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Undergraduate Education about Cancer

W.T. Smith, M.H.N. Tattersall, L.M. Irwig and A.O. Langlands

The quality, quantity and balance of undergraduate cancer teaching in Australian Medical Schools were investigated by a survey, using a self-administered questionnaire, of recent graduates from all Australian medical schools. Stratified random cluster sampling was used and a response rate of 84% (389 respondents) was achieved. The results revealed substantial differences in knowledge, experience in, and rating of teaching between the medical, surgical, radiotherapeutic and palliative components of cancer management. The proportions of graduates who had never attended radiotherapy and palliative care clinics or units (42.3% and 49.9%, respectively) were more than double the proportion who had never attended medical and surgical cancer clinics or units (17.5% and 10.9%, respectively). More than twice as many graduates rated their instruction in the palliative management of cancer as poor or very poor (29.4%) compared with those rating their instruction as poor or very poor in both cancer prevention (8.4%) and treatment for cure (14.6%). The respondents displayed a considerable lack of knowledge about radiotherapy treatment options, and reported a lack of perceived competence in doing cervical smears. Their answers to questions about 5-year survival of selected cancers, about the existence of screening tests validly shown to reduce mortality, and the ages at which breast and cervical cancers are likely to develop all revealed worrying levels of incorrect knowledge. There was some important disturbing variation in levels of knowledge, experience and rating of cancer instruction between states and between universities.
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INTRODUCTION

A SURVEY of cancer education for medical students in 1986 resulted in the Australian Cancer Society (ACS) developing guidelines for an "ideal" cancer curriculum for medical undergraduate teaching. This document has many similarities to guidelines recommended for a European undergraduate oncology curriculum proposed following the consensus workshop on a curriculum for medical students in Europe (jointly organised by the EEC and EORTC) [1, 2]. The present study investigated medical students' knowledge, perceived skills and undergraduate experience in cancer. It was planned to identify any serious deficiencies in undergraduate cancer curricula compared to the ACS guidelines, in order to enable recommendations for curriculum review, and as a baseline against which future curriculum changes could be assessed.

In recent years there have been many publications on what should be included in undergraduate curricula as assessed by teachers, interest groups and institutions [3–7]; how to decide what to include in a curriculum [8–11]; descriptions of the composition of curriculum committees [12] and sources of data and even "how to do it" instructions on the politics and machinery of curriculum change [13].

However, no valid instrument to rate instruction, or measure knowledge, experience and perceived skills in cancer among medical undergraduates was found in the literature. Apart from Tattersall *et al.* [14] and correspondence from A. Ravaud (Foundation Bergonié, Bordeaux, France), no studies were found which specifically addressed these issues in relation to cancer. The literature contained numerous papers assessing the type and frequency of educational opportunities for medical undergraduates, most commonly through surveys of institutions and teachers [15–17]. Surveys of the students' actual attendance at these education sessions (or their recalled attendance) are undertaken less frequently, as are surveys of student satisfaction with their teaching [18]. Outcomes even less frequently measured are knowledge, skills and perceptions of the undergraduate [13, 14, 19].

This paper reports on the results of the survey of aspects of oncology knowledge, exposure to oncology instruction and satisfaction with oncology teaching among graduates from Australian medical schools who began internship in January 1990.

METHODS

The survey

The instrument used in this survey was a self-administered questionnaire. The content of the draft instrument was derived from the Australian Cancer Society curriculum recommendations for undergraduate education about cancer and from a self-administered questionnaire previously used by Tattersall *et al.* [14].

Preliminary forms of the questionnaire were reviewed by a group of 20 persons identified as involved in undergraduate oncology teaching from several medical schools in Australia. Pilot testing was done amongst junior medical staff at a major Sydney teaching hospital. After each stage of pilot testing and feedback from experts, items in the questionnaire were reviewed and refined. The final version of the questionnaire (available from M.H.N.T.) took approximately 15 minutes to complete.

Measurements obtained

The questionnaire measured knowledge, perceptions of skills, exposure to teaching and rating of instruction in oncology in undergraduate training, and obtained data on sociodemographic variables.

Knowledge. Knowledge of cancer screening; management options for selected cancers; prevalence and incidence of, mortality from, and prognosis for selected common cancers were measured by a combination of open-ended and multiple choice questions.

Perception of skills. The graduates were asked to rate their skills in several oncology-related skills on a five-point Likert scale. The scale options were very, quite, somewhat, a little and not at all competent.

Exposure to cancer teaching. The graduates were asked to estimate the number of hours spent in various clinical oncology settings, and to indicate any of a selection of common cancers for which they had not examined a patient.

Rating of cancer instruction. The graduates were asked to rate their instruction in cancer prevention, management of potentially curable cancer and palliative management of cancer on a five-point Likert scale with the options very good, good, OK, poor and very poor.

Sociodemographic data. Details of the university of graduation, sex and career goals of the respondents were collected in the survey. State and hospital of internship were known from the sampling strategy.

The sample

A stratified random cluster sample of graduates starting their internships in January 1990 was selected. The sampling strategy randomly selected hospitals weighted by expected intern numbers at each hospital (thus "clusters" of interns), and stratified by state. This selection strategy has the effect of oversampling the smaller universities, decreasing the confidence intervals of medical school-specific point estimates. The survey was conducted during the first week of internship, in January 1990.

Analysis

The returned questionnaires were coded, with identifiers for state and hospital added. Programs were written in SAS [20] to provide frequencies of answers to each of the questions in the instrument, and to provide crude cross-tabulations of answers by sex, by state and by university of graduation. Selected findings were tested for statistical significance by χ^2 tests, using SAS or the SPIDA [21] statistical package. Due to the sampling design, adjustments were made for pooled point estimates and confidence intervals. The pooled estimates were calculated by summing the number of respondents in each state weighted by the number of potential respondents in each state, and dividing the total by the number of potential respondents in Australia. The variance was calculated using the method described by Yates [22] for a stratified sample with probability proportional to size. All confidence intervals presented in the text are at the 95% level, adjusted for sampling strategy. All P values marked by an asterisk are from partitioned χ^2 tests with one degree of freedom.

RESULTS

Response rate

The sampling strategy resulted in 13 hospitals being selected Australia-wide; four from New South Wales (NSW), three from Victoria, two from Queensland and South Australia, and one each from Western Australia and Tasmania. The overall response rate was 84%, with 389 respondents, 55% males, 40% females and 5% of unreported sex. 39% of respondents were from NSW, 23% from Victoria, 21% from Queensland, 7% from SA and 5% each from WA and Tasmania. Response rates from interns at each hospital ranged from 57% to 100%.

Students' career goals

No differences were noted between responses from males and females for any questions other than career goals, where the most noticeable differences are in the choices of surgery and general practice.

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Table 1. Respondents' career goals

Career goal	Overall	Females	Males
General practice	19.7	25.8	16.9
Internal medicine	18.7	13.6	23.9
Surgery	15.3	4.5	24.4
Other	15.3	15.5	16.4
Undecided	13.5	21.9	8.5
Paediatrics	6.2	10.3	3.8
Obstetrics and gynaecology	2.8	3.9	2.4
Psychiatry	1.8	1.9	1.9

Percentage.

The most obvious differences between graduates from different medical schools was in the choice of general practice as a goal: only 10% of University of Sydney graduates expressed this goal, compared to 54% from Adelaide University, and 20.9% overall.

Graduates' responses about their competence, exposure to and quality of teaching

Perceptions of skills. We found that 22.3% (CI 12.1–32.5%) of the students rated their ability to do a cervical smear as "a little" or "not at all" competent and 10.7% (CI 2.7–18.7%) rated their ability to recognise a melanoma as "a little" or "not at all" competent. Only 5.3% (CI 2.0–8.6%) considered themselves to be "a little" or "not at all" competent in teaching breast self-examination, but more than 70% of graduates felt "a little" or "not at all" competent to discuss death with a dying patient. There was found to be no association between a career goal of general practice and perceived competence in doing a cervical smear ($\chi^2 = 1.55$, df = 1, $P = 0.2$).

Exposure to cancer teaching as an undergraduate

Exposure to patients with specific cancers. 17.4% (CI 10.1–24.7%) of graduates had never examined a patient with rectal carcinoma, 13.9% (6.0–21.8%) had never examined anyone with a malignant melanoma, and 19.8% (11.7–27.9%) had never examined someone with carcinoma of the mouth. Differences existed between the states; most notably, the proportion of South Australian graduates never having examined a patient with each of these cancers was 2.8–10 times higher than the proportion of graduates who had never examined such patients in all other states (χ^2 of S.A. vs. all other states for each cancer were significant, $P < 0.02^*$ in all except lung cancer, $P = 0.25^*$).

Attendance at cancer-related clinics. There were significant differences in the numbers of students who had attended (at least once) clinics focusing on different types of cancer management, with more than double the number of respondents reporting never having attended a palliative care or radiotherapy clinic or unit, compared to medical or surgical oncology clinics or units (Table 2). Considerably more graduates from Victoria (74.7%, $P < 0.0001^*$) and South Australia (81.5%, $P < 0.0001^*$) reported never having attended palliative care facilities than graduates of other Australian medical schools (49.9%). Victorian medical schools (71%) again provided a significantly greater proportion of graduates (than all other medical schools combined, 42.3%) who had never attended a radiotherapy clinic ($P < 0.0001^*$). Over twice as many South Australian graduates had never attended a medical oncology unit (46%) compared to other graduates (18%) ($P = 0.016^*$).

Table 2. Percent of graduates spending no time in a different cancer clinic or unit

Clinic or unit	Graduates who never attended
Medical oncology	17.5
Surgical oncology	10.9
Palliative care	49.9
Radiotherapy	42.3

Percentage.

Rating of instruction

There were significant differences in the graduates' ratings of their instruction in prevention, treatment and palliation of cancer ($\chi^2 = 82$, $P < 0.0001^*$). The graduates rated their instruction in cancer prevention and cancer treatment mainly as "OK" to "very good", with only 8.4% (CI 0.4–16.4%) and 14.6% (CI 6.7–22.5%), respectively, rating such instruction as poor or very poor. In contrast, instruction in the palliative management of late stage cancer was rated as poor or very poor by 29.4% (CI 21.9–36.9%) of respondents.

State differences were apparent only with respect to rating of instruction in cancer treatment, where 37% of the South Australian respondents rated their instruction as being poor or very poor, significantly different ($P < 0.05^*$) from other states with, overall, 12.2% rating it as poor or very poor.

Questions of knowledge: prevention, screening and detection

Pap smears. Almost all respondents (99%) identified the recommended frequency of Pap smears to be between 1 and 3 years. However, Table 3 shows that 15.6% of graduates incorrectly believed that Pap smear screening should cease at menopause or at ages below 65.

The only noticeable differences between states in the responses to these questions were the Western Australians, of whom 32% considered that Pap smear screening should cease at menopause or at ages below 65, compared to an overall 15% in the other states ($\chi^2 = 13.8$, df = 1, $P < 0.001^*$).

Knowledge of valid screening tests. Table 4 summarises the answers to questions about screening tests which have been demonstrated in valid studies to reduce mortality from selected cancers. For lung cancer, 7.0% of respondents (incorrectly) believed that a valid screening test exists which has been shown to reduce mortality (CI 0.0–15.0%), and 33.6% believed that such a screening test existed for melanoma (CI 17.3–49.9%).

Table 3. Time at which respondents considered Pap smear screening

Should commence		Should cease	
Time	Graduates	Time	Graduates
Start sexual relations	86.9	Never	63.6
Menarche	1.9	Ages 70+	12.0
Age 15–25	7.0	Ages 50–65	8.5
Age 30+	2.1	Menopause	7.9

Percentage.

Table 4. Respondents who consider a valid screening test exists for various cancers

Lung	7.0
Cervix	95.4
Prostate	17.1
Breast	77.1
Melanoma	33.6
Colon	39.7

Percentage.

Table 5. Respondents who answered "yes" to the question "Is radiotherapy an equally good alternative to surgery in the management of the following cancers at a resectable stage?"

Cancer of floor of mouth	63.4
Cancer of the anus	35.2
Early cervical carcinoma	38.2
Malignant melanoma	6.9
Non-small cell lung cancer	33.4

Percentage.

Preventable cancers. The graduates were asked to list three cancers which are preventable, and to describe how they may be prevented. The three most commonly selected cancers were lung cancer (85%), skin cancer (77%) and cervical cancer (58%). Avoidance of cigarettes was cited as the method of prevention by 99% of respondents listing lung cancer as preventable, avoidance of sunlight by 97% of respondents listing skin cancer, and regular Pap smears for cervical cancer by 92%.

Cancer management

Treatment with curative intent. The respondents were asked to decide which of seven listed cancers are treatable with curative intent following blood-borne metastases. Whereas testicular and choriocarcinoma can be treated with curative intent, they would not be so treated by 26% and 36% of graduates, respectively, and although metastatic lung cancer is not regarded as treatable with curative intent, 16.3% of respondents would treat it as so. State differences in responses were most marked for lung cancer, where 32% of the Victorian respondents would treat with curative intent (significantly more than for other states, $\chi^2 = 4.17$, df = 1, $P < 0.05$*) and for testicular cancer, where 48% of South Australian respondents would not treat with curative intent, significantly more than for other states ($\chi^2 = 11.94$, df = 1, $P < 0.001$*).

Radiotherapy. Radiotherapy was considered by a majority of respondents to be a good alternative to surgery in only one cancer: cancer of the mouth, chosen by 63.4% of respondents. Less than 40% of respondents (correctly) considered radiotherapy to be an equally good treatment modality to surgery in early cancer of the cervix (see Table 5). The most noticeable difference between states was that more than twice as many graduates from NSW compared to other states believed (incorrectly) that radiotherapy was a good alternative treatment to surgery for malignant melanoma ($\chi^2 = 21.39$, df = 1, $P < 0.001$*).

Cancer palliation. The graduates were asked to list two techniques of pain control other than analgesic medication in patients with incurable cancer. Table 6 presents the most commonly listed techniques.

Epidemiology

Proportion of Australian deaths due to cancer. Over one in six of all graduates underestimated by more than 10% and over one in six graduates overestimated by more than 10% the correct estimate of the proportion (25%) of deaths in Australia which are due to cancer.

Most common causes of cancer death. The most common choices for the three main cancer causes of death in men (correctly) listed by respondents were lung, colon and prostate cancer, with less than 10% listing any cancers apart from these three. For cancer deaths in women, breast, lung and colon cancer were the most frequent choices, but with almost 20% including carcinoma of the cervix in their three choices. The most frequent choices of graduates for the three commonest causes of cancer deaths for women were also correct, if carcinomatosis of unknown origin is excluded.

Risk of developing cancer. Over a quarter (30%) of respondents thought that a woman's greatest risk of developing breast cancer was in her 30s and 40s. For cervical cancer, 62% thought that the greatest risk was also in the 30s and 40s, with only 10% believing that the greatest risk of developing cervical cancer was in a woman's 60s. In fact, in both cases, the greatest risk of developing cancer is in the woman's 60s or older. There was no association between knowledge of age at greatest risk of developing cervical cancer and knowledge of when Pap smear screening should cease ($\chi^2 = 0.13$, df = 1, $P = 0.7$).

5-year survival. Nearly half (44%) of respondents incorrectly answered that operable non-small cell carcinoma of the lung had a 50% 5-year survival rate.

DISCUSSION

The low percentage of respondents intending to enter general practice causes some concern, given that more than double the number intending to are destined to become general practitioners.

The graduates perhaps perceived themselves as having low competence in doing a cervical smear because they were not taught how. We considered the possibility that a career goal other than general practice may have led students to underrate learning a procedure—such as a cervical smear—performed

Table 6. Techniques for palliative pain control

Technique	Respondents listing technique as 1 of 2 alternatives
Nerve block	44.3
TENS	31.3
Relaxation/hypnotherapy	30.6
Radiotherapy	19.7
Operative/medical treatment of cancer	17.9
Adjuvant medications	12.7
Acupuncture	10.4

Percentage.
TENS = transcutaneous electrical nerve stimulation.

mainly in general practice, but no association was found between perceived competence and career goal. Their knowledge of when to begin and how frequently to do cervical smears was reasonable, but the need to continue screening into later life was not as well appreciated. Surprisingly, there was no association between the respondents' poor knowledge of the age a woman is most likely to develop carcinoma of the cervix and their lack of knowledge of how long to continue screening.

Less than 30% of respondents felt able to discuss death with a dying patient. While this may be a reflection of their inexperience, it does support both the graduates' own reports that they spent little time in palliative care facilities and their poor rating of palliative care instruction during their undergraduate training. In addition to the reported low exposure rates to management of some phases of cancer patient care, a disturbingly high proportion of graduates report no experience of examining patients with common cancers such as rectal cancer, melanoma and cancer of the mouth.

The respondents rated their instruction in the palliative management of late stage cancer lower than their instruction in prevention or treatment for cure, with almost a third of respondents rating their palliative instruction as poor or very poor. This could be a result of their low exposure to palliative care clinics and units, either because they are inaccessible or non-existent. However, these low rates of attendance at clinics, and especially the rates in Victoria, may be due to differential misclassification, with different names of units in different states.

There appears to be some confusion amongst respondents about what cancers should be screened for, with 7% of respondents believing a screening test exists which has been demonstrated in valid studies to reduce mortality from lung cancer, and 33% having similar beliefs about melanoma. Despite some confusion about screening, most respondents were able to volunteer three preventable cancers, and describe how they are preventable.

The percentage of respondents who would treat metastatic lung cancer with curative intent is surprisingly high (16.3%). This is especially worrying if one considers that 44% of graduates estimate (incorrectly) that lung cancer has a 50% 5-year survival rate.

Radiotherapy appears to be a treatment modality that few graduates are familiar with. Attendance at radiotherapy department clinics was substantially lower than for medical and surgical oncology clinics or units, and on a par with attendance at palliative care facilities. The low attendance figures are supported by poor knowledge of the circumstances in which radiotherapy is a good alternative treatment modality both for cure (such as for early cancer of the cervix) and for palliation (ranked lower than relaxation, hypnotherapy and TENS—see Table 6).

There was considerable misunderstanding about the age at which women are at greatest risk of breast and cervical carcinomas. For breast cancer, although 70% correctly selected the older age groups (50s and 60s), over a quarter incorrectly thought that the greatest risk was in the woman's 30s and 40s. For cervical cancer, 62% thought that the greatest risk was in the woman's 30s and 40s, with only 10% considering that the greatest risk of developing cervical cancer was in a woman's 60s. The considerable proportion incorrectly selecting carcinoma of the cervix in the three major causes of cancer death in women may be due to its high media profile and existence of a screening test for this cancer. This is somewhat at odds with most respondents' view that Pap smear screening should never cease.

In summary, this study has investigated graduates' knowledge, their undergraduate experience in cancer, their ratings of cancer teaching and their self-rated competence in cancer-related activities. On the positive side, respondents were mostly aware of (i) the major causes of cancer death among males and females, (ii) which were the more common preventable cancers, and (iii) when to begin (but not when to cease) and how often to do cervical smears.

On the negative side, respondents' exposure to palliative care and radiotherapy facilities, their rating of their palliative care teaching and their knowledge and abilities in these areas was found to be low in comparison to other aspects of cancer management. Respondents' answers about 5-year survivals, when to treat metastatic cancers for cure, about the existence of valid screening tests, and at what age breast and cervical cancers are likely to develop all revealed worrying levels of incorrect knowledge.

In the light of the significance of cancer as a cause of death and morbidity, our overall impression is of disquiet. This has two main components. First, there are important defects in knowledge and skills. Second, there is some variation in knowledge and experience among states and between universities in the same state. In Australia, this suggests to us that each medical school, using the Australian Cancer Society curriculum guidelines or similar curriculum guidelines, should review the balance and content of their undergraduate oncology curriculum. Similar surveys could be done in Europe to establish a baseline against which the impact of the introduction of a European undergraduate oncology curriculum can be assessed.

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Progesterone, Oestradiol, Somatostatin and Epidermal Growth Factor Receptors on Human Meningiomas and Their CT Characteristics

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The presence of progesterone, oestrogen, somatostatin and epidermal growth factor receptors of 24 meningiomas was related with their radiological CT appearance. Progesterone receptors were present in 16 of 21 (76%), oestrogen receptors in 4 of 21 (19%), somatostatin receptors on 23 of 24 (96%) and epidermal growth factor receptors on 17 of 19 (89%) meningiomas. There was no relationship between the presence of these receptors and the age or sex of the patients, tumour histology, tumour localisation, the presence of perifocal oedema, displacement of the midline cerebri or obstructive hydrocephalus on CT scan. There was a negative correlation ($P < 0.05$) between the number of progesterone receptors and "malignant" behaviour of the meningiomas on CT (e.g. the presence of necrosis, cyst formation, intratumoral haemorrhage, irregular surface and/or inhomogeneous attenuation of contrast). The observation that aggressive tumour behaviour on CT is accompanied by low numbers or absence of progesterone receptors makes these meningiomas less attractive candidates for medical therapy with antiprogestins.
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INTRODUCTION

IN THE last decade new information has been obtained about meningiomas, both with regard to their radiological appearance on computed tomography (CT) examination, and to the presence of hormone and growth factor receptors in these tumours. Studies into the CT characteristics of meningiomas suggest a prognostic and pathophysiological importance [1–4]. Endocrine investigations showed the presence of progesterone receptors (PR) on the majority of meningiomas [5, 6], while the presence of oestrogen receptors (ER) has been a matter of controversy [5–9]. We recently showed that somatostatin receptors (SSR) are present in various densities on virtually all meningiomas [9, 10], whilst epidermal growth factor receptors (EGFR) are simultaneously present on most of them [11, 12]. In breast cancer the presence of PR, ER, SSR and EGFR has been previously shown to be of importance both with regard to the prognosis and the choice of medical therapy [13, 14].

The clinical importance of radiological appearance as well as of the presence of hormone receptors on meningiomas is at present uncertain. However, various attempts have been made to correlate CT characteristics with histology or with the clinical course of meningiomas [1, 15, 16]. In the present study, we compared CT appearance of 24 meningiomas with the presence and quantity of PR, ER, SSR and EGFR and with histology.

MATERIALS AND METHODS

Twenty-four human intracranial meningiomas were obtained at surgery. From these tumours, a preoperative CT had been made, with and without contrast (Philips Tomoscan 310). After

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