RESEARCH COMMUNICATION

Insufficient Screening Knowledge in Chinese Interns: A Survey in Ten Leading Medical Schools

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Abstract

Objective: This study aimed to investigate Chinese medical interns' cancer knowledge and associated factors, focusing on cancer screening. Methods: A questionnaire survey was conducted in ten leading Chinese medical schools from June to July in 2011. Medical interns were invited to fill the questionnaire. Results: Out of the 1350 copies sent, 1135 eligible responses were returned. Around 50% of interns had positive attitude toward oncology, but the knowledge score was low, particularly in screening. The percentages of scores were 44.8% (8.95/20) for overall and only 29.6% (2.07/7) for screening. The majority of internship length in oncology department was eight to fourteen days. Screening and prevention was ranked as third most taught, following diagnosis and treatment. Multivariate analysis showed that positive attitude to oncology correlated with positive self-evaluated overall (OR = 1.76, 95% CI (1.45, 2.12)] and screening [OR = 1.62, 95% CI (1.35, 1.95)] competence, but unexpectedly predicted lower screening score [OR = 0.77, 95% CI (0.61, 0.97)]. Interns with positive self-evaluated screening competence were not found to possess higher cancer screening knowledge. Conclusion: Current medical education in Chinese medical schools fails to equip interns with optimal cancer knowledge, particularly in screening, even in interns who hold positive view to oncology. Interns' self-evaluated competence is not proportional to their knowledge scores.

Keywords: Cancer screening - undergraduate medical education - China

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Introduction

Globally, cancer burden increases rapidly in the past decades. It is the first and second leading causes of death in the developed and developing countries, respectively (Jemal et al., 2011). In China, cancer topped the causes of death among diseases in both urban and rural areas in 2008 (Health, 2009). The economic cost by cancer accounted for about 7% of the total economic cost of diseases in 2003(Zhao et al., 2010). Due to the increasing aging population, environmental pollution, and altered lifestyle, the cancer burden is projected to continue to rise in China.

Barton et al. (2006) advocated that all practitioners need some knowledge of cancer. Recent decades has witnessed the mortality reduction in breast and cervical cancers, argely attributed to the screening programs(Blanks et al., 2000; Raffle et al., 2003), and programs for colorectal cancer are emerging (Benson et al., 2008). Unlike in the developed countries, where primary physicians substantially take the responsibility of cancer counseling and screening (Barton et al., 2006), the quantity and quality of primary physicians are far more than satisfactory under current Chinese healthcare system (Wang et al., 2007). The limited access to healthcare resources also makes patients desire to solve all their health questions during one visit to hospital. It is not rare to meet patients, particularly the elderly who ask for cancer screening and prevention counseling even they are not visiting an oncologist or not in an oncology department. It is also not possible that only oncologists take all responsibility of cancer prevention and screening for the Chinese. Thus, for Chinese non-oncologists, screening should be one of the

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most important part of cancer knowledge that are advised to be mastered. Under current medical education system, Chinese medical students are rarely trained in oncology after undergraduate teaching if their specialty is other. Therefore, the education they received in medical school determinately influences the quality of cancer relevant information they send to patients.

Previous studies revealed that cancer education in other countries were insufficient, fragmented, and unorganized and students' knowledge and competence of cancer were to be improved (Tattersall et al., 1988; Barton et al., 2003; 2006; Hansen et al., 2004; Jeeva et al., 2007; Villarreal-Garza et al., 2010). Medical students' attitude, knowledge, and competence of cancer will greatly influence the outcome of Chinese battle on cancer. However, no studies have investigated the cancer education and students' cancer knowledge in Chinese medical schools. We therefore conducted a survey in medical interns in ten leading Chinese medical schools to explore interns' attitude, self-evaluated competence, self-reported education, and knowledge, focusing on screening. We also analyzed relationship between knowledge score and self-evaluated competence, and influence of attitude and education on scores and self-evaluated competence.

Materials and Methods

Questionnaire design

The drafted main body of questionnaire first consisted of three sections: self-evaluated competence, self-reported education, and knowledge assessment. Most questions in the latter three sections were adapted from previous questionnaires retrieved either from published literature or correspondence with author s(Barton, et al., 2003; Cave et al., 2007; Villarreal-Garza, et al., 2010). The questions on cancer prevalence, burden, prevention, and treatment were adapted from our previous small-scale survey in our medical school (unpublished). The drafted questionnaire was then reviewed in a meeting of oncologists for construct validity. The meeting resulted in the addition of the section of students' attitude to cancer and some language editing. The questions in the sections of attitude and self-evaluated competence were on a five-point Likert scale.

After the meeting, we invited five medical students in our school to test whether the questionnaire could be easily and correctly understood. The drafted questionnaire was also sent to coordinators in other medical schools to obtain their comments, focusing on the school-specific issues.The final questionnaire was nine pages long, printed on one folded sheet of A4, including cover, introductory letter, demographics, main body and thank-you letter. The main body consisted of attitude (Q01-Q04), self-evaluated competence (Q05-Q09), self-reported education (Q10-Q14), and knowledge (Q15-Q42).

Participants

The study was conducted in medical interns from ten leading medical schools in China, namely Peking Union Medical College, Peking University, Fudan University, Medical University, Huazhong University of Science and Technology, Central South University, and Sichuan University. We assumed that the knowledge of medical students from the above ten schools represents the highest level of cancer knowledge in Chinese medical schools.

Interns are defined as medical students who have finished all courses and clerkership but are neither residents nor graduate students. Typically for five-year program students in China, interns are the 4th to 5th-year students (Lam et al., 2006). However, for students in the seven-year or eight-year programs, the year of intern varies from 4th to 7th. After internship, Chinese medical students will not receive structured education on oncology, unless oncology is their chosen specialty.

Questionnaire distribution and collection

One student from each medical school was designated as the coordinator to be responsible for the questionnaire reception, dissemination, data monitoring and collection in his/her school. Questionnaires were printed in Chengdu and mailed to the coordinators in June, 2011. Several distributors under the coordinator and the coordinator him/her-self in each school sent the questionnaires to participants and checked the quality of collected questionnaires. The number of questionnaires sent by each distributor was strictly restricted to 30 to 40 to ensure the quality. The coordinator in each school collected and checked filled questionnaires from all distributors and mailed them back to Chengdu.

Scoring

The cancer knowledge was assessed in four scopes. The full score was three for epidemiology and prevention, seven for screening, five for treatment, and five for prognosis, respectively. Keys to the questions were referenced from the cancer screening guideline from American Cancer Society(Smith et al., 2010), laboratory medicine practice guidelines for use of tumor markers from National Academy of Clinical Biochemistry(Sturgeon et al., 2008, Sturgeon et al., 2010), Chinese healthcare report from the Chinese Ministry of Health (2009), website materials from World Health Organization (2009), and previous study (Barton et al., 2003).

For sections of attitude and self-evaluated competence, strongly agree/clearly know or agree/know were classified as positive, strongly disagree/clearly don't know or disagree/don't know as negative and the rest as neutral. For the overall evaluation of the two sections, two points were given to positive answer, one to neutral, and zero to negative. The upper and lower 2/5 portion of summed score were taken as positive and negative, respectively and the rest as neutral. For internship duration in oncology department, one point was given to <15 d, two to 15-28 d, and three to >28 d. Similar calculation method was applied for the overall evaluation of internship length in oncology. Therefore, the upper, medium, and lower 1/3 of summed score of three departments were categorized as short, medium, and long internship duration.

Data Input and Statistical Analyses

All data were entered using EpiData (http://www.epidata.org/). Each questionnaire was entered by two

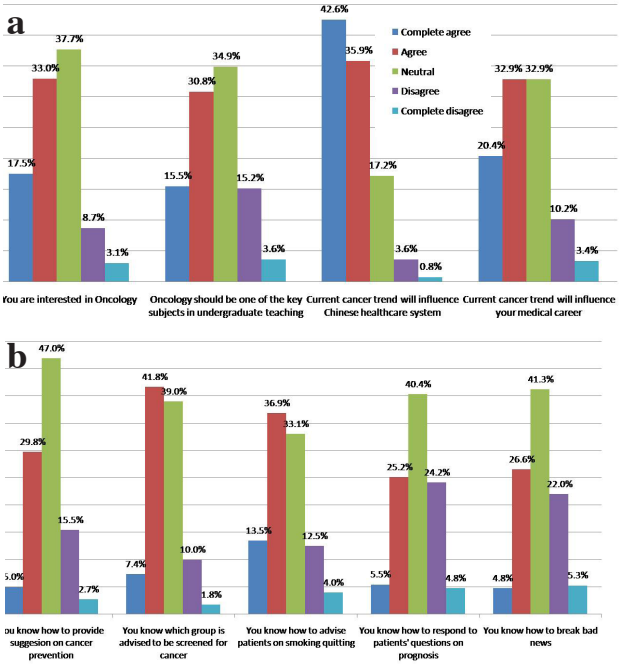

Figure 1. Interns' Attitude to a) Oncology and b) Self -evaluated Competence

people, and data were verified on a record-by-record basis by EpiData. Records failed to pass the verification were re-entered by a third person. Statistical analyses were performed using STATA for Windows version 11.0 or SPSS for Windows version 16.0. t-test, Chi-square test, or analysis of variance were used for testing difference between or among groups. Logistic regression was used for multivariate analysis. $P < 0.05$, or 95% CI not crossing one was considered significant.

Results

Of the 1350 copies of questionnaires sent out, 1254 (92.9%) were returned and 1135 (84.1%) eligible questionnaires were included in the analysis. The Cronbach's α coefficient was 0.70, and 0.79 for sections of attitude, and self-evaluated competence, respectively. The median internship length was 262 days. Four hundred and eighty-three students (42.6%) had not chosen their specialty, 56 (4.93%) had oncology, and 595 (52.4%) had other specialties.

Attitude and Self-Evaluated Cancer Competence

Figures 1a and 1b showed interns' attitude to oncology and self -evaluated competence and Tables 2 and 3 related

Table 1. Cancer Knowledge Scores (%) among Medical Interns in Ten Chinese Medical Schools

Total	44.8 ± 8.7
Epidemiology and Prevention	41.7 ± 27.0
Screening	29.6 ± 7.6
Tumor Markers	54.0 ± 17.5
Cancer Sites	39.6 ± 15.2
Breast	45.8 ± 29.4
Cervical	53.2 ± 30.4
Colon	31.8 ± 26.2
Lung	33.4 ± 47.2
Liver	33.8 ± 47.4
Case	33.4 ± 11.2
Treatment	54.4 ± 22.8
Prognosis	58.0 ± 14.8

variables. Despite that 890 (78.4%) respondents agreed or strongly agreed the statement that "the current cancer trend will influence Chinese healthcare system", only 573 (50.5%), 526 (46.3%), and 606 (53.4%), agreed or strongly agreed the statement that "you are interested in oncology", "oncology should be one of the key subjects in undergraduate teaching" and "current cancer trend will influence your medical career", respectively.

Approximately 30% of students reported that they were positive on competence of cancer prevention counseling, cancer prognosis, and breaking bad news. Higher proportion of students believed that they were competent on cancer screening (49.2%), and smoking quitting (50.4%).

Self-Reported Cancer Education

Only 20.4%, 18.8%, and 20.6% interns had rotated in the departments of surgical, medical, and radiation oncology, respectively. The highest portion (62.5%, 62.4%, and 56.3%) reported that the duration in these departments ranged from eight to fourteen days. More than half of respondents reported that they had managed liver (71. 6%), lung (70.9%), colorectal (69.3%), cervical (56.2%), and breast (50.9%) cancers. From first to third, the instruction on oncology interns received in medical school was diagnosis (65.3%), treatment (48.4%), and prevention and screening (29.9%).

The score for each scope was shown as the percentage of the corresponding full score (see Table 1). The mean knowledge score for all interns was 44.8% ± 8.7%. The score for screening was 29.6% ± 7.6%. The results showed that 64.8%, 93.4%, 94.9%, and 91.4% interns believed that Ca 15-3, Ca 19-9, CEA, and PSA could be used in cancer screening. We found that 77.4%, 81.8%, and 69.7% of

Table 2. Multivariate Analysis showing Relationships between Variables and Self-evaluated Competence

Variables	Categories	Overall Competence OR (95% CI)	p	Screening Competence OR (95% CI)	p
Gender	Male vs. Female	0.64(0.50-0.80)	0·00	1.03(0.82-1.29)	0.79
Program	5-year vs. 7-year vs. 8-year	1.00(0.81-1.23)	0.98	1.05(0.85-1.30)	0.63
Year	4th vs. 5th vs. 6th vs. 7th	1.16(1.46-0.91)	0.23	1.02(1.28-0.80)	0.89
Internship length	<7m vs. 7-12m vs. 13-18m vs. 19-24m	1.20(1.00-1.44)	0.04	1.10(0.92-1.31)	0.31
Attitude to oncology	Negative vs. Neutral vs. Positive	1.76(1.45-2.12)	0.00	1.62(1.35-1.95)	0.00
Oncology dept. internship length	Short vs. Medium vs. Long	1.26(0.99-1.60)	0.06	1.09(0.86-1.38)	0.47
Cancer patients in non-oncology dept.	Small vs. Medium vs. Large	1.33(0.92-1.93)	0.13	1.27(0.88-1.83)	0.20

Table 3. Multivariate Analysis showing Relationships between Variables and Knowledge Scores

Variables	Categories	Total Score		Screening Score	
		OR (95% CI)	p	OR (95% CI)	p
Program	5-year vs. 7-year vs. 8-year	1.02(0.82-1.26)	0.89	1.38(1.05-1.82)	0.02
Year	4th vs. 5th vs. 6th vs. 7th	1.20(0.94-1.54)	0.13	0.93(0.69-1.25)	0.63
Internship length	<7m vs. 7-12m vs. 13-18m vs. 19-24m	0.92(0.76-1.10)	0.35	1.03(0.82-1.30)	0.79
Attitude to oncology	Negative vs. Neutral vs. Positive	0.91(0.75-1.11)	0.36	0.77(0.61-0.97)	0.03
Oncology dept. internship length	Short vs. Medium vs. Long	0.91(0.71-1.17)	0.47	0.78(0.56-1.07)	0.12
Cancer patients in non-oncology dept.	Small vs. Medium vs. Large	0.97(0.66-1.42)	0.86	1.08(0.65-1.79)	0.76
Self-evaluated competence	Negative vs. Neutral vs. Positive	0.89(0.74-1.07)	0.20		-

interns reported that there were recommended screening strategy for breast, cervical, and colon cancer, respectively, and 66.5% and 66.0% reported there were for lung and liver cancers. The rank of treatment contribution assessed by interns was surgery (88.99%), chemotherapy (70.93%), radiotherapy (70.48%), and biotherapy (88.81%), listed from most to least.

Factors that Associated With Self-Evaluated Competence and Knowledge Score

Tables 2 and 3 summarize variables that correlated with self-evaluated competence and knowledge score, respectively, by multivariate analysis. Positive attitude to oncology was found to correlate with better self-evaluated overall [OR = 1.76, 95% CI (1.45, 2.12)], and screening competence [OR = 1.62, 95% CI (1.35, 1.95)], but was not translated into better knowledge score and even yielded worse cancer score [OR = 0.77, 95% CI (0.61, 0.97)].

Discussion

This study, which presents data of 1135 medical interns from ten leading Chinese medical schools, revealed that their cancer knowledge is far from optimal. Particularly for screening, the score was only 29.6% and more than 60% of interns held the incorrect perception that there were recommended screening strategy for liver and lung cancers. Compared with the Mexican report(Villarreal-Garza, et al., 2010), from which our screening questions were adapted, we found Chinese students achieved lower scores. The Chinese students achieved 45.8%, 53.2%, and 31.8% for breast, cervical, and colon cancer compared to 69.2%, 70.3%, and 45.2% in the Mexican study. Because this study asked the students whether there was a recommended screening strategy for a certain type of cancer, which was not in the Mexican, we analyzed the data of students who answered correctly to this question to make direct comparison. The scores were still lower in Chinese interns (data not shown). The scores of other scopes of cancer are not satisfactory neither (Table 1). Several other studies have reported the insufficient cancer knowledge and competence in medical students, but it is not likely to make direct comparison because of the different survey questionnaires used.

The dauntingly low scores in cancer knowledge, particularly in screening in Chinese medical interns would have negative impact on Chinese battle on cancer. In developed countries, primary physicians play a pivotal role in cancer prevention and screening counseling (Barton et al., 2006). However, due to the lack of primary care infrastructure, Chinese physician is at a greater chance being exposed directly to patients' questions of cancer prevention and screening, regardless of the specialty. Physicians' knowledge is the prerequisite for patients to benefit from correct cancer screening. Tattersall et al reported that screening was judged very important by most faculty in medical school (Tattersall, et al., 1988). However, screening and prevention was reported in our survey to be ranked third in cancer education that they received. Screening could result in marked reduction of mortality in certain cancers(Blanks et al., 2000; Raffle, et al., 2003, Benson, et al., 2008), we therefore advocate that Chinese medical education give more emphasis on cancer screening.

What surprises us is that the positive attitude, internship in oncology departments and more cancer patients taken in non-oncology departments were not translated into better cancer knowledge scores, and unexpectedly, positive attitude resulted in lower screening score. In contrast, positive attitude toward oncology correlates with positive self-evaluated cancer competence, including screening competence. Although students' confidence level may not necessarily predict the scores, it has not been reported that lower screening scores in students with positive attitudes. This suggests that internship may lead Chinese medical students to wrong perception of cancer knowledge or at least did not equip them with enough cancer knowledge, particularly in screening. Screening, which focuses n the asymptomatic population to detect cancer is critical for early cancer discovery and subsequently lower treatment cost and toxicity and higher cure rate.

Screening is different from diagnostic test on symptomatic patients. Although the two may sometimes utilize the same instruments or methods, the target and frequency are not identical. If the definition of screening was not clarified, medical students may easily mistake clinical workup strategy for screening. The use of tumor marker is often taught to use in diagnosis or follow-up in medical school (Villarreal-Garza, et al., 2010). In China, it is not rare to see a clinician order a set of tumor marker test when an asymptomatic person wishes to be screened for cancer, although for breast, lung, liver, colon, and cervical cancers, there are currently no tumor markers are recommended to screen asymptomatic non-high-risk persons (Sturgeon, et al., 2008; 2010; Smith, et al., 2010,). We also found that more than 60% of interns reported that

there were recommended screening strategy for lung and liver cancers.

Such phenomenon has potential harm on patients. Students who have positive self-evaluated competence could tend to be more confident and willing to provide cancer counseling to patients. However, our results found that this group of students does not have better cancer knowledge. What's worse, students with positive attitude may have worse screening knowledge and offer incorrect cancer instruction. Given the current Chinese medical education system, student who does not choose oncology as his/her specialty is very unlikely to update their screening knowledge, so the instruction they received in medical school is the pivotal knowledge source for their future medical practice.

Despite frustrating education, we delightedly noted that 78.4% of students were positive that cancer trend will influence Chinese healthcare system, and only 4.4% held negative view. However, this did not translate proportionally into positive attitude on their interest in oncology and the statement that oncology should be one of the key subjects in undergraduate teaching and that cancer trend will influence your medical career, with all positive rate around only 50%.

Academic organizations have formulated integrated oncology curriculum to improve the cancer education in medical schools (Muss et al., 2005; Barton, et al., 2006). Numerous previous studies have identified that several methods could improve cancer education, including use of silicone model, specific cancer courses, and exposure to cancer patients (Gaffan et al., 2006). We hope that these methods would be tested in Chinese medical students in the future.

This study has some limitations. Due to the inability to have access to intern lists in medical schools, we were not able to perform a random sampling, but employed convenience sampling instead. Nevertheless, we achieved around 50% coverage of interns in the ten medical schools to try to minimize sampling bias. The weight and measurement standard of each scope of cancer knowledge may be controversial, so we listed the score for all four scopes in addition to the overall score for better understanding.

In conclusion, this study found that Chinese medical intern's cancer knowledge, particularly screening is far from optimal. Students who have positive attitude on oncology, internship in cancer-specific department, more cancer patients taken in non-oncology department do not have better cancer knowledge. Cancer education in Chinese medical schools warrants reform to equip medical graduates with enough cancer related competence and knowledge to ensure the control of cancer in China.

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