum of care from pre-treatment to palliative care, although only 20 centres provided services in all stages of the patient care pathway. Most respondents were unable to give precise full-time equivalent (FTE) staffing figures, as few centres have dedicated resources for head and neck cancer patient services. Figures for FTE estimates were provided by 51 respondents (85%), however in many cases the nominated FTE count represented staffing available for the entire oncology dietetics workforce, not just head and neck cancer services. The median dietetic workforce available for all oncology was 0.70 FTE (range 0.1-2.4FTE). However, this varied from low volume centres with follow-up services only (median 0.45 FTE (range 0.3-0.6 FTE)) to high volume services with >100 patients with head and neck cancer treated by surgery and >100 patients treated by radiotherapy, with or without chemotherapy, each year (median 1.60 FTE (range 1.0-2.4 FTE)). Joint clinics with the speech

Table 1: *Demographics of Australian hospitals with dietetics services treating patients with head and neck cancer.*

Demographic		**No. of Respondents (n=60)**	**(%)**
State	ACT	1	1.7
	NSW	23	38.3
	NT	1	1.7
	QLD	14	23.3
	SA	2	3.3
	TAS	1	1.7
	VIC	12	20.0
	WA	6	10.00
	Total	**60**	**100.00**
Size of service	Surgery		
(No. of cases/yr)	Nil	13	21.7
	<50	21	35.0
	50-100	16	26.7
	>100	10	16.6
	Total	**60**	**100.00**
	Radiotherapy +/- Chemotherapy		
	Nil	17	28.3
	<50	19	31.7
	50-100	16	26.7
	>100	8	13.3
	Total	**60**	**100.00**
Dietetic Referal*	At Diagnosis	19	29.7
	Preadmission Clinic	11	17.2
	On the ward (pre/post Surgery)	31	48.4
	Pre-Radiotherapy	29	45.3
	During Radiotherapy	24	37.5
	Other	24	37.5
Dietetic Services*	Pre-Treatment	38	62.3
	Surgery	45	73.8
	Radiotherapy	39	63.9
	Chemotherapy	50	82.0
	Follow-Up	52	85.2
	Palliative Care	53	86.9
		*> 100 due to multiple responses	

pathologist occurred in 45% of centres, and a dietitian attended the multidisciplinary head and neck treatment planning meetings in 73% of centres.

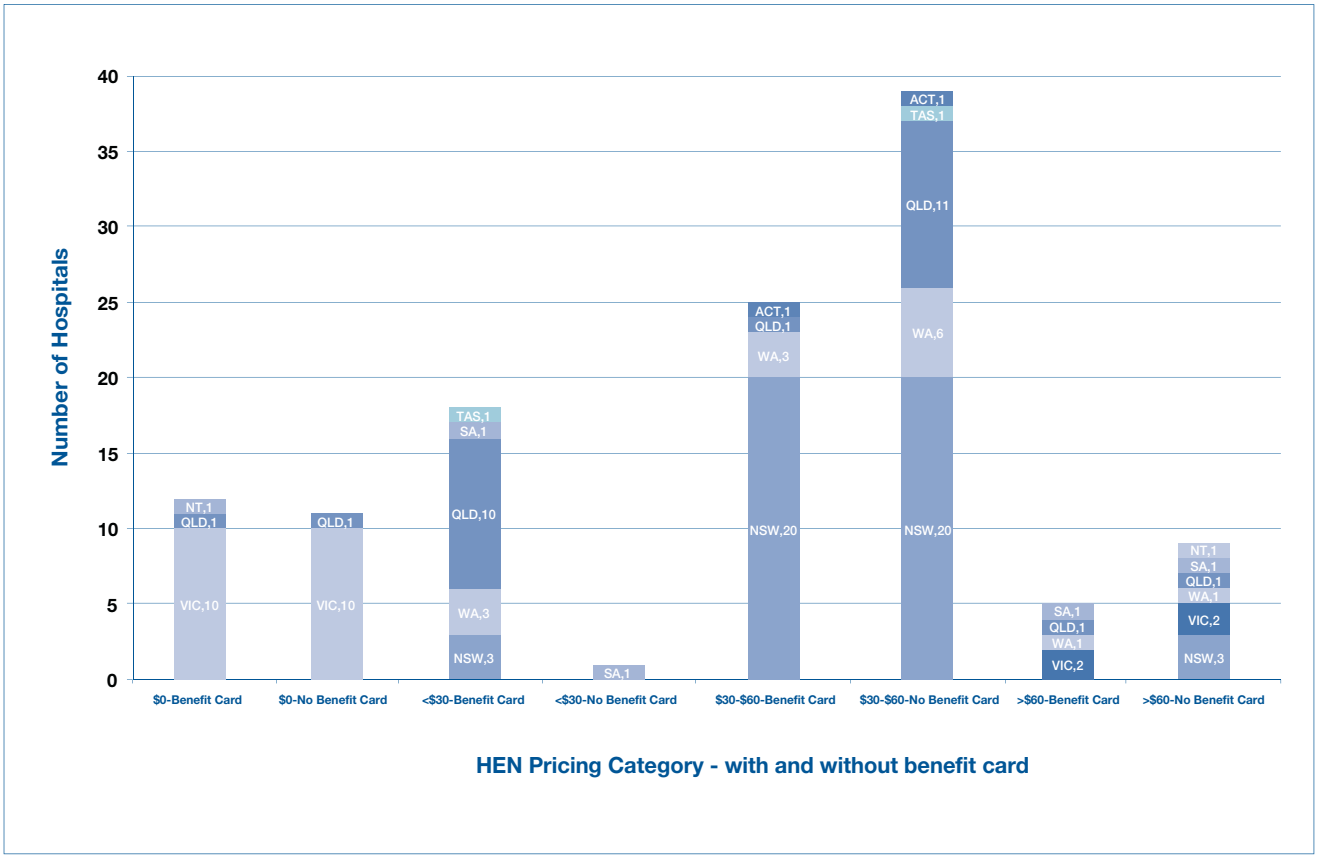
The funding of home enteral nutrition products and equipment varied nationally. While some centres (19%) reported home enteral nutrition products were provided free of charge to their patients, more than half (55%) reported patients bearing the entire cost of the products. A sizeable number (37%) of sites reported their patients pay a co-payment or contribution and others reported funding through hospital departments, state funding, or various combinations of the above. A comparison of typical costs for a week's supply of nutritional formula to provide bolus feeds of 8400kJ/day was also found to vary nationally (figure 1). If additional equipment was required for gravity bags or pump feeding, there was an additional cost associated with this in 57% of cases. Of the patients paying >$60 per week, 80% of those with benefit cards and 44% of those without benefit cards were seen at private hospitals.

Referral processes varied and may have included multiple approaches such as blanket referral system for all patients (47%), referral by medical or nursing staff only (22%) or some form of automatic referral triggered by the use of a malnutrition screening tool (27%), or identification of high risk patient groups (20%). The preferred method of nutrition assessment was the scored PG-SGA[17] (nominated by 48% of respondents).

Forty-seven hospitals indicated they had surgical services for patients with head and neck cancer. Preoperative nutrition management varied with 3.7% of respondents reporting that this was provided to all patients, 33% providing pre-operative care sometimes and 31.5% providing it to malnourished patients only. One third of hospitals (31.5%) do not provide any pre-operative nutrition support. Thirty-seven centres reported providing pre-operative nutrition support, either orally or a combination of routes. Four centres were using pre-operative immunonutrition and one centre used both pre and post-operative immunonutrition. A sizeable proportion (59%) reported the most common reason for insertion of a gastrostomy feeding tube in surgical patients was due to an anticipated functional deficit post surgery. Gastrostomy placement was reported as rarely used in surgical treatment of head and neck cancer in 40% of hospitals.

The most common method of estimating energy requirements in the surgical setting was the Schofield equation (66%).[18,19] Other methods such as kilojoules/kilogram (29.5%), or Harris-Benedict equation (4.5%) were also reported.[20] The most commonly used factors

Figure 1: *Number of hospitals in each pricing category: Weekly cost to patient for bolus feeds of 8400kJ/day.*



for the Schofield or Harris-Benedict equations were 1.1-1.2 for activity, and 1.2-1.4 for injury/stress. For estimating protein requirements, 62% of respondents used the range 1.2-1.5g/kg/day. Most centres used enteral nutrition formulas containing fibre as their routine post operative feed (79.5%), with use of a 1.5kcal/mL energy dense feed most frequently reported (59.5%). Post-operative tube feeding was largely commenced within 24-48 hours (93%) and the timing was dependent on the consultant (34%) or the type of surgical procedure (33%). Oral intake generally resumed within 1-7 days post-surgery (75%). This was also frequently determined by the consultant (26%), type of surgical procedure (25%), or speech pathologist's recommendation (26%). It was considered a multidisciplinary decision in 12% of centres.

The majority of respondents (89.5%) have implemented the *Evidence Based Practice Guidelines for the Nutritional Management of Patients Receiving Radiation Therapy*,[7] either fully (42%) or to some degree (47%). Patients receiving Epidermal Growth Factor Receptor inhibitors, such as monoclonal antibodies, as part of their treatment were unlikely to receive any additional dietetic input (89%). If patients were receiving induction chemotherapy, they were more likely to have additional dietetic input and services (38%). The use of prophylactic gastrostomy tubes was reported in 76% of centres, with 94% of these commencing tube feeding once nutrition support was indicated (ie. following reduction in oral intake or weight loss). Only 6% reported commencing nutrition support irrespective of current nutritional status. Bolus feeding was the most frequently reported method of delivery (92%). This decision was dependent on a number of factors: patient preference (27%); patient tolerance (29%); cost of equipment/feeds (19%); limitations with time/appointment schedules (21%); and other reasons such as patient mobility and capacity (3.5%). No respondents reported recommending antioxidants during treatment, although 69% reported that they sometimes recommend multivitamins. Some respondents (11%) stated they occasionally recommend antioxidants following treatment, however, in the case of multivitamins, 18.5% reported they always recommend multivitamins and 78% recommend them sometimes.

Only three hospitals did not provide any services for patients following completion of treatment, with two of these referring patients to other local services. Twenty-five centres (23%) referred to local centres, but also continued to review at the treating centre. All other follow-up was carried out in a range of settings such as telephone reviews (36%) and outpatient clinics (38.5%). The frequency and duration of follow-up was largely determined by the patient's individual requirements for an appointment in most cases, with some centres using a structured protocol. Just over half of the centres had clear criteria for removal of a feeding tube (51%). Education on long-term cancer survivorship with respect to nutrition was also varied with the topic discussed routinely (reported by 33%), sometimes (reported by 37%), or not at all (31%).

Discussion

The results of this study demonstrate the wide variation in practice for the dietetic management of patients with head and neck cancer in Australia. Of particular note, and key areas for improvement, are the method and timing of screening for referral to the dietitian to ensure efficiency and early intervention, particularly in the case of malnourished patients who benefit from early nutrition support. The mode of enteral feeding was also varied in both the surgical setting and during radiotherapy. Although prophylactic gastrostomy placement is reported as common practice, the indications and decision remain variable, as has been found in the UK.[13]

A key finding of the survey confirms the gross inequity between patients requiring home enteral nutrition products across Australia. For example, for patients requiring enteral feeds in Victoria, the prescription is free in the majority of centres, whereas in some states, patients are required to pay over $60 per week for a similar script. Costs generally increase further if patients are required to pay more for equipment such as those associated with gravity bags, giving sets and feeding pumps. Cost of feeds and equipment was reported to influence feeding method selection in nearly 20% of cases. This may have clinical implications if a patient who better tolerates tube feeding via a pump still chooses to continue with inadequate nutrition via poorly tolerated bolus feeding, as they are unable to afford the additional associated costs.

One of the major limitations of this study is the methodology used in the survey dissemination. Some centres may have been missed in the distribution process if their dietitian was not a member of the Dietitians Association of Australia Oncology Interest Group. Within a department, individual dietitians may practice in different ways and respond differently to some of the clinical practice questions, such as estimating requirements,[21] selection of feed type and mode of feeding. Analysis of the data was complicated by the survey design, which did not always prevent multiple responses to a question and free text responses were problematic to categorise. Improvements in web-based survey design would eliminate this difficulty for future questionnaires.

Variation in dietetic practices is influenced by many factors, such as hospital size, treatment capacity and the availability and experience of the dietitian with this patient group. In many cases there was no specific funding for a dietetic service for patients with head and neck cancer. Departments either provided ad hoc services when referrals were received, or patients with head and neck cancer were seen with general resources from cancer care as a whole, which made it difficult to determine staffing allocation to head and neck cancer services.

Consequently, the median figure of 1.60 FTE in the largest head and neck cancer treatment centres appears overly optimistic and likely an overestimate of

the dietetic resources available to patients with head and neck cancer. These centres reported managing more than 100 new patients per year for both head and neck surgery and (chemo)radiotherapy. In the absence of any national workforce benchmark, comparison with the UK National Institute for Health and Clinical Excellence Guidance recommendations for 4.7 FTE specialist head and neck dietitians per 1.5 million population (equating to 100 new referrals per year) indicates services within Australia fall significantly short. Previous attempts at mapping multidisciplinary team membership profiles has methodological limitations, in that merely identifying the presence or absence of a dietitian within the multidisciplinary team fails to consider patient volume and complexity of case mix or the dietitian's available hours and scope of practice.[22] The severe nutrition-impact symptoms associated with multi-modal treatment regimens and the nature and location of the disease itself has led to an increasing reliance on nutrition support in this patient group. As such, it is essential to ensure patients have access to adequate support services to meet the significant and resource-intensive needs of nutrition monitoring and rehabilitation.

With reported existing dietetic resources, it would not be possible to meet the evidence-based recommendations for weekly to fortnightly dietetic review of patients during radiotherapy and for at least six weeks thereafter.[7] There would also be insufficient resources available for pre-treatment assessment, surgery and long-term follow-up, which are also considered to be part of best practice care. Consideration should also be given to the need for a specialist caseload to encompass other important aspects of professional practice, including protected time for audit, research, participation in multidisciplinary team activities and maintenance of professional development.

This survey has confirmed that dietetic practice for the nutritional management of patients with head and neck cancer is varied throughout Australia. The upcoming publication of the *Evidence-Based Practice Guidelines for the Nutritional Management of Patients with Head and Neck Cancer* will provide a foundation for practice.[14] It will also allow the benchmarking of dietetic resources required for best practice care for this complex and vulnerable patient group, which is intended to enhance multidisciplinary care and improve patient outcomes in Australia.

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AFTER THE STORM: NUTRITION AFTER CANCER TREATMENT

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Abstract

For cancer survivors who have completed their active treatment, evidence that a healthy lifestyle can improve chronic illness risk, cancer recurrence, secondary cancers and late and long-term effects of treatment has been increasing. Lifestyle behaviours of cancer survivors are similar to the general population, and they have much to gain from intervention. Obesity has been shown to be an independent risk factor for cancer recurrence and survival, and is associated with poor functioning and quality of life. There are inconsistent results for specific dietary components and risk of cancer recurrence and survival. Micronutrient supplementation is commonly reported among cancer survivors, however there is no conclusive evidence of survival or recurrence benefits with supplementation. Evidence suggests risks of toxicity caused by large doses of certain micronutrients, and possible increases in mortality risk with supplementation. Despite alcohol being a risk factor for the incidence of some cancers, little is known about its impact on cancer survivors after diagnosis. Cancer survivors should be encouraged to follow the general recommendations for cancer prevention as developed by the World Cancer Research Fund. More research is needed which identifies strategies to assist cancer survivors in modifying their lifestyle behaviours to optimise their health.

The number of cancer survivors worldwide is expected to triple from 25 million in 2008 to 75 million in 2030.[1] In Australia alone, there are approximately 340,000 cancer survivors, representing about 2% of the population.[2] Cancer survivors are high health care users and the total expected lifetime economic cost for Australians diagnosed with cancer is around $95 billion.[3]

In the context of this article, the term 'cancer survivor' refers to people who are living with a diagnosis of cancer, but who have completed their active treatment.[4] Some cancer survivors may have negative after-effects from their cancer treatment (eg. digestive issues following gastric surgery) or the cancer itself that affects their ongoing nutrition status.[5] Cancer survivors are an important target group for nutrition intervention as they are at increased risk of many chronic illnesses, such as cardiovascular disease and diabetes, death from non-cancer causes, cancer recurrence, secondary cancers, and the late effects of treatment, such as functional decline, depression, reduced quality of life and weight gain.[6-9]

The increasing importance of nutrition and physical activity for cancer survivors has been recognised in recent guidelines.[5,10] An international review by the World Cancer Research Fund (WCRF) concluded that cancer survivors should follow the same diet, healthy weight and physical activity principles for cancer prevention as the general population.[5] These recommendations are shown in Box 1.

Box 1: WCRF recommendations for cancer prevention.[5]

- Be as lean as possible within a healthy body weight.
- Be physically active.
- Limit energy dense food and drink.
- Eat mostly foods of plant origin.
- Limit red meat and avoid processed meat.
- Limit salt.
- Aim to meet nutritional needs through diet alone not diet supplements.

There is clear and consistent evidence about the benefits of physical activity for cancer survivors, as acknowledged in recent US and Australian physical activity guidelines for cancer survivors.[11,12] However, evidence for weight loss and specific dietary interventions is still an emerging area of research.[4] The purpose of this article is to summarise the current evidence and recommendations for providing appropriate body weight and nutrition support for cancer survivors.

Few lifestyle differences exist between individuals diagnosed with cancer and the general population – a population marked by inactivity; overweight and obesity, and suboptimal fruit and vegetable consumption.[13,14] Similar to international findings,[9] Australian data from the National Health Survey indicated no difference between cancer survivors and those without a cancer history on levels of physical inactivity and fruit or vegetable consumption.[15] However, cancer survivors were more likely to be overweight or obese, to have higher levels of alcohol consumption, and to report a range of chronic co-morbid medical conditions.[15]

Body weight

Obesity has been shown to contribute to the risk of cancer recurrence and survival independent of diet and physical activity.[16] Being overweight or obese has been associated with an increased risk of dying of cancer - 14% of cancer deaths in men and 20% in women were attributed to obesity in an American cohort study.[17] There was an increased risk of death (30-50%) in heavier women with breast cancer compared to women in the healthy weight range.[17] As well, a high body mass index or body fatness before or at the time of a bowel cancer diagnosis appears to be associated with higher all-cause mortality and recurrence.[18]

Weight gain after a cancer diagnosis has been suggested as a significant contributor to cancer recurrence and decreased survival. In breast cancer patients, weight gain after diagnosis is common in the year following diagnosis.[19] In breast cancer patients, for each five kilogram increase in weight, breast cancer mortality increased by 13% and in contrast there was no increase in mortality for women who lost weight.[20] Results from the Nurses Health Study indicated a gradient of risk between weight gain and risk of breast cancer recurrence, with the largest weight gains resulting in a 64% increased risk of recurrence.[21]

The Women's Intervention Nutrition Study, a randomised control trial of women with early stage breast cancer, highlighted the importance of weight management for cancer survivors. The intervention resulted in significantly lower dietary fat intake among the intervention group, and a corresponding reduction in body weight over five years of follow-up.[22] This resulted in a 24% lower risk of recurrence among intervention participants, compared to those in the control group.[22] The low fat diet was most beneficial in women with oestrogen or progesterone-receptor negative tumours. Further analysis is required to determine if it was the decrease in fat intake, the change in fatty acid profile, or weight loss that was responsible for the benefits.

Interestingly, another randomised control trial of breast cancer survivors, the Women's Healthy Eating and Living study, did not show an improvement in survival or breast cancer recurrence.[23] Unlike in the Women's Intervention Nutrition study, the Women's Healthy Eating and Living study women in both the intervention and control groups experienced small increases in weight, and this may be a factor in the different results.[23]

In addition to the links between overweight and risk of cancer recurrence and mortality, there is evidence that supports an association between body weight and health-related quality of life, with both body mass index and physical activity contributing independently.[24] Healthy weight and overweight cancer survivors reported significantly better physical functioning than those cancer survivors who were obese.[24] Lifestyle interventions that prevent weight gain, encourage participation in physical activity, and a healthy diet show some potential to impact on health, survival and quality of life outcomes for cancer survivors.[25]

Dietary factors

After treatment, some cancer survivors may have residual metabolic and structural damage, exemplified by example gastrointestinal surgery or xerostomia. These survivors may require individualised medical nutrition therapy with ongoing medical and dietetic support.[5]

Cancer survivors have reported high levels of interest in dietary interventions and a preference for these interventions to be initiated at diagnosis or soon after.[9] A recent review has suggested that changes in health behaviours occurring after the cancer diagnosis may be important determinants in cancer survivors' wellbeing.[26] Although some cancer patients make healthy lifestyle changes after diagnosis, these changes may not be seen in all populations of cancer survivors or, when they do occur, may only be temporary.

There is considerable research on the association between diet and cancer incidence, however there are fewer studies that have looked specifically at cancer survivors.[27] Studies of cancer survivors are difficult to compare, as it is such a heterogeneous group with inconsistent definitions for cancer survivors. For example, studies can include one or a number of cancer types and may involve people who have been diagnosed but not yet treated, those with ongoing treatment and those who have been free from disease for years.[5] Most studies that have examined diet and cancer survival have been conducted in breast cancer survivors. To date, these studies, as well as those in other types of cancers, have had conflicting results, with some studies indicating a benefit and others suggesting no benefit.[27]

The results of the two randomised control trials referred to in the body weight section provided conflicting results about the effect of dietary intervention in survivors. The Women's Intervention Nutrition study found a small improvement in secondary breast cancer events in the intervention arm that followed a reduced fat diet, however this group also lost a significant amount of weight.[22] The Women's Healthy Eating and Living study suggested dietary information for a healthier diet, encouraging five serves of vegetables, two cups of vegetable juice, three serves of fruit, 30g fibre and 20% energy from fat. Yet the study found that dietary intervention made no difference in the incidence of breast cancer recurrence or all-cause mortality. However, both intervention and control arms gained weight in the study.[28]

The American Cancer Society's Study of Cancer Survivors-II found an association between meeting fruit and vegetable recommendations and increased health-related quality of life. Breast, prostate, melanoma and bowel cancer survivors who met the recommendations reported significantly higher quality of life than those not meeting fruit and vegetable recommendations.[29] While recommendations on diet and cancer survival remain conservative, a healthy diet remains one of the most important lifestyle behaviours for survivors to reduce the risk of other chronic diseases to which survivors are particularly susceptible.[6-9, 15]

Micronutrient supplements

The use of micronutrient supplements is common in cancer survivors. A systematic review of supplement use in cancer patients in the United States reported that an estimated 64–81% of cancer patients and survivors use a vitamin or mineral supplementation, with up to a third of these cancer patients starting micronutrient supplementation after diagnosis.[30]

Despite the widespread use of supplements in cancer survivors, there are few studies assessing the effect of nutritional supplements on cancer recurrence and survival.[5] The World Research Cancer Fund assessed 39 randomised control trials of micronutrient supplementation in cancer survivors including retinol, β-carotene, vitamin B6, multi-vitamins, vitamin E, selenium and isoflavones. It concluded that the evidence "does not show that micronutrients supplements have any benefits in cancer survivors".[5]

While not specific to cancer survivors, large-scale randomised control trials on the efficacy of dietary supplements to reduce the risk of cancer have raised serious safety concerns.[31] Most water-soluble vitamins are thought to be harmless at pharmacological doses, but there are some concerns about the safety of some nutrients such as selenium, β-carotene, magnesium and chromium which are known to be toxic at pharmacological doses.[32]

A systematic review of 68 randomised trials of antioxidant supplements in the general population found no significant effect on mortality. When the meta-analysis was restricted to only the high quality trials (47 trials), there was a slightly increased risk of mortality from antioxidant supplements.[33] The conclusions drawn were that vitamin C and selenium had no significant effect on mortality and required further study, while treatment with β-carotene, vitamin A, and vitamin E may increase mortality.[33]

Of particular concern to many breast cancer survivors is soy and phyto-oestrogen. Evidence to date is inconclusive about the role soy foods might play in preventing cancer or cancer recurrence, however high-dose phyto-oestrogen supplementation is not recommended, especially in women with existing breast cancer.[34] Soy foods can be encouraged as part of a varied and nutritious diet, consistent with recommendations to consume a diet rich in plant-based foods.

While it appears that people who eat more vegetables and fruit, which are rich sources of antioxidants, may have a lower risk of cancer, the specific components which provide the cancer protective effect are not definitively known.[5] As it is not possible to replicate the nutrient combinations found in foods in supplement form, and due to the potential adverse effects high-dose supplementation may have, whole foods appear to be the most beneficial. The World Cancer Research Fund states that dietary supplements are not recommended for cancer prevention and people should aim to meet their nutritional needs through diet alone.[5]

Some cancer survivors may require micronutrient supplementation due to the late effect of cancer treatment or unrelated co-morbidities. Supplements should only be given when clinically indicated. Instances where lower-dose micro-nutrient supplementation may be indicated for cancer survivors are: biochemically confirmed nutrient deficiency; where dietary approaches have been inadequate; nutrient intakes persistently below recommended intake levels; to meet public health recommended levels of intake if not contraindicated due to cancer therapy; and known health sequelae related to cancer therapy or other co-morbidities such as osteoporosis.[31]

A daily multivitamin supplement in amounts equivalent to 100% of the recommended dietary intake is a good choice for those cancer survivors who are not able to eat a healthy diet. As high doses of dietary supplements may be associated with toxicity, the use of vitamin and mineral supplements in higher doses should be assessed and discussed on an individual basis.[31] Box 2 provides a checklist for cancer health professionals to discuss with survivors who are considering supplementation.

The association between post-diagnosis alcohol intake and cancer survival remains unclear, despite the convincing evidence that alcohol drinking causes some types of cancer.[5, 35]

There is evidence from observational studies suggesting a worse prognosis for individuals with head and neck

Box 2: Checklist for cancer survivors considering micronutrient supplements.[3]

- Is the dietary supplement suitable for treating the condition? Is there any scientific evidence for its use?
- Does the dietary supplement have the potential to prevent, alleviate and/or cure symptoms or in other ways contribute to improved health and wellbeing?
- Is the dietary or herbal supplement provided by a qualified (preferably registered and certified) practitioner with adequate training background, good skills and knowledge?
- Are the products or materials of assured quality and what are the contraindications and precautions?
- Are the dietary or herbal supplements available at a competitive price?

cancers who report higher alcohol consumption after diagnosis.[36-38] Despite there being a positive association between alcohol intake and risk for primary breast cancer, findings conflict regarding alcohol intake and breast cancer recurrence.[35, 39-41] Small sample sizes, differences in study design and data collection, and correlations between alcohol intake and other lifestyle factors (eg. smoking) or comorbid conditions may be responsible for the conflicting results reported thus far.[27]

However in view of the consistency of the evidence suggesting alcohol is a modifiable risk factor for some types of cancer, and its contribution to other health problems, it is prudent to recommend that alcohol is limited or drunk only in moderation by cancer survivors. This is consistent with recommendations from the World Cancer Research Fund.[5]

Conclusions

The World Cancer Research Fund recommends that cancer survivors follow the recommendations for cancer prevention (box 1).[5] These recommendations are consistent with advice to reduce the risk of cancer and promote general health and wellbeing, and should be considered within the context of the individual survivor's overall health and social circumstances.

Lifestyle modification is an important component of cancer survivorship. With a growing number of cancer survivors, research and knowledge will have to grow and develop to provide recommendations specific to their needs and in turn, a health system that responds and adapts to such needs is crucial. A recent article has summarised some intervention studies currently being undertaken with survivors in Australia, that include randomised control trials of exercise, telephone lifestyle modification counselling and face-to-face lifestyle training.[42]

Health professionals such as general practitioners and oncologists have an important role to play, and with routine follow-up of survivors are well placed to provide a leading role in promoting and supporting health behaviour change.[6] Long-term follow-up of cancer survivors should include advice and information on general healthy lifestyle recommendations.

A brief intervention tool, 'Making changes to prevent cancer: A summary guide to brief interventions for general practitioners', has been developed by Cancer Council Western Australia to guide general practitioners through an ask, assess, advise, assist and arrange pathway for addressing smoking, alcohol, sun exposure, nutrition, healthy weight and/or physical activity with their patients.[43]

Resources for cancer survivors that provide information and support on eating well and being active after cancer treatment, can be handed out by general practitioners or oncologists to encourage healthy lifestyle change in cancer survivors.[44] With ongoing improvements in cancer treatments and survival, it is important for health professionals to look beyond the cancer treatment storm and provide survivors with advice on a healthy lifestyle for life after cancer.

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BODY COMPOSITION AND BREAST CANCER – THE ROLE OF LEAN BODY MASS

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Abstract

Breast cancer risk and outcomes for breast cancer survivors are known to be influenced by body composition. A wealth of literature surrounds the function and role of fat tissue, however considerably less is known regarding lean body mass and its functional role in immune, hormonal and metabolic regulation in breast cancer aetiology. This review outlines findings relevant to lean body mass before, and following breast cancer diagnosis. A paucity of research exists regarding lean body mass and breast cancer risk. However, post-diagnosis lean body mass losses are commonly reported and a concern for ongoing co-morbidity after treatment. A comprehensive mechanism for sarcopenic obesity in breast cancer survivors is currently unknown. However, findings from other disease states indicate that the effects of chronic inflammation and/or an increase in sedentary activity may partly explain the exaggerated losses of lean body mass. Exercise has been a successful intervention for attenuating lean body mass losses after treatment, while weight loss through energy restriction may exacerbate breast cancer related sarcopenia. Combining exercise with dietary intervention to optimise lean body mass may be ideal; however there is insufficient evidence for this at present. Similarly, the role of functional food supplements, such as omega-3 fatty acids and essential amino acids, may aid lean body mass maintenance through anti-inflammatory action and increased muscle protein synthesis.

There were 1.15 million new cases of breast cancer diagnosed worldwide in 2002,[1] while in Australia alone, 12,600 new cases are diagnosed each year and at the end of 2006 there were 144,000 breast cancer survivors country-wide.[2] Significant advances in research have increased our understanding of predisposing factors and improved the management of breast cancer, resulting in a five-year survival rate of 88% and a one-year survival of 97%.[2]

Over the last three decades, numerous studies and meta-analyses have established a relationship between body composition and breast cancer aetiology and prognosis.[3-6] Postmenopausal breast cancer risk has a positive correlation with body mass index (BMI),[3] while a lower BMI[3] but high waist to hip ratio (WHR) is associated with an increased risk of premenopausal breast cancer.[4,5] At the time of diagnosis, a higher BMI and WHR are both related to poorer prognosis, irrespective of menopausal status.[6]

Due to the strong correlation found between BMI, WHR and body fat mass, investigations have focused on the function of fat tissue in breast cancer aetiology with specific reference to its influence over sex hormone balance, endocrine function, insulin and insulin-like growth factors and adipokine expression.[7] More recently, better understanding of the function of lean body mass (LBM) indicates that it too exerts a powerful endocrine, immune and hormonal influence within the body.[8]

For breast cancer survivors, simultaneous LBM loss with fat tissue accumulation, known as sarcopenic obesity, is common.[9-11] The complete aetiology of LBM loss in this population is unclear, however it appears to be associated with poorer metabolic outcomes, such as earlier onset of cardiovascular disease and metabolic syndrome related diseases.[8,12,13] In addition, LBM has been shown to be a positive predictor of survival in chronic heart failure,[14] chronic kidney disease,[15] chronic obstructive pulmonary disease,[16] and cancer cachexia.[17] Evidence from these populations suggest that LBM loss may in part be related to inflammatory mediators present as a result of the disease state and treatment.[17,18]

The purpose of this review is: to provide a brief outline of findings related to LBM before and after breast cancer diagnosis; to explore the role of inflammation in LBM loss in breast cancer survivor populations; and review the established and potential roles of exercise and dietary intake in LBM maintenance specific to the breast cancer survivor population.

Search criteria

A literature search was carried out using MEDLINE and Pubmed databases. Selected studies and review articles were hand-searched for additional relevant references. Key terms used included: breast cancer (breast neoplasms, cancer of the breast, breast cancer survivor, breast neoplasm risk); body composition (percentage body fat, muscle mass, lean body mass, skeletal muscle, body composition); exercise (physical activity, resistance training, aerobic training); diet (energy intake, omega-3 fatty acids, diet therapy, caloric/energy restriction). Additional search criteria included, subjects >18 years of age, non-metastatic breast cancer survivors and articles published in English. Included articles were those that reported body fat composition and/or lean body mass in relation to: breast cancer risk (all study designs included); time after breast cancer diagnosis (all prospective and retrospective cohort studies, case series, non-randomised and randomised studies); and diet and exercise, or combined interventions post breast cancer diagnosis (all non-randomised and randomised control trials).

LBM prior to breast cancer diagnosis

There is a lack of studies prospectively assessing LBM in association with breast cancer risk using sensitive measures such as dual-energy X-ray absorptiometry, CT scanning, densitometry or bioelectrical impedance. Of the studies that could be located, two prospective cohorts consisting entirely of postmenopausal women, have reported mixed results for the effect of LBM on breast cancer risk as assessed by bioelectrical impedance.[19,20] In a Dutch postmenopausal population with a median of six years follow-up, each 1kg/m^2 increase in LBM-to-height ratio (LBM divided by height squared) was positively associated with breast cancer risk, with seemingly no effect from body fat to height ratio.[20] This differed somewhat to a postmenopausal Australian cohort measured at baseline and again after nine years.[19] Each 10kg increase in absolute lean body and fat mass, and 10cm increase in waist circumference, were associated with increased breast cancer risk. However, when results were stratified for time since onset of menopause and history of hormone replacement therapy (HRT), a significant effect was only found for those who had experienced menopause more than 15 years before assessment, and in never-users of HRT.[19-21]

These results are not surprising, as it is well established that adult weight increases and higher BMI values are significantly associated with postmenopausal breast cancer risk.[3,21] Considering normal weight gain in healthy adult populations involves a simultaneous increase in LBM and fat mass,[22] the association between breast cancer risk and absolute LBM in these studies may be secondary to the effects of significant long-term total body weight and fat mass gain during adulthood.

In contrast to the above findings, when the ratio of fat to skeletal muscle mass was measured at or shortly following diagnosis in a Uruguayan case-control study, a higher value for fat-to-muscle ratio was more indicative of a breast cancer diagnosis.[23] Compared to the lowest (1st) quartile of fat-to-muscle ratio, both 3rd and 4th quartiles had an odds risk of 4.86 and 6.09 ($p<0.0001$) independent of BMI and menopausal status. The authors noted that to maintain skeletal muscle mass at a level that was protective, regular exercise was mandatory. Alternatively, these results may indicate the importance of active lean tissue and its influence over immune and hormonal regulation.[24] Caution in interpretation of these data is required. Limitations regarding the body composition measurement methodology used, and the applicability of findings to populations in developed countries are not clear.

To date, few meaningful relationships between LBM and risk of breast cancer have been uncovered. Current evidence suggests that the effect of LBM may be secondary to total weight and fat mass gains prior to diagnosis. More prospective studies using accurate and repeated measures of body composition, along with markers of muscle function, are required to further elucidate the protective or predisposing effect of LBM and breast cancer risk.

Pattern of LBM changes after breast cancer treatment

Sarcopenic weight gains are common after treatment for breast cancer.[10] Over the five years following active treatment, 50-100% of survivors have been shown to increase total weight,[10,11] with the probability of re-attaining their pre-diagnosis weight being inversely associated with initial post-treatment weight gains.[12] LBM growth accounts for 20-40% of total weight gains in disease free populations.[22] Studies of breast cancer survivors have shown that more than one year after chemotherapy, total fat mass gains of 2.4kg to 6.7kg were accompanied by LBM losses of -0.4kg to -1.7kg, respectively.[9,25] Women who seemingly maintain their weight in the years after treatment still undergo these adverse changes, such that LBM losses match increases in adipose tissue.[26] Factors that are linked with more exaggerated changes include premenopausal status at diagnosis, experiencing treatment related menopause,[27] receiving chemotherapy compared to no chemotherapy, a lower BMI at diagnosis and those who are least physically active after treatment.[28] The sarcopenic pattern is still prevalent, albeit of smaller magnitude in postmenopausal breast cancer populations.[25, 29]

In regards to timing of LBM changes, the most significant changes are seen during adjuvant chemotherapy and in the 6 to 12 months following this.[9,25,29,30] By observing control groups in large randomised trials, the rate of sarcopenic weight gain seems to normalise two to four years post diagnosis,[31-34] however total weight increases can still occur after this point.[12]

LBM losses with concurrent fat and total weight gains are associated with metabolic dysfunction including impaired glucose metabolism,[13] high triglyceride levels,[35] and chronic inflammation in healthy and diseased populations.[8] While the function of fat tissue has been a focus of previous interventions aimed at breast cancer survivors, LBM should be evaluated more closely in future, as it is known to be a large contributor to glucose disposal,[8] triglyceride oxidation and, when stimulated through exercise, can exert systemic anti-inflammatory effects.[36]

Contributors to LBM losses

Studies assessing moderators of weight change during treatment (local surgery and radiotherapy, with or without chemotherapy) have not conclusively explained the reasons for the higher than expected total weight gains and the sarcopenic nature of the body composition changes.[9,25,27,37,38] The role of both resting metabolic rate and energy intake do not fully explain the magnitude of weight change after treatment.[9,27] It is thought that any increases in fat mass are sufficient to mask the resting metabolic rate reduction associated with LBM losses,[9] while weight gains have been observed even after a reduction in energy intake.[27] In contrast, lower levels of physical activity have been associated with increased weight,[38] however total weight gains still seem to be greater than predicted after accounting for the reduction in energy expenditure associated with decreased physical activity.[25] Therefore, auxiliary mechanisms other than those relating to

conventional energy balance, such as chronic inflammation metabolic disturbances related to sedentary activity, may partly explain the exaggerated changes in LBM.

Systemic inflammation has proven to be a strong inhibitor of muscle protein synthesis and increased muscle protein degradation in ovarian, gastroesophageal and pancreatic cancers.[39,40] A full review of these mechanisms can be found elsewhere.[40] In brief, increased circulating levels of inflammatory cytokines such as tumour necrosis factor (TNF-)alpha and interleukin-6 (IL-6), and increased genetic expression of inflammatory markers through nuclear factor-kappa B (Nf-ƙB), stimulate muscle degradation while inhibiting muscle protein synthesis.[40] At least one prospective study revealed that elevated levels of inflammatory markers have been positively associated with body mass accumulation in healthy populations.[41]

Direct associations between LBM changes and inflammatory markers have not yet been made in breast cancer survivor populations. Elevated levels of acute phase inflammatory markers, C-reactive protein and serum amyloid A, have been correlated with increased fatigue,[42] increased incidence of cardiovascular disease, insulin resistance,[43] and mortality independent of BMI, stage of disease and race.[44] Cytokines generated from active LBM (particularly skeletal muscle), known as myokines,[45] contribute to the anti/inflammatory balance of the body.[8] While the muscle-fat cytokine interplay has not been fully elucidated, numerous studies have confirmed that muscle activity has a significant anti-inflammatory influence on the systemic cytokine milieu, and further research may develop mechanisms that increase the importance of functional LBM in healthy and breast cancer populations.[24]

A reduction in physical activity and an increase in sedentary activity are common after breast cancer diagnosis.[28] Increased sedentary time, such as sitting or lying down, has been related to increased adiposity in breast cancer populations.[46] This phenomenon can be explained through an increase in abdominal fat deposition, decreased insulin sensitivity,[35] decreased triglyceride oxidation,[35] and an inhibition of muscle synthesis,[47] following muscle deactivation related to physical inactivity. Decreased energy expenditure plus the metabolic disturbances associated with physical inactivity, may partially explain discrepancies in predicted and actual weight gains found in breast cancer survivors.

Inflammation and sedentary activity related changes in metabolism have a significant role in LBM physiology. More research is needed to fully elucidate exact physiological mechanisms even in healthy populations, however compelling evidence indicates that regularly stimulated as opposed to dormant LBM may be closely related to LBM changes.[13, 48]

Influences of exercise and diet on LBM

Diet and physical activity interventions have had a significant impact on body composition changes in breast cancer survivors despite their disappointing influence on LBM following treatment.

Regular exercise in the well population has been shown to reduce breast cancer risk by 25-30%,[49] and after diagnosis, total mortality by ~40%, breast cancer mortality by 34%, and breast cancer recurrence by 24%.[50] Therefore, increased physical activity is recommended for healthy populations and breast cancer survivors alike.

With respect to LBM, randomised control trials that involved resistance training have shown 0.5 to 0.88kg LBM increases over 8 to 26 weeks.[51-53] In a population that typically loses muscle mass, aerobic exercise during and after treatment when compared to no intervention, has been shown to attenuate and sometimes reverse LBM losses.[32, 33] However, a recent meta-analysis of randomised control trials notes only body fat percentage is consistently improved by aerobic exercise in this population.[54] As well as absolute LBM growth, improvement of muscle function in conjunction with smaller absolute LBM growth is an important outcome in this population. A landmark randomised control trial by Schmitz et al (2009) investigated the effect of year long, twice weekly resistance training on outcomes relating to lymphoedema. The study did not detect a significant change in LBM compared to control. However upper and lower body strength increased by 29% and 32% respectively in the intervention group, compared to 4% and 8% respectively in the control.[31] Similarly, VO_2 max was disproportionately improved after aerobic exercise training compared to the relatively small improvements of body composition.[54,55] Considering the varying abilities of individuals of different body shapes and genetic predisposition to increasing absolute LBM, functional outcomes may give a more consistent insight into physiological improvement of LBM. Muscle strength has been shown to be a better predictor of mortality than muscle mass in ageing populations,[56] VO_2 max has long been an independent marker of mortality regardless of body composition in other populations,[57] and evidence shows that exercise training and muscle contraction exerts anti-inflammatory effects through myokine production.[24] While the data regarding outcomes and muscle function is lacking in breast cancer survivors, these consistent relationships in otherwise not dissimilar populations are suggestive of similar links in breast cancer populations.

Dietary interventions for breast cancer survivors have shown successful weight loss through energy restriction,[58-61] and with mixed results after low fat and high fruit and vegetable consumption.[62,63] Randomised control trials assessing weight loss through energy restriction in breast cancer survivors have resulted in 3.3 to 9.5kg weight loss over 6 to 12 months.[59-61] However, there has been little focus on lean mass maintenance in these studies. In otherwise healthy overweight and obese populations, weight loss through energy restriction without exercise inevitably results in losses of both fat and LBM.[60,64,65] A recent randomised control trial evaluated the efficacy of low carbohydrate or low fat diets for weight loss in breast cancer survivors and their potential hazard to LBM.[60] Similar weight loss was found for each group, however, while body fat percentage, metabolic markers and C-reactive protein decreased, a classification of sarcopenia categorised

by appendicular LBM (<5.67kg/m^2), measured by dual-energy X-ray absorptiometry, increased from 8% to 18% within the study cohort.[60] Considering the known link between breast cancer survival and the loss of LBM after treatment, this study is the first in this population that clearly indicates the need for additional interventions to attenuate LBM during weight loss.

Combining exercise and dietary restriction for breast cancer survivors has shown promise in attenuating LBM loss during total body weight loss.[66] Some studies have been underpowered or have failed to measure LBM,[67-69] leaving the need for more research into a model that has been useful in non-breast cancer populations.[65] Apart from exercise, anti-inflammatory nutrients may have utility in this population when addressing LBM maintenance. Long chain omega-3 fatty acids (LCn-3 FAs) through anti-inflammatory and mitochondrial influence, are associated with protein sparing and increased fat oxidation in overweight populations,[70-72] and LBM attenuation in cancer cachexia.[39,73] In conjunction with exercise, LCn-3FAs supplementation has shown to exert more powerful effects again on fat oxidation and LBM growth.[71] Substantial literature supports the ability of LCn-3FAs to reduce inflammation through many of the pathways associated with LBM loss.[74-76] An Australian study is currently underway investigating these relationships within a breast cancer survivor cohort. Another potential group of nutrients that show promise in LBM preservation are supplemented essential amino acids. Emerging findings indicate that essential amino acids, when dosed appropriately, may independently stimulate muscle protein synthesis.[77] Supplementation has improved LBM in both chronic heart failure and older female populations,[78,79] and has a theoretical potential in breast cancer populations.

Conclusions

Adipose tissue has long been a focus of breast cancer aetiology and management. While little published research exists, recent insights regarding the role of LBM in inflammatory, immune and hormonal balance indicate an intriguing avenue for improving breast cancer outcomes. Sarcopenic weight gains during and after breast cancer treatment are not fully understood, however inflammatory regulation, inactivation of muscle tissue through sedentary activity and muscle-fat communication via endocrine pathways may provide further explanation of these adverse changes. Regardless of the incomplete physiological understanding, exercise interventions during and after treatment are effective in attenuating and reversing LBM losses in breast cancer survivors. Perhaps more importantly, it has been shown to dramatically improve muscle function in breast cancer populations. In contrast, dietary energy restriction alone is effective in reducing weight, however, the concurrent loss of LBM during weight loss may expose survivors to more severe sarcopenic changes. Optimal management of body composition is still under investigation, however conclusions from other populations would indicate a combined diet and exercise approach is best. Finally, a potential role exists for specific dietary supplements that address chronic inflammation and inhibition of muscle protein synthesis likely present in breast cancer survivors.

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NUTRITION AND PROSTATE CANCER: LATEST INSIGHTS AND PRACTICE RECOMMENDATIONS

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Abstract

Prostate cancer is a growing epidemic worldwide and the sixth most common cause of death from cancers in men. Diet and lifestyle factors have been associated with prostate cancer risk, but limited evidence supports their effect on prostate cancer progression post diagnosis. The majority of clinical trials conducted studied men in the lowest severity category of 'active surveillance'. A small number of studies show differences in the response to diet and/or lifestyle intervention depending on the severity of disease. There are inconsistencies in the quantities of intervention, nutrient/s provided, dietary intake methods, trial lengths and follow-up times. Interventions including substantial fat and energy restrictions risk nutrient deficiencies, particularly iron and zinc, and have inconsistent adherence rates. Dietary changes to modify nutrient profiles, for example, the ratio of n-3:n-6 fats, appear to have more potential than those that restrict specific food groups or macronutrients. Evidence suggests a combination of weight management and lycopene (30mg per day), soy isoflavones or flaxseed supplementation may contribute to delaying prostate cancer proliferation for men on 'active surveillance'. Studies of these nutrients as adjunctive therapies to weight management interventions in men with locally advanced or advanced disease with metastases are needed to ascertain the effect on prognosis and quality of life.

Cancer of the prostate gland is the second most commonly diagnosed cancer in men, and accounts for 6% of total cancer deaths in males.[1] Prostate cancer severity is classified using the standard staging scale (I-IV) and the Gleason score (range 2 to 10), with 10 being the most aggressive form.[2] The Gleason total score is a combination of two sub-scores: (i) most common tissue pattern (range 1-5) and (ii) second most common tissue pattern (range 1-5). Gleason scores of less than or equal to 6 are considered the least aggressive (low grade), while Gleason scores of 7 are intermediate and 8-10 are high grade. Prostate cancer has the highest incidence in Australia and New Zealand at 104 per 100,000 while South-Central Asia has the lowest incidence, at 4 per 100,000.[1] This may be related to the high prevalence of prostate specific antigen (PSA) testing and follow-up biopsies in Australia and New Zealand; however, several diet and lifestyle factors and their resulting metabolic effects are becoming increasingly implicated in the development of prostate cancer.

The approach of 'active surveillance' or 'watchful waiting' involves the monitoring of PSA levels at regular short-term intervals. It is sometimes appropriate for men with a Gleason score ≤6. Once the Gleason score is ≥7, treatment may range from radical prostatectomy, radiation therapy or a combination of these with Androgen Deprivation Therapy (ADT), if there is locally advanced disease or advanced disease with metastases.[2] Receptors for testosterone are competitively inhibited by the oestrogen-like agents in ADT and this reduces the inflammatory process exacerbated by free testosterone binding with these receptors in prostate tissue, thereby slowing the growth of the tumour.[2,3] A substantial side-effect of ADT is that the hormonal changes predispose patients to a range of metabolic risk factors, including weight gain, abdominal obesity, insulin resistance and cardiovascular disease, culminating in the metabolic syndrome.[3] Diet and lifestyle changes known to assist in alleviating symptoms of the metabolic syndrome may be beneficial in improving quality of life for men with advanced prostate cancer on ADT. Furthermore, since progression of the disease is associated with higher waist circumference and velocity of weight gain,[4] minimising the metabolic side-effects is important for limiting this process.

Prostate cancer is a growing epidemic worldwide.[5] The associations of prostate cancer prevention with diet and lifestyle factors in observational studies and the potential for limiting the detrimental side-effects of ADT suggest that further investigation into the effects of food and nutrients as adjunctive therapy is warranted. The purpose of this paper is to review the quality of the latest scientific evidence on the benefits of specific foods, nutrients, nutritional supplements, and diet and lifestyle interventions for three groups of prostate cancer patients: (i) early stage, locally confined; (ii) locally advanced (regionally invasive); and (iii) advanced (distant metastatic).

Search criteria

A search of Medline, PubMed, ScienceDirect, CINAHL, Health Source (Nursing/Academic) was conducted between September 2010 and March 2011 for articles published within the last 20 years. Search terms used included prostate cancer, nutrition, diet, dietary supplements and complementary/alternative medicine. Exclusion criteria were animal and cell studies, pre-diagnostic studies of prostate cancer and an absence of information regarding the stage of prostate cancer. Articles were designated levels of evidence

using the National Health and Medical Research Council Evidence Hierarchy.[6] Of the 109 articles retrieved, 40 were selected for inclusion in this review due to their relevance to nutrition and prostate cancer progression. In further review, articles were excluded if there was only one paper available on the topic, as this precluded comparison of findings. Nineteen studies were included in the final review.

Diet and/or lifestyle modification

A summary of the studies examining prostate cancer progression as a result of dietary interventions is presented in table 1.

Seven studies examined the effects of diet and/or lifestyle modification on the progression of prostate cancer. One of the interventions was a vegan diet, including: daily soy (unspecified amount or fermentation) and fortified soy protein powder, 58g; fish oil (3g, proportion of eicosapentanoic acid [EPA]/docosahexanoic acid [DHA] not defined); vitamin E (400IU, type not defined); selenium (200mcg); vitamin C (2g); 30 minutes of walking six days per week; stress management activities; and attendance at an intervention support group for an hour per week.[9] This combination of nutrients was associated with a 4% reduction of PSA in the intervention group, compared to a 6% increase in PSA in

Table 1: *Studies examining prostate cancer progression as a result of dietary and/or lifestyle intervention.*

Dietary Intervention	Author	Sample size at baseline	Severity of disease	Level of evidence
Diet and/or lifestyle modification	Dewell et al[7]	Intervention = 42 Control = 43	Active surveillance	II
	Carmody et al[8]	Intervention = 17 Control = 19	Biopsy confirmed; primary treatment	II
	Ornish et al[9]	Intervention = 44 Control = 49	Active surveillance (Gleason < 7); T1, T2	II
	Parsons et al[10]	Intervention = 30 Control = 13	Active surveillance	II
	Bourke et al[11]	Intervention = 25 Control = 25	Advanced with metastases; ADT	II
	Ornish et al[12]	Intervention = 31	Active surveillance (Gleason < 7)	III-2
	Saxe et al[13]	Intervention = 14	Primary treatment; active surveillance	IV
Lycopene/ Carotenoids	Kim et al[14]	Intervention = 32 Control = 34	T1 or T2; awaiting prostatectomy	III-3
	Grainger et al[15]	Intervention 1 = 20 Intervention 2 = 21	Localised prostate cancer	III-3
Lycopene or fish oil	Chan et al[16]	Intervention 1 = 22 Intervention 2 = 21 Control = 26	Active surveillance Gleason < 7	II
Soy isoflavones	Kumar et al[17]	Intervention = 37 Control = 39	Gleason 6 or lower	II
	Dalais et al[18]	Intervention 1 = 8 Intervention 2 = 10 Control = 8	Average Gleason 5.71-6.5	II
	Napora et al[19]	Intervention = 17 Control = 16	Advanced with metastases	I
Flaxseed supplementation	Demark-Wahnefried et al[20]	Intervention 1 = 40 Intervention 2 = 40 Intervention 3 = 40 Control = 41	Gleason 4-9	III-1
	Demark-Wahnefried et al[21]	Intervention = 15		IV
Iron and zinc	Sarafanov et al[22]	Group 1 = 40 Group 2 = 40	Cancer prior to prostatectomy	III-2
	Epstein et al[23]	n=525	Watchful waiting, hormone therapy, prostatectomy, other	II
Folate	Tomaszewski et al[24]	Group 1 = 87 Control = 25 Group 2 = 19 Control = 25	Gleason 6-9	III-3

the control group, but there were no differences in serum testosterone or prostate cancer cell apoptosis. It is unclear which component of the intervention contributed to this effect, or if it was as a result of synergism of all components. After one year, adherence to the intervention was 95%, with 45% adherence to the control diet, measured using a food frequency questionnaire.[9]

Two recent feasibility studies examined adherence to diet and/or exercise interventions. Men with advanced stage prostate cancer on ADT showed reductions in total fat, saturated and monounsaturated fat intake and total energy after a 12 week lifestyle program, as reported in three day diet diaries.[11] Adherence to this dietary pattern after six months was not reported. In a study of telephone counselling, men on 'active surveillance' increased their intake of cruciferous vegetables and tomatoes, whole grains, beans and legumes as reported by 24 hour recall, with higher plasma levels of carotenoids after six months.[10] Similar outcomes were obtained from other studies with comparable dietary guidance and follow-up times,[7,8] but there was no significant change in disease progression outcomes, only small changes in PSA doubling time.[8] This occurred in another study, along with changes in gene expression for fat and carbohydrate metabolism and the insulin-like growth factor (IGF-1) in prostate tissue. However, due to the mixture of interventions utilised (low fat, plant-based diet; stress management; moderate exercise; psychosocial support), it is unclear which strategy led to this effect, or if it was simply due to energy restriction and weight loss.[12] There are reported adherence issues throughout the intervention and follow-up periods of similar interventions.[11,13] Poor adherence has been linked to weight gain after an initial weight loss at three months, with subsequent re-rising of PSA.[13] This has prompted investigation of whether certain dietary compounds are more powerful than others and may serve as helpful adjunctive therapies, rather than having to rely on such a significant, potentially non-sustainable, energy restriction.

Lycopene

Lycopene is a red carotenoid pigment found predominantly in tomatoes, and is the most efficient antioxidant when compared to other carotenoids and vitamin E.[25] It is highly concentrated in the prostate gland and consumption of 30mg per day has been associated with reduced rates of prostate cancer risk and progression in observational studies.[26] In a study comparing the prostate tissue of 24 men with benign prostatic hyperplasia or prostate cancer pre and post-prostatectomy, consumption of 30mg lycopene per day as 200g spaghetti sauce (3/4 cup) for three weeks prior to prostatectomy resulted in an increase in apoptotic prostate cells and higher rates of cell death.[14] When prostate tissue was compared between cases and controls (no additional lycopene prior to prostatectomy), no significant difference in apoptotic cells or cell death was detected.[14] Although the timeframe was short, adherence to this intervention was good, with patients receiving 82% of the planned lycopene dose pre-surgery.

Another study, the Molecular Effects of Nutritional Supplements Trials, investigated whether 30mg lycopene or 3g fish oil per day for three months could alter the expression of IGF-1 or cyclooxygenase 2 (COX-2), which have been associated with inflammatory pathways and prostate cancer progression in observational studies.[16] IGF-1 has been associated with cancer growth and metastasis and is a novel target of therapies to reduce cancer progression.[27] IGF-1 and COX-2 expression has been reduced by lycopene in breast and colorectal cancer.[28,29] However, in this study of men on 'active surveillance', there was no difference in gene expression for either pathway between the intervention or placebo groups after three months. Similarly, a small case-control study examined the effect of either >25mg lycopene per day (n=20), 40g soy protein supplement per day (n=21) or a combination of both for four weeks (n=41) on IGF-1 and PSA outcomes in men with localised prostate cancer. There was no effect on IGF-1 levels, but a trend towards reduction in PSA doubling time occurred for some men (p=0.08) during both interventions.[15] It is unclear which intervention had the greater effect.

Soy isoflavones

Phytoestrogens comprise isofavonoids and lignans.[30] Epidemiological data suggest the isoflavone content of soy is protective against prostate cancer, as men in Asian countries where soy is regularly consumed have much lower rates of the disease. However, within two generations of living in the US and consuming diets lower in isoflavones, Asian men have a substantially higher rate of prostate cancer compared with those in Asia.[31] The mechanism of action of soy isoflavones is quite well characterised in vitro, but less understood in vivo, due to the paucity of clinical trials conducted in humans. Some published literature suggests that isoflavones may exert an estrogenic effect and lower testosterone levels,[30] however a recent meta-analysis showed that increasing soy protein or isoflavone intake had no effect on testosterone levels in men.[32] An Australian clinical trial showed reductions in total PSA and the ratio of free to total PSA (-15.5%; $p<0.05$) after men consumed 117mg daily soy isoflavones from 50g soy grits baked into bread.[18] An additional reduction in free to total PSA (-10%) occurred when 20g linseed was added to the soy ($p<0.01$).

Another study demonstrated that 60mg soy isoflavones per day for 12 weeks in patients with early-stage prostate cancer was associated with non significant overall reductions in free testosterone and serum total PSA compared with the placebo group, suggesting it may have had an anti-proliferative effect;[17] but this study was of short duration. Conversely, a 12-week randomised control trial administered 20g soy protein (160mg soy isoflavones) or 20g whole milk protein (control) in a group of men with advanced prostate cancer who were on ADT.[19] There were no differences in inflammatory markers (adipokines [leptin, resistin], interleukin-6, TNF-α or C-reactive protein) or serum testosterone levels between the groups.

Flaxseed supplementation

Flaxseeds contain Alpha Linolenic Acid (ALA), a plant-based omega-3 fatty acid which is a precursor to eicosapentanoic acid (EPA) and docosahexanoic acid (DHA), as well as lignans, which belong to the phytoestrogen group. A randomised control trial compared the effects of a low fat diet (<20% energy), a flaxseed-supplemented diet (30g) and a low fat diet supplemented with flaxseeds (<20% energy; 30g) for 30

days prior to prostatectomy on the progression of prostate cancer.[20] Men on low fat diets had significant reductions in serum cholesterol with no other effects. Prostate tissue from men on low fat diets supplemented with flaxseeds or on usual diets supplemented with flaxseeds showed significantly lower prostate cancer proliferation rates compared to the pre-intervention biopsy. These findings were consistent with those obtained in a previous feasibility study,[21] however, there were no differences in PSA or IGF-1 levels in any of the intervention groups.[20] Flaxseed supplementation did not alter erythrocyte or prostate tissue levels of ALA, however EPA levels were higher, suggesting the ALA had already been converted to EPA.

Iron and zinc

Zinc contributes to DNA repair and apoptosis, immune system function and is highly concentrated in the prostate gland.[23] In a large, population-based cohort study, higher intakes of zinc were associated with reductions in prostate cancer mortality, particularly for localised disease.[23] 'High' intake referred to the highest quartile of intake in this study of more than 15.6 mg, quantified through food frequency questionnaires. A recent study analysed post-prostatectomy tissue samples from 40 men and lower concentrations of zinc and iron in prostate tissue were associated with a higher likelihood of rising PSA post-prostatectomy.[22]

Folate and folic acid

Limited trials have focused on the effect of folate levels and folic acid supplementation in prostate cancer. In one randomised control trial aiming to prevent colorectal adenomas using folic acid supplements, new diagnoses of prostate cancer occurred in 9.7% of the intervention group, compared with 3.3% of the control group.[33] A recent study compared prostate tissue folate levels in 19 cases post-prostatectomy with 25 controls and examined associations with serum folate levels in both groups.[24] Men with prostate cancer had significantly higher serum folate levels (taken fasting at prostatectomy) in their cancerous and non-cancerous tissue when compared with controls. Of interest is that there was no significant difference in serum folate results between men taking folic acid supplements (39.5%) compared to those who were not.

Implications

Studies involving vegan diets have prescribed total fat as 10% of energy with inconclusive effects, since the studies have been conducted with concomitant other interventions.[9,12] The emerging associations of tissue levels of zinc and iron with lower prostate cancer mortality and likelihood of biochemical recurrence is important.[22,23] Interventions emphasising vegan diets risk inadequate supply of iron and zinc as well as other nutrients. It is important to note that the Australian recommended dietary intake for zinc for adult males is 14mg/day, while the upper level of intake is 40mg.[34] Although zinc has been shown to have positive associations with prostate cancer mortality, it is critical that the upper level is not exceeded by the consumption of rich food sources and/or multiple supplements, as some observational studies show consumption of more than 100mg per day is associated with a higher risk of death from prostate cancer.[23]

The issue of fat restriction compared with modifying the fat profile of the diet remains uncertain. In the study by Demark-Wahnefried, Polascik and George et al (2008), supplementing the diet with ALA from flaxseed had more effect on reducing prostate cancer proliferation rates than the low fat diet in isolation.[20] Other studies suggest that the conversion of ALA to EPA and DHA is more efficient in the presence of lower levels of linoleic acid ie. diets lower in total fat.[35] ALA and linoleic acid (eg. meat, dairy, nuts, seeds, avocados) compete as substrates for the enzyme, delta-5-desaturase.[36] The product of delta-5-desaturase action on ALA is EPA and DHA, while the product of delta-5-desaturase action on linoleic acid produces arachidonic acid, a precursor to prostaglandin PG_2 which stimulates inflammatory pathways.[36] This suggests that any dietary intervention to reduce prostate cancer progression and systemic inflammation needs to consider the context of the whole diet and that change to nutrient profiles, rather than the elimination of food groups, is more appropriate. Instead of excluding meat and dairy foods, for example, recommendations to consume lean and low fat sources of nutrients may be more appropriate.

There is some evidence to suggest that folate is protective for cells in a precancerous state, but once cells turn cancerous, folate can stimulate cancer proliferation.[37] This has significant implications for men with prostate cancer, particularly those who are consuming plant-based diets, or fortified cereals, rich in folate. However, there were no clinical trials available for inclusion in this review; all of the existing data is cross-sectional and sample sizes are small, therefore no conclusions can be drawn about folate and prostate cancer at present.

There was some evidence for the promotion of apoptosis and prostate cancer cell death after three weeks of lycopene supplementation as tomato sauce (3/4 cup),[14] however studies investigating the effect of short interventions on IGF-1 and COX-2 inflammatory pathways were inconclusive. Other studies of mixed interventions of soy and lycopene could not decipher which was associated with reductions in PSA doubling time,[15] therefore conducting further studies of longer duration with single ingredients may be warranted.

Soy products may have a role in reducing PSA levels in patients with early-stage prostate cancer, however it is unclear whether fermented (miso, tempeh, soy sauce) or non-fermented (soy milk, tofu) soy is more effective. Unfermented soy products contain phytates and trypsin inhibitors, which may limit the absorption of calcium, zinc, iron and magnesium. Given the importance of these nutrients for general health and the association of adequate iron and zinc with healthy prostate tissue, consuming more fermented rather than non-fermented soy products may be beneficial. However, more clinical studies are needed in this area, particularly as the response to soy differed between men with early-stage and advanced prostate disease.

Conclusions

There is substantial epidemiological data on nutritional factors influencing prostate cancer risk, but clinical trials on diet and lifestyle interventions to slow prostate cancer progression once in situ are limited. Most studies differ in the quantities of intervention nutrient provided, trial length and follow-up time,

which precludes direct comparison of findings. No studies report on the processing methods or bioavailability of the nutrients and serum or tissue markers of dietary adherence or absorption are used rarely. Dietary intake measures have either relied on food frequency questionnaires, three-day food diaries or 24 hour recalls, which are unreliable at the individual level and should not be used in isolation to quantify individual nutrient consumption.[38] Multiple methods should be utilised to enable triangulation of the data, particularly when sample sizes are small.

There is a clear opportunity for further research into the modification of dietary patterns, lifestyle and nutrient profiles in men with prostate cancer. The majority of clinical trials conducted have studied men in the lowest prostate cancer severity category of 'active surveillance'. In the few trials that have included men with advanced disease on ADT, interventions appear to have different effects compared to those with less severe disease. No clinical trials of weight management or nutritional therapy have been conducted in men with advanced prostate cancer on ADT in order to prevent and/or alleviate the range of metabolic side-effects. Results indicate that a combination of weight management and lycopene (30mg per day), soy isoflavones or flaxseed supplementation may contribute to delaying prostate cancer proliferation, as results were promising for men on 'active surveillance'. It is important to conduct trials of these nutrients as adjunctive therapies to weight management interventions in men with locally advanced or advanced disease with metastases to ascertain the effect on prognosis and quality of life.

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A REVIEW OF EVIDENCE-BASED PRACTICE IN NUTRITION RELATED COMPLEMENTARY THERAPIES: IMPROVING THE KNOWLEDGE OF DIETITIANS

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Abstract

Use of complementary and alternative medicine in cancer continues to increase and there is a need for health professionals to provide evidence-based information. The aim of this review was to determine whether nutritional supplementation, as a complementary and integrative therapy during oncology treatment, has either improved or adversely affected outcomes. A literature review and appraisal of the hierarchy of evidence until February 2010 were undertaken, excluding individual studies, animal studies, in vitro studies and anecdotal reports. The search results included 52 articles for inclusion. The summary of evidence was divided into four main sections: supplements that had a potential positive effect and no evident harm, supplements that had a potential positive effect but also had side-effects, supplements that had no effect, and supplements that had potential negative/harmful effects. There is a significant volume of evidence concerning nutrition related complementary therapies, however the evidence is generally weak and there are multiple variables making it difficult to extrapolate generalised recommendations for any one type of supplement. The challenge remains to provide strong evidence to support complementary and integrative therapy as part of integrated mainstream treatment therapies.

Complementary and alternative medicine (CAM) is defined as a group of diverse medical and health care systems, practices and products not presently considered to be part of conventional medicine.[1] Complementary therapies are used together with conventional medicine, whereas alternative medicine is used in place of conventional medicine and is therefore generally not recommended.[1] Integrative medicine combines conventional and CAM treatments where there is evidence of safety and effectiveness.[1] Perhaps a more encompassing and emerging term is complementary and integrative therapies (CIT) because it blends evidence-based complementary therapies with conventional medicine.

People with cancer may use CAM in an effort to: treat their cancer; reduce treatment toxicities; improve cancer related symptoms; foster the immune system; assist with quality of life/coping; prevent recurrence; or treat non-cancer related conditions such as arthritis, heart disease and insomnia.[2-6] Types of CAM include nutrition related therapies such as herbal medicines/botanicals, vitamins, minerals, special diets and other natural products including probiotics/enzymes. Non-nutritional types of CAM include mind-body medicines such as meditation, yoga, acupuncture, manipulation and body-based practices such as spinal manipulation and massage, along with other practices such as energy therapy, magnets, art, music and spirituality.

The use of CAM by people with cancer varies significantly in the literature (7% to 91%),[7-12] partly due to considerable differences in definitions/research methodology, practice disclosure issues and because the popularity of CAM continues to increase.[13] A recent Australian study found that 65% of cancer patients used at least one form of CAM, the most common type being nutritional supplements.[14] Despite common medical concerns, reports of adverse effects from the use of CAM in this study were rare (3%) and reported perceived benefits common (90%).[14] This study also reported that most patients (90%) agreed that medical doctors should consider learning about CAM to provide appropriate advice to their patients, highlighting the need to assist clinicians to provide evidence-based information.[14]

Another recent study conducted in Asia found that 71% of participants did not discuss their CAM use with their oncologists, mainly because the doctor never asked, 29% did not discuss with any healthcare providers and 64% obtained advice from friends/families.[15] When the issue was discussed, 73% of oncologists did not encourage using CAM, especially during radiotherapy.[15] This study suggested that oncologists should initiate discussion in a non-judgemental manner so as to encourage disclosure and highlighted the need for high quality communication.[15]

Numerous guidelines have been published on communication and decision making regarding CAM.[16-18] Health professionals should be informed about commonly used CAM and be able to access evidence-based information on potential benefits, harm and interactions, to advise patients accordingly.[15,16] Health professionals should be proactive in discussing with patients how well they are coping and the use of CAM.[15] Being open minded, using effective communication skills, and working together as a team appear vital for an improved patient journey and outcomes.[16,18]

Some may question which health professionals' role/scope of practice includes CIT, and it appears pertinent that all team members play a part and remain up-to-date with professional development in this area. Dietitians are ideally placed to have open dialogue with patients on CIT, especially nutrition related therapies, and to assist with decision making. Basic training for dietitians includes chemistry, physiology, evidence-based practice and

literature appraisal, communication and counselling skills, and complex decision making skills. In addition, dietitians are well placed members of the multidisciplinary team, liaising regularly with medical, nursing and allied health staff, including pharmacists, and could act as patient advocates to discuss CIT with all team members.

Currently in clinical practice, dietitians are frequently asked by patients for advice on CIT. The aim of this review is to determine whether nutritional supplementation as a CIT during any type of oncology treatment has either improved or adversely affected outcomes for patients. With this increased knowledge, it is proposed that dietitians would feel more comfortable and confident in discussing CIT with their patients.

Search criteria

A literature review was performed including relevant guidelines, summaries (via Up-To-Date, British Medical Journal clinical evidence), synopses, syntheses and systematic reviews (via Evidence-based medicine reviews, Cochrane Library, Pub Med Clinical Queries), and hand searching of reference lists of those articles retrieved. Search terms included 'cancer' and any form of oral nutrition supplement eg. vitamins, minerals, micronutrients, herbs, antioxidants, fish oils, carotenoids, flavonoids, or soy, and also included medical subject headings. Inclusions were English language and human studies. Exclusions were parenteral nutrition or enteral nutrition with supplements added, eicosapentaenoic acid in relation to cancer cachexia (as guidelines already published),[19] and primary prevention trials. The hierarchy of evidence was searched up until February 2010 and limited to higher levels of evidence. Grey literature was not within the scope of this review and individual studies for each therapy, animal studies, in vitro studies and anecdotal reports were excluded. Following article retrieval, the evidence was appraised using the National Health and Medical Research Council's levels and grades of evidence.[20] Each paper was reviewed independently by both authors and consensus was reached on the levels/grades of evidence.

Current data

The search results included eight existing guidelines, one summary of evidence (via Up-To-Date), eight synopses of evidence (via Evidence-based medicine reviews),[18] syntheses of evidence (via Cochrane) and 12 clinical queries (via Pub Med). Hand searching of reference lists identified a further five papers, resulting in a total of 52 articles for inclusion.

Summation of nutrition related complementary therapy evidence was based on four main categories: supplements that had a potential positive effect and no evident harm (see table 1); supplements that had a potential positive effect but side-effects (see table 2); supplements that had no effect (see table 3); and supplements that had potential negative/harmful effects (see table 4).

Table 1: *Supplements with potential positive effect and no evident harm.*

CIT	Potential positive effects	Potential negative/ harmful effects	Grade for recommendation
Calcium supplement (1200-2000mg/d) for patients with colorectal adenomas/polyps	Reduces recurrence of this pre-cancerous state.	Nil	B[21,22*]
Vitamin E supplementation for breast cancer survivors	Assists with reducing hot flashes especially in those receiving tamoxifen.	Nil	B[23*]
Glutamine supplementation in a swish and swallow solution for breast cancer patients receiving anthracycline chemotherapy	Assists with reducing the incidence and severity of oral mucositis.	Nil	C[23*]
Melatonin (20mg/d) (pineal gland secretion) taken by patients who have not responded to treatment or do not accept treatment	Longer survival and less weight loss.	Nil	C[24,25*]
Melatonin added to chemotherapy (most trials 20mg orally in the evening commencing one week prior to chemotherapy)	Reduces dose-limiting toxicities.	Nil	C[26*]
Melatonin added to chemotherapy (most trials 20mg orally in the evening commencing one week prior to chemotherapy)	Reduces dose-limiting toxicities.	Nil	C[26*]
Melatonin added to doxorubicin for breast cancer patients	Better clinical response.	Nil	C[23*]

Table 1 continued:

CIT	Potential positive effects	Potential negative/ harmful effects	Grade for recommendation
Levocarnitine (L-carnitine)	Assists with cancer related fatigue.	Nil	D[27*]
Selected vegetables or Sun's soup (vegetable and herb mixtures that contain phytochemicals) for patients who have not responded to treatment or do not accept treatment	Prolongs survival.	Nil	D[24*]
Multiple vitamin and mineral supplement (contains approximately 100% of the daily recommended values) taken during and after cancer treatment	Probable benefit, because during these times, it may be difficult to eat a diet with adequate amounts of these micronutrients.	Nil	Expert opinion[27]

* A= Body of evidence can be trusted to guide practice. B= Body of evidence can be trusted to guide practice in most situations. C= Body of evidence provides some support for the recommendation but care should be taken in its application. D= Body of evidence is weak and recommendation must be applied with caution.[20]

Table 2: *Supplements with potential positive effect but have side effects.*

CIT	Potential positive effects	Potential negative/ harmful effects	Grade for recommendation
Hydrazine sulphate	Beneficial in terms of anthropometric measures and appetite, but has no benefit on survival.	Associated with hepatorenal failure.	B – anthropometric effects, appetite[24*] Expert opinion – potential harmful effects[24*]
Arginine taken prior to the start of neoadjuvant chemotherapy for breast cancer	Assists with histopathological response in tumours <6cm.	Insufficient evidence to evaluate the safety.	B – histopathological response[29*] Insufficient evidence - safety
Vitamin E (400IU/268mg), alone or in combination with beta-carotene, for head and neck cancer patients during radiotherapy	Reduces acute severe side-effects of treatment and osteoradionecrosis.	Decreased survival, increased risk of second primary cancers, and increased cancer mortality and recurrence in smokers. There are also concerns about nutrient and drug interactions (with anti-coagulants and anti-hypertensive drugs).	B – positive and harmful effects[17, 29, 30*]
Organosulfur compounds (Oltipraz and anethole dithiolethione) for patients with lung cancer or at high risk of lung cancer (i.e. smoking history with dysplastic lesions)	Reduced rate of progression in those with pre-existing dysplastic lesions.	Not recommended as hepatotoxic. Gastrointestinal side effects also documented.	B – progression rate[31*] C – potential harmful effects[31*]
Organosulfur compounds (Oltipraz and anethole dithiolethione) for patients with lung cancer or at high risk of lung cancer (i.e. smoking history with dysplastic lesions)	Reduced rate of progression in those with pre-existing dysplastic lesions.	Not recommended as hepatotoxic. Gastrointestinal side effects also documented.	B – progression rate[31*] C – potential harmful effects[31*]

Table 2 continued:.

CIT	Potential positive effects	Potential negative/ harmful effects	Grade for recommendation
Antioxidant supplementation (including amifostine, vitamin C, E, Mg) during radiotherapy for pelvic malignancy	Decreases side-effects of radiation	Reduced local tumour control and survival.	C - positive and harmful effects [17,28,30,32*]
Antioxidant supplementation during chemotherapy	Assists with reducing dose limiting toxicities, particularly neurotoxicities, especially vitamin E, melatonin, amifostine, and glutathione. No statistically significant improvements though, have been seen with vitamin C, selenium or beta carotene for lung cancer patients in terms of response, survival, or toxicity, although there is a trend to improvement and further research is needed. No evidence on reducing efficacy of the chemotherapy or influencing response or survival.	Limited evidence concerning safety and interactions.	C – positive effects [17, 24, 25,26,29, 30*] Insufficient evidence - safety
Vitamin A (or the analogue Fenretinide)	Evidence inconclusive, but may improve response, survival, delay disease progression, decrease recurrence and assist with pain/anal ulceration during pelvic radiation. Note there are significant inconsistencies in the literature for different tumour types and menopausal status.	May be associated with increased chemotherapy toxicities and the toxic syndrome hypervitaminosis A.	C – positive effects [17,25,26,32,33*] C - toxicities [26*]
Green tea (greater or equal to five cups/day)	Drinking green tea appears to be safe at moderate, regular and habitual use (3-5 cups/ day; 250mg/day catechins) and may be associated with lower recurrence and longer disease free period for cancer patients, especially in the early stages of tumour development.	Intake greater than this allowance has been associated with emesis, abdominal pain, flatulence, insomnia, diarrhoea, dizziness, confusion and tachyarrhythmia. Preclinical trials also suggest that green tea may inhibit the effect of bortezomib used to treat multiple myeloma.	C – positive effects [24,34,35,36*] D – potential harmful effects [24,34,36*]
Honey (topical application) in head and neck cancer patients receiving radiotherapy	Prevents mouth sores.	Interference with effectiveness of radiation has not been evaluated.	C – mouth sores [29*] Insufficient evidence – safety
Mistletoe	Improves quality of life, fatigue, immune function, therapy effects and survival however there is no evidence to support routine use.	Usually well tolerated, depending on the dose; care should be taken to monitor for allergic reactions including anaphylactic shock and numerous other adverse side-effects.	C – positive and harmful effects [24,27,34,37,38*]

Table 2 continued:.

Mistletoe	Improves quality of life, fatigue, immune function, therapy effects and survival however there is no evidence to support routine use.	Usually well tolerated, depending on the dose; care should be taken to monitor for allergic reactions including anaphylactic shock and numerous other adverse side-effects.	C – positive and harmful effects[24,27,34,37,38*]
PC-SPES (PC=prostate cancer; SPES=Latin for hope; mixture of Chinese and one American herb)	Could be associated with reduced levels of prostate specific antigen (PSA) and soft tissue shrinkage, however evidence on its efficacy is inconclusive.	There have also been multiple cases of adverse events eg. toxicity of acquired bleeding tendency and also concerns about contamination of ingredients resulting in FDA product recall in 2002.	C – positive effects[17, 24*] Expert opinion and case reports – potential harmful effects[17, 24*]
Individualised Chinese herbs prescribed by a qualified herbalist	Reduces nausea and improves quality of life and bone marrow function in some studies, especially breast and colon cancer. Experts also believe, and some studies have shown, Chinese herbs may assist with alleviating the toxic side-effects caused by chemotherapy, improving the rates of remission and reducing short-term mortality, however evidence is inconsistent.	Limited information is available on safety.	C – nausea, quality of life, marrow function[24, 39, 40*] Insufficient evidence - safety
Ginseng	Decreases fatigue.	Experts have advised that it is also associated with side-effects such as diarrhoea, headaches, hypertension, insomnia, nausea, and anticoagulant effects, and should be used cautiously with chemotherapy and discouraged completely for breast and endometrial cancer patients as it may stimulate tumour growth.	C – fatigue[17, 24, 41*] Expert opinion – potential harmful effects[17, 24, 41*]
Coenzyme Q10 (or vitamin Q10, ubiquinone, or ubidecarenone) during chemotherapy for leukaemia	Might protect from cardiotoxicity.	Interacts with warfarin and insulin.	D - cardiotoxicity[24, 26*] Expert opinion – potential harmful effects [24*]
Calcium and vitamin D supplementation in prostate cancer patients.	May have a role in improving metastatic pain and muscle strength and reducing progression of disease.	Care must be taken with calciuric side-effects and close monitoring is needed.	D – positive effects[42, 43, 44*] Expert opinion and case reports – potential harmful effects [44*]
Chinese herb astragalus membranaceous (Huangqi compound) added to chemotherapy	May be associated with a reduced risk of death, an improved response rate and a better performance status, increased white cells, and reduced nausea/vomiting, especially for colorectal cancer, however evidence is inconclusive.	Limited information is available on safety.	D - positive effects [24, 45*] Insufficient evidence - safety

HESA-A (herbal mixture) or Ai-Tong-Ping capsules (herbal supplement)	Currently there is insufficient evidence, however preliminary data suggests there may be a benefit to relieve cancer pain.	Limited information is available on safety.	D - pain[46]* Insufficient evidence - safety
Chinese herb Hauchansu, added to chemotherapy	Might improve leukopenia caused by chemotherapy, but does not improve rate of short-term remission.	Limited information is available on safety.	D – positive effects[40]* Insufficient evidence - safety
St John's wort	Might assist in skin cancer management.	Concerns about safety, interaction with medications metabolised by CYP3A4 cytochrome, nausea and hypersensitivity reactions during chemotherapy, and potential altered levels of drugs (through effects on metabolism eg. cytochrome P450).	D – positive effects[16, 17, 24, 41]* Expert opinion – potential harmful effects[16, 17, 24, 41]* D - altered levels of drugs [17]*
Botanical agents and herbs within the context of clinical trials for cancer patients who have not responded to treatment or do not accept treatment	May provide benefits such as immunomodulatory effects, reduced side-effects and toxicities, and improved quality of life.	Some evidence of drug-supplement interaction, antiplatelet effects, gastrointestinal effects and toxicities.	D – positive effects[16, 24, 47]* Expert opinion – potential harmful effects[16, 24, 47]*

* A= Body of evidence can be trusted to guide practice. B= Body of evidence can be trusted to guide practice in most situations. C= Body of evidence provides some support for the recommendation, but care should be taken in its application. D= Body of evidence is weak and recommendation must be applied with caution.[20]

Table 3: *Supplements with no effect.*

CIT	***Evidence-based statement***	***Grade for recommendation***
Selenium	Currently research findings do not provide a basis for any recommendation in favour of or against selenium supplementation in cancer patients. Some believe it may assist with toxicities related to oncological treatment, on development and severity of secondary lymphoedema and on quality of life, however this has not been shown in the research.	C[48]*
Lycopene	Currently, there is insufficient evidence to draw a firm conclusion with respect to lycopene supplementation in prostate cancer patients. There is some suggestion of improved clinical response and cancer related symptoms however more research is needed. Severe toxicity or intolerance does not appear to be evident.	C[49]*
Copper and zinc	No role in prevention or treatment of breast or lung cancer outside of a well designed trial.	D[23, 31, 33]*
Shiitake mushroom extract	Is an ineffective treatment for men with clinically advanced prostate cancer.	D[24]*
Essiac herbal mixture	Systematic review did not find one study on the use of Essiac herbal mixture by a Canadian Ojibwa healer – therefore there is no definitive evidence of its utility but it is unlikely to cause serious adverse effects.	Expert opinion[24]

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Table 4: *Supplements with potential negative/harmful effects.*

CIT	Potential positive effects	Potential negative/harmful effects	Grade for recommendation
High dose supplements of vitamins, minerals and other bioactive compounds ie. >100% of daily value	Micronutrient supplements do not have any specific benefits.	Should be avoided by cancer patients receiving treatment and survivors as they can be harmful or toxic. Patients should check with medical professionals regarding specific current evidence, side effects, and potential interactions.	A – no benefit[50]* Expert opinion – potential harmful effects[16, 28, 50]
Antioxidant supplementation for primary or secondary prevention of lung and other cancers during and after cancer treatment	No evidence of benefit.	May increase some cancers eg. bladder and lung. No evidence of an association with mortality.	A – incidence[31, 51, 52]* B – mortality[53]*
Beta carotene supplementation for lung cancer patients (or individuals with a smoking history >20 pack years)	Not recommended.	Associated with increased rates of lung cancer.	A – lung cancer rates[31]*
Phyto-oestrogens to treat breast cancer	No evidence that it eases the symptoms such as hot flashes.	Some experts believe it might stimulate tumour growth, interact with tamoxifen and should be avoided in breast/endometrial cancers, however no adverse events in prostate cancer have been documented.	A – hot flashes[16, 17, 23, 34]* Expert opinion – potential harmful effects[16, 17, 34]*
Fish oils/omega 3/ eicosapentaenoic acid (EPA)	No evidence of benefit for cancer related symptoms (cancer cachexia excluded) such as appetite, fatigue, nausea, lean body mass, intake, infections.	Potential drug-nutrient interactions eg. herbal supplements, anticoagulants, antihypertensives.	B – no benefit[24, 29]* Expert opinion – potential harmful effects[24, 29]*
Shark cartilage	No evidence of benefit on survival.	Adverse events have been documented eg. emesis, constipation, hepatitis, and hypercalcaemia. Some experts also believe it to be a potential inhibitor of angiogenesis and should therefore be avoided in pregnancy, the perioperative period, and vascular insufficiency.	B - survival[17, 24]* Expert opinion and case reports – potential harmful effects[17, 24]*
Vitamin E (670-1000mg oral) for treatment of chronic radiation induced fibrosis for breast cancer patients	No evidence of benefit however research inconclusive.	There are concerns about drug-nutrient interactions eg. Anticoagulants.	C - benefit[17, 29]* Expert opinion – potential harmful effects[17, 29]*
Thymus extract	Research is inconclusive, but suggests it does not improve chemotherapy effects or reduce tumour growth despite suggestion from limited low quality studies.	Care must be taken as it can result in severe allergic reactions and severe infections when injected.	D - benefit[24]* Expert opinion and case reports – potential harmful effects[24]*
Valerian	Not recommended.	Causes toxicity during chemotherapy.	Expert opinion - potential harmful effects [24, 41]
Chinese herb Aristolochia fangchi	Not recommended.	Potentially nephrotoxic and may be associated with increased risk of transitory epithelium cancer.	Expert opinion - potential harmful effects [34]

CIT	Potential positive effects	Potential negative/harmful effects	Grade for recommendation
Dong Quai (contains Safrol as active ingredient)	Not recommended.	Tumorigenic and should also be avoided by those taking tamoxifen due to the phytoestrogen properties.	Expert opinion - potential harmful effects [16,34]
Echinacea	Avoid during chemotherapy.	Hypersensitivity reactions including anaphylaxis.	Expert opinion - potential harmful effects [24,41]
Ginkgo	Avoid during chemotherapy.	Emesis, headaches and potential interaction with anticoagulation medications.	Expert opinion - potential harmful effects [16,17,24,41]
Comfrey	Not recommended.	Hepatotoxic.	Expert opinion - potential harmful effects [34]
Laetrile (purified amygdalin from the kernels of apricots, peaches and bitter almonds)	No clinical trials have been conducted to investigate accurately if it can slow cancer progression as FDA and Europe have banned its use.	Can cause emesis, headaches, dizziness, obtundation, dermatitis and cyanide poisoning.	Insufficient evidence – potential positive effects Expert opinion - potential harmful effects [24,54]
Grape seed	Not recommended.	Interacts with numerous chemotherapy agents and should therefore be avoided.	Expert opinion - potential harmful effects [24,41]
Garlic	No evidence of benefit.	Should be avoided by those patients receiving decarbazine and anticoagulation medications due to potential interactions, and caution should be taken with other chemotherapy agents.	Expert opinion - potential harmful effects [16,17,24,41]
Kava	No evidence of benefit.	Should be avoided by all patients with pre-existing liver disease or injury and with all potentially hepatotoxic chemotherapy agents.	Expert opinion - potential harmful effects [16,34,41]

* A= Body of evidence can be trusted to guide practice. B= Body of evidence can be trusted to guide practice in most situations. C= Body of evidence provides some support for the recommendation but care should be taken in its application. D= Body of evidence is weak and recommendation must be applied with caution.[20]

As seen in table 4, there is strong evidence (Grade A) concerning a small number of nutrition related therapies. High dose supplements of vitamins, minerals and other bioactive compounds do not have any specific benefits seen in the research (Grade A) and there is expert opinion concerning potential negative/harmful effects. In addition, phyto-oestrogens to treat breast cancer have shown no benefit on easing symptoms such as hot flashes (Grade A) and some experts believe it might stimulate tumour growth and should be avoided in breast and endometrial cancers. Of great concern is that antioxidant supplementation during and after cancer treatment may increase the incidence of some cancers (Grade A), including bladder and lung (with beta carotene).

Implications

It appears that evidence concerning nutrition related CIT during oncology treatment is generally quite weak, with a few exceptions. Specifically, high dose supplements and phyto-oestrogens have shown no benefits, while antioxidants may increase the incidence of some cancers. These conclusions may be due to the lack of large randomised control trials and the sheer number of variables that need consideration in this area of research. These include supplement type/dose/timing, tumour stream and stage, treatment type, and other medications/treatments that potentially could interact. These multiple factors also make it difficult to extrapolate broad recommendations for any one type of supplement.

Much of the research conducted to date is not sufficiently detailed to provide strong conclusions for practice. For example, much of the research around antioxidants does not outline specifics and as further evidence comes to light, these factors appear pertinent. Some antioxidants including vitamin E, melatonin, amifostine and glutathione supplementation during chemotherapy may assist with reducing dose limiting toxicities. However, antioxidant supplementation during radiotherapy may be associated with reduced local tumour control and survival, especially vitamin E with head and neck cancer.

The implication from these finding for oncology dietitians in practice is that they should be as specific as possible when reviewing the research and encourage patients to consider all factors relating to supplement type, tumour stream and treatment plan, in decision making. There is also an ethical obligation to ensure patients are well informed, particularly where there is strong evidence of supplements with potential negative/harmful effects, and to clearly emphasise the importance of specificity. Additionally, personal circumstances need to be considered and advice should be individualised.

It appears that many of the recommendations in the literature concerning potential side-effects, toxicities and interactions are based on expert opinion. One would think this is due to the ethical difficulties in conducting randomised trials in this area, especially if there is a theoretical risk of harm. There is a tendency for health professionals to discourage patients from taking supplements altogether if there is any risk of harm. However, it is worthwhile considering the basis for the expert opinion and the relevant applicability to individuals' circumstances. For example, is the risk a theoretical risk, has it been seen in animal studies only, or reported in individual participants in human case studies, or in research outcomes.

Traditionally, CIT has probably been outside of the scope of practice for most dietitians. However, with the rise of evidence-based therapies such as medical nutrition therapy and more recently functional nutrition therapy, where active nutrients, ingredients and functional foods are used in a therapeutic manner to address nutritional deficiencies and nutrition-related problems, dietitians need to be approachable and keep abreast of current developments and trends, in order to guide patients through what can be a very complex decision making process. Oncology dietitians should endeavour to include CIT in their regular professional development in this fast growing area.

Patients will often weigh up the benefits and risks themselves. For example, a patient suffering from severe fatigue may choose to take ginseng despite expert advice that it may cause emesis, headaches and interact with anticoagulation medications. The requirement for oncology dietitians is to encourage patients to consider the basis for reported potential harm, and to liaise with other members of the multidisciplinary team who may be more knowledgeable in this area, such as medical staff and pharmacists. There are also a number of databases/websites available. Individual supplements may be assessed for potential interactions/side-effects. Patients may thereby be provided with useful information to assist in decision making. Examples include the Natural Medicines Comprehensive Database,[55] the Memorial Sloan-Kettering Cancer Centre website,[56] the National Centre for Complementary and Alternative Medicine website,[57] the Office of Cancer Complementary and Alternative Medicine website,[58] and the Therapeutic Goods Administration website.[59]

Additionally, dietitians should refer patients to qualified CIT practitioners, however this may be more difficult in Australia than in other countries throughout Asia, America and Europe where CIT practitioners often work side-by-side with the traditional multidisciplinary team. CIT practitioners should have completed the relevant education and be a member of a professional association. For example, an association with high entry standards for naturopaths/herbalists is the National Herbalists Association of Australia. In addition, some naturopaths have completed degrees or post doctoral study and it would be ideal for dietitians to determine if any such practitioners are located in their area. There is also the Australian Acupuncture and Chinese Medicine Association and the Chinese Medicine Registration Board of Victoria. Chinese Medicine Practitioners will soon be included in the National Registration Accreditation Scheme in 2012.[60] Ideally, people should meet a few CIT practitioners in their local area to find out about their background, experience and training, and then build a referral list to provide diversity. In addition, a referral letter including medical history and treatment plan, medications, and dietary recommendations should be provided to increase patient safety.

It would also be beneficial for patients and clinicians alike, if more oncology treatment centres throughout Australia would look to integrate qualified CIT practitioners into the more traditional multidisciplinary team structure. One example is the SolarisCare Cancer Support Centre located within the Sir Charles Gardiner Hospital, Western Australia, which opened in 2001 to provide free information, support and supervised complementary therapies in a drop-in community centre style service on a tertiary hospital campus.[61] This innovative service, focused on non-nutritional CIT, has demonstrated a positive impact on quality of life and symptom distress.[62] Throughout the world, there are numerous other examples of similar integrative services.

The limitations of this review should be acknowledged and considered when interpreting the findings. The scope and methodology excluded non-English publications and due to the use of CIT, for example in parts of Asia and Europe, potentially important information may have been omitted. In addition, individual studies for each therapy and grey literature such as animal studies, in vitro studies and anecdotal reports were also excluded. As this is an emerging area of research, the grey literature could potentially highlight important beneficial findings to explore in higher level studies. Some proponents of CIT may not have the medical model background in evidence-based practice, and may not have conducted research in areas they believe from experience to show benefit.

It appears dietitians are well placed to guide oncology patients through decision making regarding CIT and that a collaborative effort by the entire multidisciplinary team is needed regarding potential interactions, interpreting the literature and making recommendations for practice. The traditional oncology multidisciplinary team may need to reconsider its scope to engage with CIT practitioners. Such an integrative approach would need cooperation between practitioners in relation to individual patients and the need to support the patient using a sympathetic but evidence-based approach, rather than simply producing barriers which may result in non-disclosure by the patients and a missed opportunity to integrate therapies safely.

As a result of this literature review, the authors plan to integrate the findings into 'The Integrative Medicine Drug-Complementary Medicine Project', sponsored by the Complementary and Integrative Therapies Interest Group of the Clinical Oncological Society of Australia. This group comprises pharmacists, naturopaths, herbalists, dietitians, nurses and oncologists. It seeks to undertake comprehensive reviews of the literature to establish the level of evidence suggesting an interaction between three to five key chemotherapeutic agents and the most commonly used herbal and nutritional supplements in Australia. It is hoped that by working together we will be able to foster respect between different practitioners, promote consistent messages to patients, provide more widely available guidelines in this area, and identify clearer evidence-based recommendations for practice to improve the patient journey.

Conclusion

This review found a significant volume of evidence concerning nutrition related complementary therapies, however the strength of the evidence is generally weak. In addition, there are multiple variables that need to be considered in the research, making it difficult to extrapolate recommendations for any one type of supplement. The challenge remains to provide strong evidence to support CIT as part of mainstream treatment therapies. Collaborative engagement between the proponents of CIT and established multidisciplinary teams is needed to enable well designed randomised control trials that include large numbers of patients and relevant clinical endpoints. Further research is also needed in order to map with confidence relevant potential interactions and side-effects.

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MENTORING AND PROFESSIONAL SUPPORT PROGRAMS IN CANCER NUTRITION FOR REGIONAL DIETITIANS

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Abstract

Increasing numbers of cancer patients are receiving radiotherapy treatment in regional areas, in addition to those requiring long-term local follow-up on treatment completion at metropolitan centres. Dietitians in rural and remote areas are by necessity required to practise a broad range of nutritional interventions. A limited knowledge of specialist cancer nutritional management, particularly for head and neck and upper gastrointestinal cancer, can arise from lack of exposure to a cancer caseload, limited access to professional development and recruitment and retention issues. Mentoring and professional support has been demonstrated to improve confidence, facilitate skill development and build professional networks. Mentoring and professional support programs in head and neck and upper gastrointestinal cancer across various states in Australia assist regional dietitians and other health professionals in improving care for regional cancer patients through support in delivering a high quality and sustainable service.

Cancer nutrition in regional areas

Between 2003 and 2007 a total of 174,714 cases of cancer were diagnosed in regional and remote areas of Australia.[1] Cancer patients living in rural and remote areas are known to have poorer outcomes than those in metropolitan areas.[2] The mortality rate for all cancers combined for people living in remote and very remote areas of Australia over the five years from 2003 to 2007 was higher than for people living in more urbanised areas.[1] Numerous authors have discussed the disparities in treatment outcomes between metropolitan and regional areas.[2-4] A multitude of reasons have been proposed to explain this disparity, including stage of cancer at presentation, socioeconomic disadvantage, indigenous status, treatment disparities and the comparatively small cancer caseloads of regional clinicians.[2,3] Initiatives such as the National Radiotherapy Single Machine Unit trial have stemmed from the need to decentralise cancer services and provide access to treatment closer to home for patients living in regional areas.[5] The impact of the trial was to redistribute radiotherapy services from metropolitan areas through an increase in the number of patients receiving radiotherapy at regional centres.[5] The increasing numbers of cancer patients receiving medical treatment in regional centres, in addition to those requiring long-term follow-up care upon

completion of treatment at metropolitan sites, highlights the importance of evidence-based supportive care and allied health services to be provided alongside medical care.

Dietitians in rural and remote settings are required to provide a broad range of patient care for all patients with cancer, often without having the opportunity to gain specialist experience. Exposure to cancer caseloads may be limited, particularly in relation to rare or complex cases which tend to be treated in metropolitan centres.[4,6] Some authors recommend the establishment of regional cancer centres of excellence, with multidisciplinary care and support and educational services with links to metropolitan sites for mentoring and continuing professional development to address this issue.[4,7] Dietitians in metropolitan cancer centres have a professional responsibility to provide support and mentoring for rural and remote colleagues.

Support for rural and remote dietitians

In addition to the generalist nature of rural dietetics practice, a number of factors may contribute toward a limited knowledge of cancer nutrition in rural and remote areas. These include minimal exposure to oncology cases during undergraduate clinical placements and limited access to professional development, as well as recruitment or retention issues. Difficulty in recruiting and retaining staff in rural and remote areas can lead to high staff turnover and loss of knowledge and experience, highlighting the importance of ongoing and sustainable mentoring and professional support.

Mentoring and professional support models in cancer nutrition trialled in Australia have focused on nutritional management of patients with head and neck or upper gastrointestinal cancers. These tumour types were chosen due to the impact of the tumour and the treatment on nutritional status. The prevalence of malnutrition prior to head and neck surgery ranges from 20-67% and prior to chemoradiation can be as high as 50% of patients.[8-10]

Nutritional intake may be further compromised during treatment secondary to anatomical changes following surgery and from the acute toxicities of chemoradiation, including mucositis, xerostomia and dysgeusia, with up to 57% of patients requiring enteral feeding during treatment.[11] The literature reports patients with tumours of the upper gastrointestinal tract experience similar nutritional concerns. Up to 69% of patients with oesophageal cancer experience weight loss with mean weight loss between 13 and 16% of body weight.[12] A recent study demonstrated 75% of gastrointestinal cancer patients experience loss of weight during chemoradiation.[13] Following the completion of treatment, acute toxicities can take months to resolve.[14,15] Evidence-based guidelines for the nutritional management of patients receiving radiotherapy recommend a minimum six month follow-up for patients who require enteral feeding during radiotherapy.[16] Follow-up should ideally occur close to home.

In complex cases there can be long-term consequences for nutrition, with one study demonstrating a gastrostomy tube dependency rate in head and neck cancer patients of 19% at 12 months following completion of chemoradiation.[17] Throughout Australia, most head and neck and upper gastrointestinal cancer patients receive treatment in a few tertiary centres, often travelling vast geographical distances and returning home to receive community follow-up. The post treatment period is when rural dietitians are most likely to come across these patients during long-term follow-up care of complex cases discharged from metropolitan centres. Close links with metropolitan colleagues are vital to ensure continuation of optimal patient care.

The literature describes numerous benefits to mentees from mentoring, including improved confidence, skill development, enhanced professional support networks and improved recruitment and retention of staff.[18-20] Valued qualities of a mentor are reported as experience and knowledge in the practice area and traits such as a friendly and positive personality.[21] While traditional mentoring has involved a one to one relationship, new models of mentoring are emerging in the form of peer and group mentoring, with demonstrated effectiveness.[22] Several strategies to provide mentoring and professional support to rural and remote dietitians have been employed across various states, although all have used a component of group based mentoring due to the numbers of dietitians involved. These programs have used concepts from mentoring models and adapted them to the specific professional support needs of the group, with most containing a multidisciplinary element. Strategies used have included the employment of experienced oncology dietitians as mentors or facilitators, workshops, interactive videoconferences and shadowing/ observation of clinical practice.

Mentoring and professional support models used in Australia

Victoria

A partnership between Western and Central Melbourne Integrated Cancer Service and Loddon Mallee Integrated Cancer Service was formed in 2010, to undertake a project funded by the Victorian Government to improve care for regional cancer patients through support and mentoring of regional health professionals. The project built upon a previous Commonwealth funded mentoring project. It aimed to provide a model of support for regional dietitians and speech pathologists through training and mentoring at both a general cancer level and the development of specialist skills in head and neck and upper gastrointestinal (GI) cancer management. The project was undertaken in three stages. The first stage consisted of a learning needs survey distributed to dietitians, speech pathologists and nurses in the Loddon Mallee region. The survey enabled regional clinicians to identify their learning needs from a list of areas in the management of head and neck and upper GI cancer, as well as their level of confidence in management of specific discipline related issues in these tumour groups.

A project dietitian from Peter MacCallum Cancer Centre and a project speech pathologist from St Vincent's Hospital, Melbourne, were employed for the second stage of the project, developing and delivering education and training to the regional clinicians. This included two day workshops attended by 15 dietitians, 10 speech pathologists and six nurses. The workshop content was based largely on the learning needs identified in the needs survey. Following

the workshops, six dietitians and two speech pathologists participated in shadowing visits which involved regional clinicians visiting one of the metropolitan hospitals to consolidate skills learnt during the workshops and observe and participate in patient management. Site visits were also conducted by the project clinicians, upon request, to visit clinicians in their regional setting to consolidate skills in a local setting with local patients. Resource packs containing theory on evidence-based nutrition, speech and swallowing management of head and neck and upper GI cancer, references and resources, case studies, referral pathways and discharge proforma's between regional and metropolitan centres, and patient education material, were developed by the project clinicians and disseminated to the workshop participants. The content was informed by feedback from participants during a brainstorming session at the workshops, the workshop evaluation and any unmet learning needs from the needs survey.

The final stage was the development of a sustainable model of mentoring and support to maintain and build on the knowledge, skills and confidence in nutrition, speech and swallowing management of head and neck and upper GI cancer in the Loddon Mallee region. A key element of the sustainability plan was the establishment of regional lead clinician roles in the disciplines of dietetics and speech pathology, with responsibility for updating the resource packs annually and facilitating ongoing professional development opportunities in the region with support from the metropolitan clinicians.

Evaluation following the workshops indicated all participants had an increased knowledge of head and neck and upper GI cancer management. Final evaluation at project completion demonstrated educational needs had reduced and confidence had increased.

Queensland

An opportunity to address the professional development needs of health practitioners working with the long-term and complex needs of patients with head and neck cancer came through the Cancer Care Workforce Learning and Development Initiative. This employed four 0.5FTE Workforce Development Officers commencing in 2009, with positions funded until June 2011. Each Workforce Development Officer has a statewide clinical portfolio focused around the key allied health areas documented in the Queensland Statewide Cancer Treatment Services Plan 2008-17. Within each clinical portfolio area, the brief was to look at new ways of learning and to develop mentoring type programs modelled on the Pharmacy Mentoring Program at Princess Alexandra Hospital (2006-07). In May-June 2009, the Head and Neck Cancer Mentoring Program was piloted as a structured five week mentoring program for staff working in both metropolitan and rural/remote areas.

Fifty participants from allied health, oral health, nursing and medical streams provided individual learning objectives, a learning contract and demonstrated manager support. Funding was available for an experienced speech pathologist and dietitian to develop the content and deliver the program. A specialist dentist also delivered a videoconference attended by an additional 51 oral health staff.

The program incorporated five two-hour interactive videoconferences. Content was tailored to mirror participants' learning objectives and focused on the problems experienced by head and neck cancer patients that are often addressed by allied health staff. Participants were encouraged to share individual case studies and experiences with the group. Phase I evaluation included participant and line manager email surveys and focus groups. It was identified that the coordinated approach contributed to the program's success.

The very popular pilot program resulted in further funding for July 2009 - June 2010. The program was renamed Head and Neck Cancer Peer Support Program to reflect the diverse needs of participants. The 91 participants linked in from 19 videoconference sites, ranging from tertiary hospitals to community health centres and more remote areas.

Modifications to the format included videoconferences every two months with different times to accommodate staff shifts, some sessions more in-depth and discipline specific, and a continued focus on case studies and active participation. Telephone/email mentoring by a dentist, speech pathologist or dietitian was also available. Sixteen clinical observership visits were provided to multidisciplinary clinics held at Princess Alexandra Hospital and Royal Brisbane and Women's Hospital. A face-to-face workshop was also held at the 2010 Advancing Key Initiatives in Cancer Care forum in Brisbane. Positive feedback from the Phase II evaluation in June 2010, led to continued funding to the program for another year. An online community of practice forum is currently being developed.

This program is an example of a successful interprofessional education program for health professionals working in cancer care. Participants have reported an increased understanding of the roles of other disciplines, as well as improved referral processes. It demonstrates a strong perceived need among professionals for professional support in this area and highlights how technology can assist networking and information sharing for clinicians despite geographical distance.

Western Australia

In Western Australia, the Head and Neck Cancer Education Roadshow was developed and taken out to all seven rural regions of WA. Roadshow team members included a cancer nurse coordinator, speech pathologist, dietitian, dentist and doctor (radiation oncologist or surgeon, with a link to the rural area). Commencing in November 2009, the team, with the support of the Western Australian Cancer and Palliative Care Network and the Western Australian Clinical Oncology Group, aimed to visit each of the rural regions of WA over a 14 month period, equating to approximately one show every two months.

The aim of the roadshow was to increase knowledge and skills of health professionals in the management of head and neck cancer. This included all facets of management, including detection, referral to specialised multidisciplinary clinics, treatment involved and associated side-effects (including management) and post-treatment rehabilitation. Additionally, the roadshow aimed to break down the barriers between urban and rural health professionals.

To cover the aims of the roadshow, two sessions were conducted in each region. An evening show aimed at all health professionals provided an overall picture of the head and neck cancer patient and the multidisciplinary team, including detection of the cancer, treatment of the cancer, dental management, side-effects and post-treatment rehabilitation. Each team member presented a snapshot of their role, demonstrating how the team worked together. The emphasis of the first session was on signs, symptoms, treatment and referral pathways. The second session targeted supportive care workers, building on the overview from the evening session. It provided practical information on the management of dysphagia, nutrition, symptom management and laryngectomy care. Case studies and real-life patient presentations were used to give practical and useful information.

Attendance at the roadshows varied with the size of each region. Input from rural cancer nurse coordinators has been crucial in ensuring good attendance from all health professionals. On assessment of attendees after the first three shows, the greatest proportion of attendees was from dental health and nursing (24% and 23% respectively). Remaining attendees were fairly evenly split between general practitioners (8%), speech pathologists (11%) and dietitians (8%).

Feedback was obtained from participants through the use of a questionnaire (completed at the end of each session). Feedback has been collated from the first three roadshows. The responses were positive with the majority of attendees agreeing that they would make changes to their practice. Comments from participants included: “Increased awareness of specialised multidisciplinary clinics”; “Better understanding of the treatment pathway prior to seeing rural clinician”; “Understanding the role of each profession in managing head and neck cancer patients”; and “More aware of the pathways to get advice and help for patients”. Comments provide a strong indication that the aims of the roadshow were achieved. In addition, the presenting team has been able to reflect on their practice and improve handover procedures to their rural counterparts.

Conclusion

Dietitians and other health professionals in rural and remote areas have demonstrated their willingness to participate in professional development and mentoring programs provided by metropolitan colleagues. These programs have been designed to increase confidence and skills in head and neck and upper GI cancer management and provide valuable networking opportunities. Positive outcomes have included improved understanding of multidisciplinary roles, improved referral processes and increased awareness of the availability of support from metropolitan colleagues. These programs have potential for broader application to other health disciplines and tumour groups and should be assessed for longer term impact on patient outcomes.

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REPORTS

AUSTRALIAN BEHAVIOURAL RESEARCH IN CANCER

Centre for Behavioural Research in Cancer Control (WA)

Fruit and vegetable campaign evaluation

In 2010, Cancer Council Western Australia and Diabetes WA's 'Go for 2&5' campaign aimed to raise awareness in the community of the need to eat two serves of fruit and five serves of vegetables each day as part of a healthy diet. As part of the campaign evaluation, we assessed the frequency and quantity of fruit and vegetable consumption among the target group of the campaign. In total, 528 Western Australian residents aged 25 to 55 years were surveyed using computer assisted telephone interviewing. Respondents were asked: "On average, on how many days of the week do you eat fruit/vegetables?" Those who consumed fruit/vegetables on at least one day a week were asked: "If you were to put the fruit/vegetables you usually eat in a day in a cup, how many cups would it be a day?" The proportions of respondents who consumed fruit and vegetables on a daily basis were 48% and 59%, respectively. On a usual day of fruit intake, 44% of respondents consumed two cups of fruit or more. For vegetables intake, 6% of respondents consumed five cups of vegetables or more. For both fruit and vegetables, there was a positive relationship between the frequency and quantity of intake. That is, respondents who consumed fruit/vegetables on a greater number of days per week consumed greater quantities of fruit/vegetables. For example, the proportion of respondents who consumed two or more cups of fruit on a usual day increased from 18% among those who consumed fruit on 1-3 days a week to 34% for 4-5 days a week to 62% for 6-7 days a week. It is encouraging that approximately half of the target group are consuming fruit and vegetables on a daily basis. However, people need to be encouraged to increase the quantity they consume, particularly for vegetables.

Impact of the tobacco shop display ban

As of 21 September 2010, tobacco retailers in Western Australia were prohibited from openly displaying cigarette packets at point-of-sale. Similar display bans have been legislated in most states around Australia. We were interested in assessing the impact of the display ban on impulse purchases. Prior to implementation of the ban, we conducted 200 exit interviews with smokers observed purchasing cigarettes at supermarkets in four shopping centres around Perth. Participants were asked whether they had intended to purchase cigarettes before entering the store, and a series of questions to assess their unprompted, semi-prompted and prompted awareness of the tobacco products at the point-of-sale. After the ban was implemented we conducted a further 200 interviews asking the same questions. The results suggested that after the ban was implemented: unprompted mention of the presence of tobacco products influencing purchasing decisions decreased from 8.6% to 1.1% ($p<.001$); semi-prompted attributions decreased from 20.4% to 2.7% ($p<.001$); and prompted attributions decreased from 31.6% to 11.0% ($p<.01$). These results were reflected in the fact that unplanned purchases were noted to decrease from 27.7% to 19.8% ($p<.05$). These results suggest the ban has been highly successful at achieving its purpose of decreasing the visibility of tobacco and decreasing unplanned purchases.

Centre for Health Research & Psycho-oncology (CHeRP) Newcastle

Knowledge and awareness of the vitamin D message

While it has long been assumed that most Australians receive adequate sun exposure to meet vitamin D requirements, several studies have recently found surprisingly high levels of vitamin D deficiency among some Australians. In 2007, a number of peak Australian health organisations released a statement recommending a few minutes of sun exposure outside peak UV times on most days of the week during summer, extending to two to three hours over the week during winter for adequate vitamin D. However it is still not known to what degree the public is aware of this message and is heeding this advice. This qualitative study explored knowledge and awareness of the vitamin D message among groups at higher risk of vitamin D deficiency. Six focus groups (n=52) were conducted with primary and secondary school teachers, office workers, and adults aged over 65 years living both independently and in residential care. Results showed that overall knowledge of vitamin D was low. Most participants had not heard of the current guidelines and tended to overestimate the amount of sun exposure needed in summer and underestimate the amount of exposure needed in winter. The main barriers to receiving adequate sunlight included lack of knowledge about the need for vitamin D, perceived limited consequences of vitamin D deficiency, and concerns about sunburn. Given the high rates of vitamin D deficiency in some groups, increased efforts to communicate the message for adequate sun exposure without increasing risk of skin cancer are needed.

'Call it Quits' smoking cessation project

Disadvantaged groups are an important target for smoking cessation intervention. Smoking rates are markedly higher

among severely socially disadvantaged groups such as Indigenous people, the homeless, people with a mental illness and the unemployed, than the general population. Although tobacco control initiatives such as state and national media campaigns, tax increases and legislation appear to have reduced population smoking rates, the social gradient in smoking prevalence remains. There is a clear imperative for research evaluating efficacious smoking cessation strategies targeting disadvantaged groups. The 'Call it Quits' project aims to evaluate the efficacy of a client-centred, caseworker delivered cessation support intervention at increasing validated self reported smoking cessation rates in a socially disadvantaged population. The trial will be conducted in a non-government community service organisation that offers emergency relief and counselling services. At baseline, clients attending the service will be approached to complete a touch screen computer survey and those identified as smokers will be invited to participate in the trial. Clients randomly allocated to the intervention group will receive an intensive client-centred smoking cessation intervention offered by a smoking support worker over two face-to-face and two scheduled telephone contacts. Follow-up surveys and two primary outcome measures: (i) 24-hour expired air CO validated self-reported smoking cessation; and (ii) 7-day self-reported smoking cessation, will be obtained at one, six and 12 months follow-up. Continuous abstinence will also be measured at six and 12 months follow-up. This project is funded by a National Health and Medical Research Council (NHMRC) grant.

Centre for Behavioural Research in Cancer (CBRC), Victoria

Identifying levels and types of emotion that maximise effectiveness of anti-smoking ads, especially in low SES smokers

Smoking accounts for more than one in ten deaths in Australia each year and wields the greatest burden of illness upon those least able to afford it. There is strong evidence that mass media tobacco control campaigns successfully reduce smoking. However, there remains much to be learnt about the characteristics of messages most likely to change attitudes and behaviour, with recent research indicating the level and type of emotion evoked is likely to be important. Dr Sarah Durkin and colleagues have been awarded a three-year NHMRC/VicHealth Partnership Grant to investigate optimum levels and types of emotion evoked by anti-smoking ads. To inform whether messages need to be tailored for disadvantaged groups, this study also aims to examine the impact for low socio-economic smokers. Initial ad rating studies will involve smokers rating a series of anti-smoking advertisements scheduled to be broadcast in Victoria, to enable selection of those ads that best depict target emotions (ie. high fear or low emotion). In the population study, adult smokers will be asked about their smoking behaviour and quitting intentions before and after the selected ads are broadcast. The responses of these Victorian smokers will be directly compared to groups of smokers from other Australian states not exposed to any anti-smoking advertising at the time of the Victorian broadcast. Findings will provide crucial information about the most efficient and effective use of tobacco control campaign funds in Australia.

What impact have tobacco control policies, cigarette prices and tobacco control program funding had on Australian adolescents' smoking?

There is increasing interest in determining the impact on adolescent smoking of individual and multiple policies introduced as part of a comprehensive tobacco control program. Funded by an NHMRC grant, A/Prof Vicki White and colleagues used data collected through a triennial national survey of representative samples of secondary students aged 12-17 years, from 1990-2005, to relate implementation strength of five tobacco control policies to adolescent smoking prevalence. This period reflects the time after Australia became free of all direct mass media pro-tobacco advertising. The policy areas included youth access, clean indoor air, point-of-sale and outdoor tobacco advertising, increased cigarette price and funding levels for tobacco control programs. Extent of implementation of these policy areas varied between states and over the survey years. Multivariate analyses that adjusted for demographic factors, year and all individual tobacco control policies showed that 12-month cigarette price increases, greater per capita tobacco control spending and stronger implementation of clean indoor air policies were independently related to reduced smoking prevalence among adolescents. These findings suggest that adult directed, population-based tobacco control policies such as clean indoor air laws and increased price of cigarettes, implemented as part of a well funded comprehensive tobacco control program, are associated with lower adolescent smoking. This paper is in press in *Addiction*.

Viertel Centre for Research in Cancer Control (VCRCC), Queensland

Lifestyle and cancer research program

Researchers of the Lifestyle and Cancer Research Program at Cancer Council Queensland are developing and pilot testing a novel telephone delivered lifestyle intervention for first degree relatives of colorectal cancer survivors, who are around two to eight times more likely to develop the disease themselves. The intervention aims to promote healthy lifestyle behaviours and appropriate colorectal cancer screening to support participants to reduce their cancer risk. Phase 1 of the study has been completed, and involved focus groups with first degree relatives to assist with the development of the intervention. Phase 2 of the study has now commenced with an overwhelming response from interested participants. This response highlights the desire for information and support by those at risk of colorectal cancer to improve their lifestyle and reduce their risk. Phase 2 is a trial of the intervention, with n=20 participants, to test the acceptability and short-term effectiveness. This trial will be completed in December 2011.

Prostate cancer research program

Over the last few years, the Prostate Cancer Research Program has expanded to include research into the experiences of partners and family members of men with prostate cancer. Current prostate cancer research projects include: (1) ProsCan – a longitudinal study of the pathways to care and outcomes experienced by men, including a randomised control trial of a decision support intervention; (2) ProsCan Partners – a longitudinal study of the ongoing distress and psychosocial experiences of partners of men with prostate cancer; (3) ProsCan for Couples – a randomised control trial of a sexuality support intervention for couples following radical prostatectomy, comparing usual care to nurse or peer delivered support; (4) First Degree Relatives – an examination of the screening and health behaviours of men with a family history of prostate cancer; (5) Vitamin D and Prostate Cancer – an examination of the relationship between vitamin D and prostate cancer recurrence or progression; and (6) Living with Prostate Cancer – a randomised control trial of a wellness program comparing self-management to web-based plus peer support.

Breast cancer outcome study

Breast cancer is the most common cancer affecting Australian women. Currently, differences in outcomes for women following diagnosis exist in Australia. These outcomes include: pattern of treatment; use of supportive care services; quality of life; and survival from breast cancer. An understanding of the reasons for these differences will allow us to intervene to improve the lives of all women who are diagnosed with breast cancer. Cancer Council Queensland is undertaking a large-scale research project of women's experiences of breast cancer, from their initial diagnosis through to two years after diagnosis. This study is currently in the recruitment phase with over 4000 Queensland survivors expected to take part over the course of the study. The study will document how breast cancer is diagnosed and patients' satisfaction with the process. The study will also document the quality of life experienced by women with breast cancer and examine the factors that influence quality of life.

Cancer Nurses Society of Australia

The Cancer Nurses Society of Australia (CNSA) continues to enjoy steady growth, particularly in the membership of the breast and radiation oncology specialist interest groups.

Plans are underway to formalise a new gynae-oncology special interest group. To find out more, contact Pauline.Tanner@health.wa.gov.au or Judith_Eddy@health.qld.gov.au.

CNSA is also experiencing a substantial rise in the number of survey invitations sent out to the members, reinforcing our role as the peak professional body for nurses working with people affected by cancer across Australia.

Throughout 2011, the society will continue to develop new collaborations with key nursing bodies. Essential to this is a strengthening of CNSA's activities across many of the Clinical Oncological Society of Australia groups, as well as developing partnerships with established allied health groups.

CNSA has also signed up for global network membership of the Union International for Cancer Control, building on our commitment from last year's Winter Congress in Perth to develop our national and international contribution to global cancer control initiatives.

The CNSA 14th Winter Congress will be held at the Sydney Convention and Exhibition Centre, 21-23 July. For more information log on to the congress website: www.dcconferences.com.au/cnsa2011

Clinical Guidelines Network, Cancer Council Australia

Cancer Council Australia's Clinical Guidelines Network (formerly known as the Australian Cancer Network) is moving rapidly to publication of online clinical guidelines.

A first in the area of clinical guidelines for cancer, the new wiki-based platform will facilitate more rapid guideline development and revision, make guidelines more widely accessible and reduce costs.

Initial guidelines to be produced in the wiki format include a revision of the treatment section of the *Clinical practice guidelines for the prevention, treatment and management of lung cancer (2004)* and *Clinical practice guidelines for the management of women with endometrial cancer*, which were posted to the wiki for public consultation in June.

The wiki guidelines site, accessible at wiki.cancer.org.au, already accommodates several guidelines developed by the Clinical Oncological Society of Australia.

For more information contact Clinical Guidelines Network Manager, Christine Vuletich, on 02 8063 4100 or christine.vuletich@cancer.org.au

Adult gliomas (astrocytomas and oligodendrogliomas): a guide for patients, their families and carers

This guide has been adapted for patients, their families and carers from the *Clinical practice guidelines for the management of adult gliomas: astrocytomas and oligodendrogliomas.*

Developed by a working party chaired by Professor Michael Barton, the guide was launched in May at the NSW Oncology Group Neuro-Oncology Brain Forum at the Cancer Institute of NSW.

Free of charge, the guide is available for download from Cancer Council Australia's website at www.cancer.org.au/clinicalguidelines, or printed copies can be ordered from Cancer Council Helpline on 13 11 20.

Clinical practice guidelines for surveillance colonoscopy

These guidelines address colonoscopic surveillance in adenoma follow-up, following curative resection of colorectal cancer, and for cancer surveillance in inflammatory bowel disease, including clinical, psychosocial and socioeconomic aspects of the disease

Advertised for public consultation nationally in May, submissions will be reviewed by the working party, with revisions submitted to an independent external review panel.

The draft guidelines are expected to be forwarded to the NHMRC in August for approval at their Council meeting in October.

Clinical practice guidelines for the prevention, treatment and management of lung cancer

The Clinical Guidelines Network has commenced a revision of the treatment section (chapters 5 – Non-small cell lung cancer and 6 – Small cell lung cancer) of the 2004 guidelines. Funding has been provided by Cancer Australia to jointly produce these guidelines as a pilot for Cancer Council Australia's new wiki guidelines platform.

A multidisciplinary working party, chaired by Professor David Ball, determined clinical questions to be searched for stages I-IV operable and inoperable non-small cell lung cancer. Literature searches have been completed and distributed to authors.

The authors will assess the literature and perform critical appraisals on a newly developed online form on the wiki platform and after this process will develop their topic content. In October, the non-small cell lung cancer section of the draft guidelines will be posted to the wiki platform for public comment. Relevant organisations, experts and interested parties are consulted during this process.

Investigating symptoms of lung cancer - a guide for general practitioners

Monash University, in partnership with Cancer Council Australia, is undertaking a project to develop a guide entitled *Investigating Symptoms of Lung Cancer - a Guide for General Practitioners.* A national directory of lung cancer multidisciplinary teams will also be compiled.

These resources will support GPs to investigate and appropriately refer people who have or may have lung cancer. To access the Cancer Australia Lung Cancer Program visit www.canceraustralia.gov.au

Clinical practice guidelines for the management of women with endometrial cancer

Cancer Council Australia is working with Cancer Australia to jointly produce these guidelines for clinicians. The initial focus is on management and treatment of apparent early stage low risk endometrial cancer and apparent early stage high risk endometrial cancer.

The multidisciplinary working party, chaired by Dr Alison Brand and Professor Ian Hammond, met last year to determine the key clinical questions for the literature searches. Authors have reviewed their literature search results and developed their chapters and recommendations.

The draft guidelines will be posted for public comment on Cancer Council Australia's wiki platform.

Clinical Oncological Society of Australia (COSA)

The 2011 COSA Annual Scientific Meeting will be held in Perth from 15-17 November.

Themed 'Partnerships against cancer – bridging gaps, breaking barriers', the meeting will highlight opportunities and challenges facing cancer health care today and into the future.

The scientific program will focus on urological, prostate and colorectal cancers, complemented by the role of primary care in cancer control.

This multidisciplinary meeting is expected to attract researchers and practitioners from a broad spectrum of practice, including medical and radiation oncology, surgery, nursing, pharmacy and allied health.

Early bird registration and abstracts are now open. For further information visit www.cosa2011.org.au

National Breast and Ovarian Cancer Centre

In 2011-12 National Breast and Ovarian Cancer Centre (NBOCC) and Cancer Australia will amalgamate to form a single national cancer control agency.

The new Cancer Australia will provide national leadership across all cancers, including breast and ovarian cancer, to benefit all Australians who are affected by cancer.

For further information visit www.canceraustralia.gov.au

Clinical practice guidelines on use of bisphosphonates in advanced breast cancer

NBOCC's new clinical practice guidelines, *Recommendations for use of bisphosphonates for advanced breast cancer, are now available.*

The new topic-specific guideline includes statements and recommendations on the use of bisphosphonates for advanced breast cancer, based on available, high-level evidence. This guideline supplements recommendations on the use of bisphosphonates as supportive treatment currently in NBOCC's *Clinical practice guidelines for the management of advanced breast cancer.*

The inclusion of further detail about zoledronic acid, ibandronate, pamidronate and clodronate will assist

clinicians in assessing the use of bisphosphonates to improve bone health and reduce bone pain for women with advanced breast cancer and bone metastases. The recommendations also provide advice on the schedule and duration of administration of bisphosphonates, and potential adverse events.

The clinical practice recommendations were developed in consultation with a multidisciplinary working group, and have been reviewed externally by key stakeholders and the wider community.

Guidelines moving online

NBOCC's topic-specific guidelines will be available in a new online publishing format which enables health professionals to quickly access recommendations and print them as required.

This new online format will also provide relevant links, for example to the systematic reviews on which the guidelines are based.

NBOCC's recommendations are available to download at: http://guidelines.nbocc.org.au

Shedding new light on pathways to diagnosis and treatment of ovarian cancer in Australia

NBOCC and Queensland Institute of Medical Research (QIMR) have undertaken two groundbreaking studies on ovarian cancer in Australia, investigating both the pathways to diagnosis and the treatment women received once diagnosed.

Australia's first national study of 1500 women diagnosed with ovarian cancer to analyse the pathways to diagnosis was published in the *Medical Journal of Australia* in September, 2010. The study found that most women with ovarian cancer are investigated and diagnosed promptly.

Key findings include:

- Ninety-three per cent of women presented first to their general practitioners and 61 per cent were either diagnosed or appropriately referred by the first doctor they saw.
- Sixty-six per cent of women with ovarian cancer were diagnosed within one month and 80 per cent within three months of initial presentation.

Given the vague nature of the symptoms of the disease, the challenge for GPs is to determine whether the presenting symptoms may be ovarian cancer. To assist with this, NBOCC has developed two resources, *Assessment of symptoms that may be ovarian cancer* and *Appropriate referral of women with suspected ovarian cancer,* which includes the Risk of Malignancy Index.

NBOCC and QIMR have also undertaken the first national analysis about the treatment received by women diagnosed with ovarian cancer in Australia. The study reviewed the treatment women with ovarian cancer received a year after the release of the evidence-based guidelines, *Clinical practice guidelines for the management of women with epithelial ovarian cancer.*

Surgery is the cornerstone of treatment for ovarian cancer and preliminary findings show that 83 per cent of women with ovarian cancer underwent surgery, and more than 90 per cent of women recommended chemotherapy received it.

While the preliminary findings are encouraging, further analysis and a better understanding of the variations in treatment is needed to ensure women receive treatment in line with the evidence.

Breakthrough in feasibility of breast cancer staging for population-based cancer registries

During 2009-10, NBOCC undertook a project with the Victorian Cancer Registry to develop and test the collection of Tumour, Node and Metastases (TNM) stage information, the gold standard for staging breast cancer.

NBOCC's work with Victorian Cancer Registry has resulted in the groundbreaking *Breast cancer staging and treatment* report. The report shows that deriving TNM stage data from routinely captured cancer notifications is very achievable, with the registry able to TNM stage 96 per cent of eligible breast cancer incidence cases in 2006 and 2007.

For more information about NBOCC projects and to order or download resources, visit www.nbocc.org.au/resources

NEWS & ANNOUNCEMENTS

New website aims to reverse HPV trends

Long-awaited data released in April by the Australian Government has raised concerns that many girls are failing to complete the three-dose course of the cervical cancer or human papillomavirus (HPV) vaccine.

Cancer Council's Kate Broun said that while the data – which includes information on the school program for girls aged 12–13 and the free catch-up program for females up to 26 years – shows the National HPV Vaccination Program has been broadly successful, significant numbers of girls are not showing up for their second and third doses.

Cancer Council's Kate Broun said 83% of girls aged 12–13 years in 2007 had had the first dose of the vaccine by December 2009, but this fell to 80% for the second dose and 73% for the final injection.

"We would say that while this represents a positive result for a newly introduced vaccination program in this age group, most states and territories are falling short of the minimum 80% coverage health experts say we should be aiming for if we want to see a marked reduction in cervical cancer incidence."

Separate Cancer Council Victoria research suggests a lack of awareness surrounding HPV and its link to cervical cancer is leading to girls missing out on some or all of the recommended vaccinations. The survey of 3000 students reveals that half of respondents are not aware that HPV is sexually transmitted.

"Unfortunately, these research findings suggest that knowledge about HPV and this vaccine – which protects against the two HPV types which cause 70% of cervical cancers – is really quite low among teenage girls and their parents," said Ms Broun.

A new website, www.cervicalcancervaccine.org.au, aims to counteract misconceptions about HPV and its prevention, improving vaccination rates for women and girls.

"It tells teens and parents the facts they need to know - that this vaccine is extremely safe and extremely effective in protecting against cervical cancer," said Ms Broun.

Plain packs will stop kids smoking

Young Australians will be less likely to die prematurely from cancer or cardiovascular disease if a newly released draft bill to mandate plain packaging of tobacco products is supported by federal Parliament, Cancer Council Australia and the National Heart Foundation said.

Cancer Council Australia CEO, Professor Ian Olver, said a glossy branded pack remained the last above-the-line form of advertising to attract and addict new, younger smokers.

"Our research shows that the look of the pack is an important consideration for young people at risk of being drawn to smoking, so this move by the Australian Government has the potential to be one of the most significant public health measures in recent history," Professor Olver said.

National Heart Foundation CEO, Dr Lyn Roberts, said campaigns opposing the initiative, funded by the tobacco industry, were further indication that plain packaging would prevent new smokers from becoming addicted.

"Unfounded and contradictory claims that plain packaging will ruin retail business on one hand yet do nothing to cut consumption on the other simply add to evidence we already have that shows it will work," Dr Roberts said.

Celebrity chefs cook off for a cause

One of Australia's biggest and most loved fundraisers was launched with a bang in Sydney's CBD in April. Office workers were met on their way to work by a celebrity cook-off featuring TV chefs Adriano Zumbo, Callum Hann, Janella Purcell and Ed Halmagyi.

The public were asked to introduce an international flavour to their morning tea when hosts from the Bangladeshi and Chinese communities joined the chefs on stage to cook up some exotic and nutritious treats.

Australia's Biggest Morning Tea, run throughout May and June, aimed to raise $11m towards research, prevention and support programs. Over a million Australians will take part in a morning tea this year.

Putting cancer on the global agenda

On 13th May 2010, the United Nations General Assembly unanimously passed a resolution calling for a UN high-level meeting on the prevention and control of non-communicable diseases (NCDs), principally cancer, diabetes, cardiovascular and chronic respiratory diseases. The meeting will take place on 19 and 20 September in New York and will be attended by heads of state, government, civil society, the private sector, academia and other stakeholders.

The NCD Alliance, formed by the Union for International Cancer Control (UICC), International Diabetes Federation, International Union Against TB and Lung Disease and World Heart Federation, campaigned for such a meeting because the global epidemic of NCDs has reached such proportions that it now constitutes a major risk to global prosperity, development and political stability.

In 2008, nearly 12.7 million new cancer cases occurred worldwide with 7.6 million cancer deaths, 64% of these occurring in developing countries. The UN meeting represents an unprecedented opportunity to achieve sustained political commitments to the priority actions needed to reduce the global burden of cancer.

Cancer Council Australia and UICC are working together through a global advocacy campaign to engage with cancer organisations to ensure that the UN meeting produces a concrete plan of action, clear targets and accountability mechanisms, and also to improve the understanding of how cancer can be treated and prevented among key policy-makers.

For further information go to www.ncdalliance.org and www.uicc.org.

Head and neck cancer

The nutrition group within the Clinical Oncological Society of Australia has developed new guidelines for the nutritional management of head and neck cancer patients.

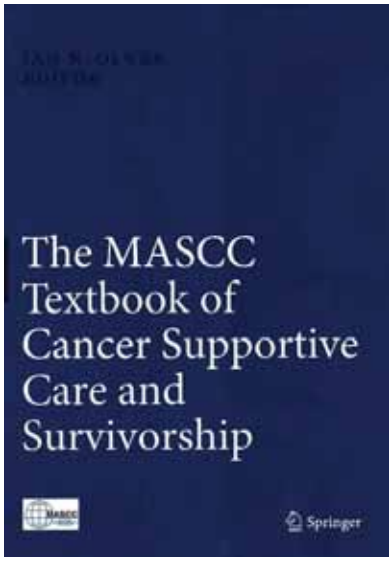
Head and neck cancer is the fifth most common cancer globally and poses a unique set of problems associated with diet and nutrition during treatment. The guidelines will provide the multidisciplinary team of health professionals with a summary of evidence-based clinical questions related to the nutrition management of adult patients.

The guidelines were developed using Cancer Council Australia's new wiki platform, allowing continual review as the body of literature evolves. The wiki system provides opportunities for stakeholders to engage in such projects from the beginning and add their expertise to ongoing collaboration.

The guidelines are discussed in the Forum paper, 'Current issues in the nutritional management of patients with head and neck cancer in Australia,' published in this issue (p92).

To view the guidelines visit wiki.cancer.org.au.

The MASCC Textbook of Cancer Supportive Care and Survivorship



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RRP: Euro 129.95

The MASCC international group is a multinational association for supportive care in cancer. The contributing authors of this book are specialists in their field of cancer care and represent 17 countries.

In view of the multimodal treatment that cancer patients receive in the current times, the target audience for this textbook would be healthcare professionals across the cancer spectrum, as well as GPs, and may prove a good resource for some patients.

The MASCC Textbook of Cancer Supportive Care and Survivorship covers the cancer trajectory from diagnosis through to treatment and the management of side-effects, both from the treatment and from the cancer itself. It also covers rehabilitation and survivorship issues, as well as palliative care. The text incorporates paediatric care and care of the elderly with cancer, as well as end of life care. The chapters cover the main areas of concern, though not in very much detail.

This text covers many symptoms of cancer treatment by dividing them into systems and then further itemises to the problems faced for parts of that system. For some sections it provides definitions and descriptions, however does not give strategies for healthcare professionals to assist the patient to improve their situation.

The book was easy to read, covering many topics under each of the basic headings, though did not give a lot of depth to many of the topics. It is a useful resource for a multidisciplinary team that provides basic information, but further “specialty-specific” solutions to problems will need to be sought elsewhere.

Overall I would recommend this book as a quality resource for basic information on cancer survivorship and symptom management, however if you are seeking an in-depth text this may not meet your needs.

Marie Condon St John of God Hospital, Murdoch, Western Australia.



CALENDAR OF MEETINGS

AUSTRALIA AND NEW ZEALAND

Date	Name of Meeting	Place	Secretariat
August			
4-7	Skin Cancer Conference	Hamilton Island, Queensland	The University of Queensland Website: www.skincancerconference.com.au Phone: 1300 856695
10-12	Medical Oncology Group of Australia Annual Scientific Meeting & Best of ASCO Australia	Adelaide, South Australia	Medical Oncology Group of Australia Website: www.moga.org.au Email: moga@moga.org.au Phone: (+61 2) 9256 9652
October			
28-30	BreastScreen Australia Conference	Melbourne, Victoria	BreastScreen Australia Website:www.bsaconference.com.au Email: bsa@thinkbusinessevents.com.au +61 3 9417 1350
17-20	Oceania Tobacco Control Conference	Brisbane, Queensland	Cancer Council Queensland Website: www.oceaniatc2011.org/ Email: JoannaLam@cancerqld.org.au Phone: +61 7 3634 5361
November			
14-17	Clinical Oncological Society of Australia Annual Scientific Meeting	Perth, Western Australia	Clinical Oncological Society of Australia (COSA) Website: www.cosa.org.au Email: cosa@cancer.org.au Phone: +61 2 80634100

INTERNATIONAL

Date	Name of Meeting	Place	Secretariat
July			
28-31	SCOPE Summer School	Cambridge, UK	International Association for the Study of Obesity Website: www.iaso.org/events/scope-summer-school/scope-summer-school-2011/ Email: scopesummerschool@iaso.org
August			
14-19	2011 Pan Pacific Lymphoma Conference	Kaloa Kauai, Hawaii, United States of America	University of Nebraska Medical Center Website: www.unmc.edu/cce Email: bram@unmc.edu Phone: +1 402 559 9250
September			
7-10	Hallmarks & Horizons of Cancer	Lausanne, Switzerland	Ecole Polytechnique Fédérale de Lausanne Website: http://isrec2011.epfl.ch Email: isrec2011@epfl.ch
22-27	ECCO 16 - 36th ESMO Multidisciplinary Congress	Brussels, Belgium	European Cancer Organisation Website: www.ecco-org.eu Email: info@ecco-org.eu Ph: +32 2 775 0201

CALENDAR OF MEETINGS

Date	Name of Meeting	Place	Secretariat
October			
06-07	IV InterAmerican Oncology Conference: 'Current Status and Future of Anti-Cancer Targeted Therapies'	Buenos Aires, Argentina	InterAmerican Oncology Conferences Website: www.oncologyconferences.com.ar Email: secretariat@oncologyconferences.com.ar
16-20	IPOS 13th World Congress of Psycho-Oncology	Antalya, Turkey	International Psycho-Oncology Society and Turkish Psychosocial Oncology Association Website: //www.ipos-society.org/ipos2011/ Email: aholcomb@ipos-society.org Phone: +1.434.996.5739
November			
09-12	16th Annual Reach to Recovery International Breast Cancer Support Conference	Taipei, Taiwan	Taiwan Breast Cancer Alliance; Formosa Cancer Foundation Website: www.reachtorecovery2011.org Email: hanna@tbca-npo.org.tw Phone: +886 2 2557 8050
27-2	97th RSNA Scientific Assembly and Annual Meeting	Chicago, Illinois, United States of America	Radiological Society of North America Website: www.rsna.org/rsnsa Email: reginfo@rsna.org Phone: +1 630 571 7879
December			
8-12	34th Annual San Antonio Breast Cancer Symposium	San Antonio, Texas, United States of America	CTRC Research Foundation Website: www.sabcs.org Email: rmarkow@crec.net Phone: +1 210 450 5912
2012			
March			
20-24	8th European Breast Cancer Conference	Brussels, Belgium	European Cancer Organisation Website: www.ecco.org.eu Email: nicola.pellegrino@ecco-org.eu Phone: +32 02 775 02 07
20-24	15th World Conference on Tobacco or Health	Singapore	World Conference on Tobacco or Health Website: www.wctoh2012.org Email: info@wctoh2012.org Phone: +65 6496 5554
22-24	1st St Gallan International Gastro-Intestinal Caner Conference	St Gallan, Switzerland	St.Gallen Oncology Conferences SONK Website: http://www.oncoconferences.ch/ Email: info@oncoconferences.ch Phone: +41 71 243 0032

CANCER COUNCIL AUSTRALIA

Cancer Council Australia is the nation's peak cancer control organisation.

Its members are the leading state and territory Cancer Councils, working together to undertake and fund cancer research, prevent and control cancer and provide information and support for people affected by cancer.

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CLINICAL ONCOLOGICAL SOCIETY OF AUSTRALIA INC

The Clinical Oncological Society of Australia (COSA) is a multidisciplinary society for health professionals working in cancer research or the treatment, rehabilitation or palliation of cancer patients.

It conducts an annual scientific meeting, seminars and educational activities related to current cancer issues. COSA is affiliated with Cancer Council Australia.

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Further information about COSA and membership applications are available from:
www.cosa.org.au or cosa@cancer.org.au

Membership fees for 2011

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Non Medical Members: $100 (includes GST)

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Information for contributors

Cancer Forum provides an avenue for communication between all those involved in the fight against cancer and especially seeks to promote contact across disciplinary barriers.

To this end articles need to be comprehensible to as wide a section of the readership as possible. Authors should provide sufficient introductory material to place their articles in context for those outside their field of specialisation.

Format

Cancer Forum welcomes original articles about medical, scientific, political, social, educational and administrative aspects of cancer control. All manuscripts should be submitted by email to info@cancerforum.org.au as MS Word documents.

Length: 2000-2500 words.

Font: Arial - 20pt for title, 12pt for headings and 10pt for text.

Following the title, include your full name, organisation and email address.

Include an introductory heading and sub-headings that describe the content.

Number pages in the footer.

Abstract

All manuscripts must include an abstract of approximately 200 words, providing a summary of the key findings or statements.

Illustrations

Photographs and line drawings can be submitted via email or on disk, preferably in tiff or jpeg format, or as transparencies or high quality prints.

If images are not owned by the author, written permission to reproduce the images should be provided with the submission.

Referencing

Reference numbers within the text should be superscripted and placed after punctuation.

The list of references at the end of the paper should be numbered consecutively in the order in which they are first mentioned and be consistent with the National Library of Medicine's International Committee of Medical Journal Editors' *Uniform Requirements for Manuscripts Submitted to Biomedical Journals.*

> eg. Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. N Engl J Med. 2002 Jul 25;347(4):284-7.

A full guide is available at www.nlm.nih.gov/bsd/uniform_requirements.html

The Editorial Board will make the final decision on publication of articles and may request clarifications or additional information.

Manuscripts should be emailed to:

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