

# Knowledge of Common Pediatric Cancers Among Medical Students in Northeast Brazil

## Conhecimento sobre Tumores Pediátricos Comuns entre Estudantes de Medicina no Nordeste do Brasil

Cynthia de Araújo Barros<sup>I</sup>

Isabella Samico<sup>I</sup>

Kátia Virginia de Oliveira Feliciano<sup>I</sup>

Felipe Araújo Andrade de Oliveira<sup>II</sup>

### KEYWORDS

- Medical Education.
- Oncology.
- Pediatrics.
- Early Diagnosis.

### PALAVRAS-CHAVE

- Educação Médica.
- Oncologia.
- Pediatria.
- Diagnóstico Precoce.

Recebido em: 08/02/2010

Aprovado em: 21/04/2010

### ABSTRACT

*Background: In recent decades, early diagnosis of childhood cancer has taken an important place on the international agenda. The authors of this study evaluated a group of medical students in Recife, Brazil, regarding knowledge and practices related to early diagnosis of common childhood cancers. Methods: Cross-sectional study with a sample of 82 medical students, from a total of 86 eligible subjects. Data were collected using self-completed questionnaires. Subgroups were defined according to knowledge of the theme and students' perceptions of their own skills and interest in learning. Results: 74.4% of the sample demonstrated a minimum level of knowledge. The group without minimum knowledge or self-perceived competence to identify suspected cases (23.3%) was in the worst position to perform early diagnosis. All subjects expressed interest in learning more about this topic. Conclusions: Despite acceptable levels of knowledge among these medical students, the definition of central aspects of the teaching and learning processes would be useful for training physicians with the skills for diagnosing and treating pediatric cancers.*

### RESUMO

*Introdução: Durante as últimas décadas, o diagnóstico precoce do câncer pediátrico tem tido importante destaque na agenda internacional. Neste estudo, os autores avaliaram estudantes oriundos de uma faculdade de medicina no Recife, Brasil, considerando conhecimento e práticas no reconhecimento precoce do câncer pediátrico. Métodos: estudo de corte transversal com uma amostra de 82 estudantes de um total de 86 elegíveis para o estudo. Os dados foram coletados por meio de questionários auto-aplicáveis. Os subgrupos foram definidos de acordo com o conhecimento sobre o tema e a auto-percepção dos estudantes acerca de sua competência e interesse no aprendizado. Resultados: 74,4% apresentaram conhecimento mínimo. O grupo sem conhecimento mínimo e com competência percebida para identificar casos suspeitos (23,3%) se encontrava na pior situação no sentido do diagnóstico precoce. Todos expressaram interesse em aprender mais sobre o tema. Conclusões: Apesar dos níveis aceitáveis de conhecimento entre os estudantes, a definição de aspectos centrais dos processos de ensino-aprendizagem seria extremamente útil para a formação de médicos com competência para diagnosticar e tratar o câncer pediátrico.*

<sup>I</sup> Instituto de Medicina Integral Prof. Fernando Figueira, Recife, PE, Brasil.

<sup>II</sup> Marinha do Brasil, Recife, PE, Brasil.

## INTRODUCTION

Pediatric cancer cases represent approximately 2% of all types of cancer<sup>1</sup>. The World Health Organization estimates that by the year 2020, 70% of pediatric cancer cases will be diagnosed in developing countries<sup>2</sup>. Despite the fact that in Brazil the survival rates for all types of childhood cancers are similar to those of developed countries, with event-free survival rates estimated at 70%<sup>2</sup>, cancer is already the fourth leading cause of death in children 0 to 9 years old and the second leading cause in 10 to 19-year-olds. In the State of Pernambuco, cancer is the third leading cause of death in children 5 to 9 years old and the second cause in 10 to 19-year-olds.<sup>3</sup>

Most types of pediatric cancer can be cured. Early diagnosis reduces the intensity of treatment and is one of the most important factors for reducing clinical complications, long-term side effects, suffering, and death<sup>4</sup>. Early diagnosis is particularly relevant in children and adolescents due to the lack of preventive measures and the aggressive growth of cancers in these age groups. Attention to the early recognition of clinical signs of these cancers is one of the most important factors for improved treatment and prognosis<sup>6</sup>.

In Brazil, the increase in survival in pediatric patients has resulted from the creation of multidisciplinary care groups, cooperative treatment groups, specialized professional training, and increased availability of specialized equipment in referral centers<sup>2</sup>. Still, the high mortality in the first 30 days of hospitalization, generally associated with complications that appear in advanced stages of cancer, demonstrates that delayed diagnosis of pediatric cancer still poses a major challenge<sup>7,8</sup>. Knowledge and information about the referral system are essential for the early detection of cancer cases by physicians treating children and adolescents, irrespective of their specialty<sup>9-11</sup>.

In recent decades, medical training for early diagnosis of cancer has assumed an important place on the international agenda. Many studies have focused on teaching oncology as a mandatory component of undergraduate medical education and have also supported continuing medical education<sup>12-16</sup>. The First International Latin American Conference for the Teaching of Oncology in Medical Schools highlighted the need for a definition of the minimum necessary knowledge on early diagnosis of pediatric cancer for recent graduates<sup>17</sup>. In 1986, the Brazilian Health Ministry supported the inclusion of general oncology as a mandatory subject in medical schools<sup>18</sup>.

In Brazil, the increasing efficacy of therapeutic resources since the 1990s has demonstrated the importance of improved medical training for early diagnosis of pediatric cancer. First, investments were made to develop a better referral system (hospital infrastructure and professional qualification)<sup>7</sup>. Second, an

important improvement occurred in the population's access to primary health care through implementation of the "Family Health Care Strategy", in which physicians work as general practitioners<sup>19</sup>. Third, curricular changes have been made in medical schools to provide adequate training in primary care according to the guidelines of the Unified National Health System (SUS)<sup>20</sup>.

The lack of references in the literature on knowledge of pediatric oncology among undergraduate medical students motivated the authors to conduct this study. Students from a medical school in Pernambuco State were assessed for their knowledge on early diagnosis of pediatric cancer, their self-rated level of competence for recognizing signs and symptoms, and their level of interest in learning about these topics.

## METHODS

This cross-sectional study was conducted from October 2006 to May 2007 in a medical school in Recife, Pernambuco State, Northeast Brazil. In a context where medical training was undergoing a profound conceptual and objective transformation<sup>20</sup>, the decision to study this specific institution was due to the fact that its curricular reform began in the first semester of 2001, allowing the authors to include students in the sample that were already taking their training under the new curriculum. These students had already undergone a mandatory cycle of pediatric training. The research project was approved by the Research Ethics Committee of the Instituto de Medicina Integral Prof. Fernando Figueira — IMIP.

Starting with information provided by the university on the 86 students comprising the study population, data on 82 students were collected at five different health centers where they were performing mandatory clerkships. Three students could not be contacted, and one other student was excluded because he was directly involved in the research project. Subjects answered questionnaires in the presence of two field workers, after providing informed consent.

The study measured knowledge on leukemia, tumors of the central nervous system, lymphoma, and various histological types of abdominal tumors that together account for about 90% of all cases of malignant tumors in children and adolescents<sup>21</sup>. A pre-test on knowledge and perceived competence was carried out to help adjust the questionnaire before data collection.

Students were classified as having *minimal knowledge* of pediatric cancer when they correctly answered one item in each of four areas as follows: 1. epidemiological (risk factors for pediatric cancer or risk factor for acute leukemia); 2. clinical (relevant findings in physical examinations or important complaints for early diagnosis); 3. laboratory evaluation (total leukocyte count related to leukemia or peripheral blood blasts related to leukemia); 4. referral system (awareness of a specific referral unit).

Out of a total of 13 items, *average knowledge* was assigned to students with 5 to 8 correct answers and *good knowledge* to those with 9 or more correct answers. The measurement of correct answers for those with average or good knowledge took into account the availability of minimal knowledge. This classification was applied to the 61 students with minimal knowledge.

Six subgroups were created based on the correlation between indicators of knowledge (*with or without the minimum level of knowledge*) and the students' own perceptions of their technical competence to make an early diagnosis (*high, average, low competence*): Group A: with more than minimal knowledge and high level of competence; Group B: with more than minimal knowledge and average competence; Group C: with more than minimal knowledge and low competence; Group D: with minimal knowledge and high competence; Group E: with minimal knowledge and average competence; Group F: with minimal knowledge and low competence.

Another six subgroups were created based on correlations between the indicators of knowledge (*with or without minimal knowledge*) and the students' level of interest in acquiring knowledge about pediatric cancer (*high, average, and low level of interest*): Group 1: with more than minimal knowledge and high level of interest; Group 2: with more than minimal knowledge and average level of interest; Group 3: with more than minimal knowledge and low level of interest; Group 4: with minimal knowledge and high level of interest; Group 5: with

minimal knowledge and average level of interest; Group 6: with minimal knowledge and low level of interest in learning.

For the creation of groups related to competence and interest, the following categories were used: *high* ("very high" and "high"), *average* ("average"), and *low*. No participants showed a total lack of knowledge or interest in the theme. The correlation between level of knowledge, level of competence, and interest in learning about pediatric cancer was further analyzed. Level of significance for the association between the various socio-demographic variables, theoretical and practical access to knowledge on the theme, immediate employment, and knowledge on pediatric cancers was measured using the chi-square and Fisher's exact tests, when applied, with a 95% confidence interval.

## RESULTS

Eighty-nine percent of the students answered seven or more questions correctly. One student answered all the questions correctly. As shown in Table 1, the questions with the highest proportions of incorrect answers referred to the most common form of Hodgkin's lymphoma (23.2%), risk factors related to Wilms tumor (39%), important complaints that aid early diagnosis (39%), and the most common site for non-Hodgkin's lymphoma in Brazil (41.5%). All subjects knew at least one referral center for cases of pediatric cancer, and 92.7% established an adequate relationship between total leukocyte count and leukemia diagnosis.

TABLE 1:  
Medical students' knowledge about prevalent pediatric neoplasia in relation to wish for immediate employment.  
Recife, Brasil, 2007-2008

Knowledge	Wish for immediate employment							
	Yes (N=48)				No (N=34)			
	Correct answer		Wrong answer		Correct answer		Wrong answer	
	n <sup>o</sup>	%	n <sup>o</sup>	%	n <sup>o</sup>	%	n <sup>o</sup>	%
Most frequent pediatric neoplasias	31	64,6	17	35,4	27	79,4	7	20,6
Risk factors for pediatric cancer	23	47,9	25	52,1	21	61,8	13	38,2
Risk factors for acute leukemia	36	75,0	12	25,0	24	70,6	10	29,4
Risk factors for Wilms' tumors	17	35,4	31	64,6	15	44,1	19	55,9
Important clinical signs for early diagnosis	21	43,8	27	56,2	11	32,4	23	67,6
Important Physical examination symptoms for early diagnosis	38	79,2	10	20,8	27	79,4	7	20,6
Most frequent Location of non-Hodgkin Lymphoma in Brazil	18	37,5	30	62,5	16	47,1	18	52,9
Most common form of Hodgkin's Lymphoma	5	10,4	43	89,6	14	40,2	20	58,8
Most common form of Central Nervous System tumor	28	58,3	20	41,7	18	52,9	16	47,1
Most common forms of Neuroblastoma	28	58,3	20	41,7	21	61,8	13	38,2
Total number of leucocytes and leukemia	45	93,7	3	6,3	31	91,2	3	8,8
Blasts in Peripheral blood and leukemia	25	52,1	23	47,9	20	58,8	14	40,2
Knowledge of a Referral Center	48	100,0	–	–	34	100,0	–	–

TABLE 2:  
Minimal level of knowledge about prevalent pediatric neoplasia in comparison with gender, age, access to information and prospective employment. Recife, Brasil, 2007-2008

Variables	Minimal Level of Knowledge					
	Yes (N=61)		No (N=21)		Total (N=82)	
	n <sup>o</sup>	%	N <sup>o</sup>	%	n <sup>o</sup>	%
Female	34	55,7	12	57,1	46	56,1
Ages between 21 and 24	45	73,8	18	85,7	63	76,8
Worked rounds in Pediatric ER	38	62,3	8	28,1	46	56,1
Discussed pediatric cancer clinical cases	56	91,8	20	95,2	76	92,7
Acquired information about pediatric cancer from medical publications	51	85,0	20	95,2	71	86,6
Had access to information about pediatric cancer through the internet	40	65,6	17	80,9	57	69,5
Had expectations of immediate employment	34	55,7	14	66,7	48	58,5
Type of job intends to work in:						
Family Health Strategy	15	44,1	8	57,1	23	47,9
Clinician	17	50,0	6	42,9	23	47,9
Other	2	5,9	-	-	2	4,2

Table 2 presents some characteristics of students with minimal knowledge (four correct answers) of common pediatric cancer. From a total of 82 students, 74.4% (61) scored this minimum level. Among those who had done clerkships in the pediatric emergency department, a 2.2 times higher proportion reached the minimum level of knowledge, with borderline significance ( $p=0.0054$ ). No other variables significantly differentiated the students, although a higher percentage of those 21 to 24 years of age showed more knowledge. Prospects of immediate employment (55.7%) and the intention to join the Family Health Strategy (44.1%) were lower in the presence of

minimal knowledge as compared to the other students (66.7% and 57.1%).

According to Table 3, 29.5% of the 61 students with minimal knowledge showed average levels and 70.5% showed good levels of knowledge on childhood cancers. No variables significantly differentiated the students. Those with average knowledge of pediatric cancer had more access to information on the subject through the Internet (72.2%) as compared to those with good knowledge (62.8%) and lower access through books, magazines, or medical journals (77.8% compared to 86.0%.) The desire for immediate employment was higher

TABLE 3:  
Level of knowledge about prevalent pediatric neoplasia in comparison with gender, age, access to information and prospective employment. Recife, Brasil, 2007-2008

Variables	Level of knowledge					
	Medium (N=18)		High (N=43)		Total (N=61)	
	n <sup>o</sup>	%	n <sup>o</sup>	%	n <sup>o</sup>	%
Female	10	55,5	24	55,8	34	55,7
Ages between 21 and 24	13	72,2	32	74,4	45	73,8
Worked rounds in Pediatric ER	10	55,5	28	65,1	38	62,3
Discussed pediatric cancer clinical cases	17	94,4	39	90,7	56	91,8
Acquired information about pediatric cancer from medical publications	14	77,8	37	86,0	51	83,6
Had access to information about pediatric cancer through the internet	13	72,2	27	62,8	40	65,6
Had expectations of immediate employment	11	61,1	23	53,5	34	55,7
Type of job intends to work in:						
Family Health Strategy	5	45,4	10	43,5	15	44,1
Clinician	5	45,4	12	52,2	17	50,0
Other	1	9,2	1	4,3	2	5,9

among those with average knowledge, but the desire to work as a clinician was more common among those with good knowledge. A larger proportion of those with greater knowledge on the subject had worked in the pediatric emergency department.

As for the groups, Table 4 shows that 90.5% of those without minimal knowledge, which corresponded to 23.3% of the total sample, perceived themselves as having high or average technical competence to make an early diagnosis, as indicated by groups A and B respectively. On the other hand, Group E, which included those with minimal knowledge of the theme and perceived themselves as having average technical competence, represented half of the participants. Among those with minimal knowledge, 29.5% rated themselves as having great competence to detect early cases of pediatric cancer (21.9% of the total) and these constituted group D. Group E included a smaller percentage of students with expectations of immediate employment.

Table 4 also shows that all participants without minimal knowledge showed interest in learning about issues related to pediatric cancer; of these, 80.9% expressed high interest, forming Group 1 (20.7% of the total). Virtually all subjects with minimal knowledge, representing 73.2% of the total sample, expressed high or average interest in acquiring knowledge on pediatric cancer, according to the data from group 4 (51.4% of the total) and group 5 (21.9%). A smaller proportion of students with expectations of immediate employment expressed high levels of interest in learning about pediatric cancer (group 4).

It should also be highlighted that all the students without minimal knowledge but who rated themselves as having high competence for early diagnosis of pediatric cancer expressed great interest in learning about the subject. Meanwhile, those without minimal knowledge but who rated themselves as having average competence expressed high (75.0%) or average interest (25.0%) in learning.

TABLE 4:

Distribution of medical students in groups according to knowledge about prevalent pediatric neoplasia, competence and interest in learning about the theme compared to immediate employment. Recife, Brasil, 2007-2008

Variables	Immediate employment					
	Yes (N=48)		No (N=34)		Total (N=82)	
	n <sup>o</sup>	%	n <sup>o</sup>	%	n <sup>o</sup>	%
<b>Knowledge and perceived competence for early diagnosis:</b>						
<b>Without minimal knowledge:</b>						
• With high competence	3	6,3	1	2,9	4	4,9
• With average competence	9	18,7	6	17,6	15	18,4
• With low competence	2	4,2	-	-	2	2,4
<b>With minimal knowledge:</b>						
• With high competence	11	22,9	7	20,7	18	21,9
• With average competence	22	45,8	19	55,9	41	50,0
• With low competence	1	2,1	1	2,9	2	2,4
<b>Knowledge and interest in learning:</b>						
<b>Without minimal knowledge:</b>						
• With high interest	11	22,9	6	17,6	17	20,7
• With average interest	3	6,3	1	2,9	4	4,9
• With low interest	-	-	-	-	-	-
<b>With minimal knowledge:</b>						
• With high interest	22	45,8	20	58,8	42	51,3
• With average interest	12	25,0	6	17,6	18	21,9
• With low interest	-	-	1	2,9	1	1,2

## DISCUSSION

Of the total sample, 74.4% of the students had a minimal level of knowledge on basic epidemiological, clinical, and laboratory aspects and the referral system for pediatric cancer cases, comprising nearly half of the total sample. Theoretically, within this context, the students with minimal knowledge and average competence and that expressed interest in learning more about the subject (29.3%) were in the best position in relation to cognitive issues for early diagnosis of pediatric cancer.

It was worrisome that 23.3% of the students lacked the minimum knowledge of childhood cancers to make an early diagnosis, but rated themselves as capable of identifying possible cases of the disease. However, they all expressed high interest in learning about the subject. The group of students with minimal knowledge that considered themselves highly capable of recognizing cases of pediatric cancer also merits close analysis, because of their lack of understanding about the limitations of their own knowledge, although they had all expressed high interest in learning about the subject.

Expectations of employment immediately after graduation make it even more important to focus on learning about the most important childhood cancers. Although it cannot be characterized as a trend, students with such expectations provided fewer correct answers in the interviews. Increasingly, due to the widespread implementation of the Family Health Strategy in Brazil<sup>19</sup>, general practitioners are the primary health care providers for children and adolescents, whether in emergency departments, outpatient clinics, or primary care centers. Such circumstances obviously increase the likelihood that such general practitioners (some of them recent graduates) will encounter children and adolescents with cancer.

The lowest proportion of correct answers was associated with clinical practice issues, such as the patient history, physical examination, and differential diagnosis, which in our study generated numerous incorrect answers. Most cases of Non-Hodgkin lymphomas in Brazil cause large and fast-growing abdominal masses that compromise the patient's overall condition<sup>22</sup>. However, complaints of pain and increasing abdominal size in children are often treated as intestinal parasites. Meanwhile, from 60% of 90% of Hodgkin's lymphoma cases present enlarged cervical lymph nodes, a common sign in many other pediatric diseases<sup>23</sup>.

Non-specific characteristics of pediatric cancers can hinder the recognition of signs and symptoms by physicians, including general pediatricians who may see only one or two cases in their entire careers<sup>2</sup>. Such issues reinforce the responsibility of medical schools to prepare professionals that are more alert to risk factors and suggestive signs in order to identify cancer cases in their initial stages.

According to the unanimous opinion of American pediatric oncologists, the most important factor for favorable outcomes is to refer a child with suspected cancer to the closest specialized center as quickly as possible<sup>24</sup>. As shown by Haimi et al.<sup>25</sup>, patients that see more than three physicians before reaching a specialized service usually take around 11 weeks to establish a diagnosis, as compared to three weeks for those examined by only one physician before referral.

Practical activities are essential to teach future physicians to consider the possibility of pediatric cancer and to link into the referral system for such cases. In the present study, the characteristics of learning about malignant pediatric tumors were highly positive. The high proportion of students that had discussed clinical cases and had contact with pediatric patients during their course activities demonstrates the numerous opportunities for students to acquire knowledge and improve their skills through everyday interfaces between theory and practice. This tendency is confirmed by high levels of knowledge among students that have worked in pediatric emergency departments, considered the most common point of entry for children with cancer.

Students had also accessed knowledge through teaching and scientific materials such as books, magazines, and medical journals. The search for information and knowledge on the Internet was important, offering great credibility to the data about interest in the theme. Numerous studies have shown the increasing use of the Internet in medicine, making available a large amount of research resources and a huge digital database that allows access to libraries, discussion forums, and clinical guidelines. Moura et al.<sup>26</sup>, at a medical school in Greater São Paulo, found that 64% of the students accessed the Internet to obtain medical information, although most had been using the web relatively infrequently and for less than a year.

Although the results show an acceptable level of knowledge, and since the sample did not involve experienced doctors with a strong background of acquired theoretical and practical knowledge, the study emphasized the lack of knowledge on basic elements for early detection of malignant tumors by the vast majority of the students in the sample. It is thus necessary to reinforce access to theoretical and practical knowledge through the definition of essential elements that are part of the learning process related to early detection, diagnosis, treatment, and rehabilitation in pediatric cancer cases. For Barton et al.<sup>16</sup>, a perspective that focuses on essential problems is the best strategy to prepare physicians with a minimum level of competence to deal with cancer within a specific context.

Advances in medical knowledge have helped increase the pressure on medical students to obtain more information. However, important clinical skills will only be incorporated over time through everyday experiences in professional life. In this

sense, the interest expressed by students in our study indicates a favorable environment for developing adequate education in pediatric oncology. The constant process of comprehensive and contextualized development of medical professionals sustains the responsible practice of early diagnosis, which is essential to increase survival rates and reduce the severity of treatment for pediatric cancers.

## REFERENCES

1. International Union Against Cancer. Childhood cancer: rising to the challenge. Geneva (Switzerland): Ed. Parác Reamonn; 2006.
2. Rodrigues KE, Camargo B. Diagnóstico precoce do câncer infantil: responsabilidade de todos. *Rev Assoc Med Bras.* 2003;49:29-34.
3. Brasil. Ministério da Saúde. Indicadores de mortalidade [online]. Brasília; 2005. [acesso em 15 ago 2008]. Disponível em: <http://tabnet.datasus.gov.br/cgi/deftohtm.exe?idb2007/d0202.def>.
4. Margolin JF, Steuber CP, Poplack DG. Acute lymphoblastic leukemia. In: Pizzo PA, Poplack DG, eds. *Principles and Practice of Pediatric Oncology*. 5th ed. Raven: Lippincott; 2006. p.538-90.
5. Rubnitz JE, Crist WM. Molecular genetics of childhood cancer: implications for pathogenesis, diagnosis and treatment. *Pediatrics.* 1997; 100:101-8.
6. Weinstein JL, Katzenstein HM, Cohn SL. Advances in the diagnosis and treatment of Neuroblastoma. *The Oncologist.* 2003;8:278-92.
7. Howard SC, Pedrosa M, Lins MM, Pedrosa A, Pui CH, Ribeiro RC et al. Establishment of a pediatric oncology program and outcomes of childhood acute lymphoblastic leukemia in a resource poor area. *JAMA.* 2004;291(20):2471-5.
8. Pedrosa MF, Pedrosa F, Lins MM, Pontes Neto N, Nicodemus T, Falbo GH. Linfoma não-Hodgkin na infância: características clínico-epidemiológicas e avaliação de sobrevida em um único centro no Nordeste do Brasil. *J Pediatr (Rio J).* 2007;83(6):547-54.
9. Barrios CH. Uma análise do ensino atual da Oncologia e proposta de um conteúdo curricular mínimo para o curso de graduação. *Rev Bras Educ Med.* 2000;24(1):14-9.
10. Junqueira ACC. Medical student cancer education: experience from projects in São Paulo, Brazil, and in other parts of Latin America. *J Surg Oncol.* 2001;77:1-4.
11. Lins MM. Fatores associados ao retardo no diagnóstico das leucemias agudas na infância em um serviço de referência no Nordeste do Brasil. Recife; 2005. [Thesis] - Instituto Materno Infantil Professor Fernando Figueira; 2005.
12. Bakemeier R. Cancer education objectives of medical schools. *Med Pediatr Oncol.* 1981;9: 585-633.
13. Ravaud A, Hoerni B, Bécouam Y, Lagarde P, Soubeyran P, Bonichon F. A survey in general practice about undergraduate cancer education: results from Gironde (France). *J Cancer Educ.* 1991;6:153-7.
14. Zapka JG, Luckmann R, Sulsky SI. Cancer control knowledge, attitudes and perceived skills among medical students. *J Cancer Educ.* 2000;15:73-8.
15. Gaffan J, Dacre J, Jones A. Educating undergraduate medical students about oncology: a literature review. *J Clin Oncol.* 2006;24:1932-9.
16. Barton MB, Bell P, Sabesan S, Koczwara B. What should doctors know about cancer? Undergraduate medical education from a societal perspective. *Lancet Oncol.* 2006;7(7):596-601.
17. Perdicaris AAM, Mello FG, Delgado GL, Silva RB. Ensino da Cancerologia [notícia]. *Rev Bras Educ Med.* 1985;9(3):191-3.
18. Abreu E. Pro-Onco 10 anos. [Editorial]. *Rev Bras Cancer [periódico na internet]*. 1997 [acesso em 17 maio 2006];4(43):[cerca de 2 p.]. Disponível em: [http://www1.inca.gov.br/rbc/n\\_43/v04/editorial.html](http://www1.inca.gov.br/rbc/n_43/v04/editorial.html)
19. Brasil. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Atenção Básica e a Saúde da Família: histórico de cobertura [online]. Brasília; 2007. [acesso em 13 fev. 2008]. Disponível em: <http://dtr2004.saude.gov.br/dab/abnumeros.php#historico>.
20. Brasil. Ministério da Educação. Conselho Nacional de Educação/ Câmara de Educação Superior. Resolução CNE/CES nº4, de 7 de novembro de 2001. Institui diretrizes curriculares nacionais do curso de graduação em medicina [online]. *Diário Oficial da União.* Brasília, 9 nov. 2001; Seção 1. p.38. [acesso em fev. 2008]. Disponível em: <http://portal.mec.gov.br/cne/arquivos/pdf/CES04.pdf>
21. Gurney JG, Bondy ML. Epidemiology of childhood cancer. In: Pizzo PA, Poplack DG, eds. *Principles and Practice of Pediatric Oncology*. 5th ed. Raven: Lippincott; 2006. p. 1-13.
22. Sandlund JT, Downing JR, Crist WM. Non-Hodgkin's lymphoma in childhood. *N Eng J Med.* 1996; 334:1238-48.
23. National Cancer Institute. Childhood Hodgkin's Lymphoma Treatment. [online]. [acesso em 21 dez. 2007]. Disponível em: <http://www.cancer.gov/cancertopics/pdq/treatment/childhodgkins/HealthProfessional>.
24. Raney RB, O'Donnell JF, Brooks CM, Gallagher RE. Pediatric Oncologist's Assessment of Oncology Education in U.S. Medical Schools: Cancer Education Survey II. *J. Cancer Education.* 1994;9:141-4.

25. Haimi M, Nahum P, Arush WB. Delay in diagnosis of children with cancer: a retrospective study of 315 children. *Pediatr Hematol Oncol.* 2004;21:37-48.
26. Moura AA, Lhano MG, Del Giglio. Educação via Internet: experiência preliminar de Hematologia e Oncologia da Faculdade de Medicina da Fundação ABC. *Rev Assoc Med Bras.* 2000;46:47-51.

#### **AUTHORS' CONTRIBUTIONS**

Cynthia de Araújo Barros participated in the study conception, all stages in the elaboration of the research, and writing of the article. Isabella C. Samico and Kátia V. de Oliviera Feliciano participated in the elaboration and orientation of the

research, as well as in the drafting and final revision of the article. Felipe Araujo A. de Oliveira participated in the elaboration, data collection and analysis, and writing of the article.

#### **CONFLICTS OF INTEREST**

The authors had no conflicts of interest.

#### **MAILING ADDRESS**

Isabella Samico  
Rua Muniz Tavares, 81/402  
Jaqueira — Recife  
CEP: 52050-170 PE  
E-mail: isabella@imip.org.br