

Teaching writing of scientific abstracts in English: CLIL methodology in an integrated English and Medicine course

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Abstract

In the I Faculty at the University of Rome “La Sapienza” Medical School, one of the several methodology courses aims at developing approaches by physicians to patient queries. One such course comprises several disciplines: Pathology, Immunology, Medical Statistics, Internal Medicine and English, with the specific aim of furnishing students, all Italian speakers, with skills for searching and evaluating the medical literature for answers to patient queries regarding risks and effectiveness of therapy. This paper describes the integration of English into a Methodology Course and delineates how the language component uses a Content and Language Integrated Learning (CLIL) approach to train students to write the highly specific genre of journal abstracts for medical experimental research articles. A corpus of student writing is presented and discussed with the aim of furnishing one didactic model for language teaching within the Italian Medical Curriculum.

Keywords: CLIL, medical English, didactic model, research articles, abstracts.

Resumen

La redacción de resúmenes de artículos científicos en inglés: metodología AICLE dentro de un curso integrado de inglés y medicina

Uno de los distintos cursos metodológicos que se imparten en la Facultad I de la Universidad de Roma “La Sapienza” tiene por objetivo desarrollar enfoques que permitan a los médicos dar respuesta a las dudas que les plantean los pacientes. Dicho curso comprende diversas disciplinas, como son: patología, inmunología, métodos estadísticos aplicados a las ciencias médicas, medicina

interna y lengua inglesa, y, entre otros, pretende dotar a los alumnos, todos ellos hablantes nativos italianos, de destrezas de búsqueda y evaluación de bibliografía médica a fin de facilitar esas respuestas requeridas por los pacientes relativas a los riesgos y la eficacia de determinadas terapias. En el presente trabajo se describe cómo se ha llevado a cabo la integración de los contenidos relacionados con la lengua inglesa en dicho curso metodológico y, además, se ofrecen una serie de líneas generales relativas al empleo de una metodología de aprendizaje integrado de contenidos y lenguas extranjeras (AICLE) destinada a formar a los alumnos en la redacción de resúmenes tipo *abstract* característicos de los artículos de investigación que se publican en el área. Se presenta y estudia un corpus de extractos redactados por los propios alumnos con la finalidad de elaborar un modelo pedagógico encaminado a la didáctica de lenguas dentro del plan de estudios médicos italiano.

Palabras clave: AICLE, inglés médico, modelo pedagógico, artículos de investigación, resúmenes tipo abstract.

1. Introduction

Medico-scientific research in many EU countries has often been criticized because of poor productivity in bibliometric comparisons with the US or other countries (Soteriades et al., 2005; Sheridan, 2006). Many factors such as the lack of funds or poor dissemination and access to research publications are held responsible for this condition (EU Commission, 2006), but a significant limitation is the ability to write in scientific English (Man et al., 2004). Thus, because of poor writing skills, researchers and residents find it quite difficult to break into the international research fields and many valid publications remain hidden in what is known as the “grey literature” (Cook et al., 1993; Berman, 1995). As a result, many valid and competent scientists, speakers of other languages, may often fail to enter into international debates about clinical or biomedical issues such as that seen in the editorial or letters in professional medical journals (Magnet & Carnet, 2006) and thus reverse the so-called decline of biomedical research in Europe. Many specialists in pedagogy suggest that the professional “persona” in-training has much to gain by developing and improving academic literacy (Bazerman, 1988; Johns, 1997) and this is particularly important for medical professionals, speakers of languages other than English.

One of the many criticism levelled against language programs in tertiary education is the lack of integration between language and content. The

content-based language classroom has long been advocated in US tertiary education (Grabe & Stoller, 1997; Benesch, 2001; Hyland & Hamp-Lyons, 2002; Song, 2006) with the development of Content-Based Instruction (CBI) but it is rare in tertiary education in Europe. In a recent conference held in Maastricht in 2003, several patterns of integration between content and language, called CLIL or Content and Language Integrated Learning, have been proposed in academic fields such as Engineering (Räisänen, 2004), Political Science (Argondizzo & Laugier, 2004), Business Management (Slepovich, 2004) and Architecture (Winberg, 2004) but to the best of our knowledge, none in Medicine.

From the point of view of language learning, the lack of contextualization has also been documented in Communicative Language Teaching (Canagarajah 2002; Bax, 2003; Holliday, 2005). It has even been suggested that the highly specialized nature of academic texts may constitute an impediment to language learning (Spector-Cohen, Kirshner & Wexler, 2001) because of two missing features: the lack of contextualization and the absence of attention to the disciplinarity of the academic context. These authors proposed an EAP syllabus consisting of four prongs with the first teaching modules consisting of firstly high frequency vocabulary and discrete linguistic forms, an idea supported by the findings of Woodward-Kron (2008). The next prong should consist of improving reading comprehension strategies. This is followed by the third prong: a top-down genre analysis using deconstruction of academic genres common to the specific academic discipline, in agreement with the suggestion by Swales, (1990), Holmes (1997) and Bhatia (2004), all of whom highlight the genre specificity of academic language in several different fields. The fourth and final prong should consist of authentic criterion tasks.

This paper describes one application of this four-prong approach in one of the courses in Medical Methodology integrated with English at our university and delineates how the language component trains students to examine experimental research articles (RAs) with a specific aim to learn to write the highly specific genre of journal abstracts for medical experimental research articles. I first describe this integrated Methodology course and how English is integrated into this course using the patterns proposed by Finkel et al. (2003) and Holloway et al. (2004). Because this course comprises several disciplines (Pathology, Immunology, Medical Statistics, Internal Medicine) it was designated an “Integrated” Course. Then I describe various exercises to develop language skills which illustrate application of the

different syllabus prongs. In order to exploit the full potential of such integration, English studies converged on research or laboratory publications with particular emphasis on one criterion exercise: the writing of the methods section of abstracts because of the documented importance of research and laboratory papers (Braine, 1989 & 1995; Jackson et al., 2006). Finally, data from this criterion exercise is presented and discussed.

2. English within the Integrated Course

2.1 Integration within the course

The broad didactic aims of this Methodology course consist of moving from a strictly clinical case to a more research-centered vision of medicine for an in-depth understanding of research and how clinical questions can be answered by research. In any given year, a single clinical case was chosen collegially and teaching modules of the three sub-courses were developed as schematized in Figure 1. The modules were developed to overlap and integrate teaching material. For example, in the first module, identified by (1) in Figure 1, lessons consisted of the reading of the clinical case itself in English with attention to lexis and form, followed by Internal Medicine lessons teaching how to approach the patient to extract clinically relevant information, the signs and symptoms characteristic of the clinical case in

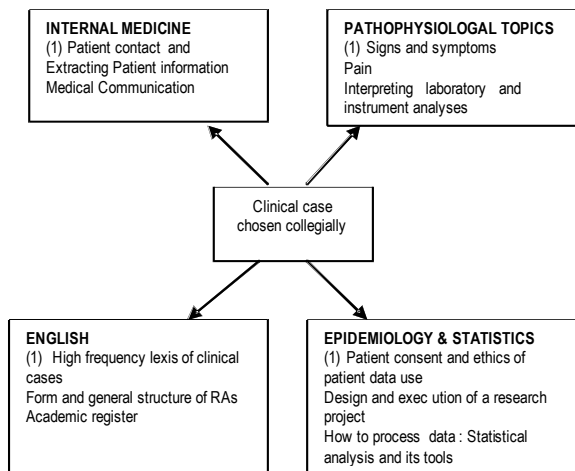


Figure 1. Inter-relationship between the elements in the integrated course.¹

Patho-physiology, and the elements of legislation and ethics concerning informed patient consent in Epidemiology. Subject teachers focussed on the pathologies, treatment and surgical options and refining the differential diagnosis of the case. Language teaching focussed on lexis, form and the structure of RAs and the academic register.

2.2 English language teaching

Because the patient is central to any academic reasoning in formulating clinical questions about possible therapeutic options, the patient was considered representative of a category and the treatment applied was compared to alternative treatments available to see if the results of some measurable parameter (called the outcome) were better or worse. This method of reasoning is given the name “PICO” (Patient, Intervention, Comparison and Outcome) and is shown in Figure 2. It was first used by the putative fathers of EBM² (Oxman et al., 1993) not only for the formulation of a clinical question but also to create keywords in interrogating a medical database for pertinent literature. PICO then acted as a kind of cognitive scaffolding for students to learn how to formulate clinical questions and interrogate a medical database. They were allowed to work in groups and to develop clinical questions of their own choice, based on the broad areas studied in this integrated course, such as patho-physiology, internal medicine, surgery, radiology or pharmacology, pertinent to the clinical case.

Once the clinical questions in PICO and the keywords were decided on, students were asked to find a given research publication in its entirety and one other research abstract pertinent to the clinical case by searching databases and online libraries. These instructions stimulated not only their curiosity but also furnished opportunities for developing library skills and served to inculcate the habit of continuous updating, so essential in a medical professional. The creation of clinical queries also acted as a scaffolding of information for students to critically evaluate medical abstracts or RAs. In this content-based framework, lessons in English for the other modules used a genre approach to identify the logical moves of an author of an academic publication, following the IMRaD pattern first used by Swales (1990).

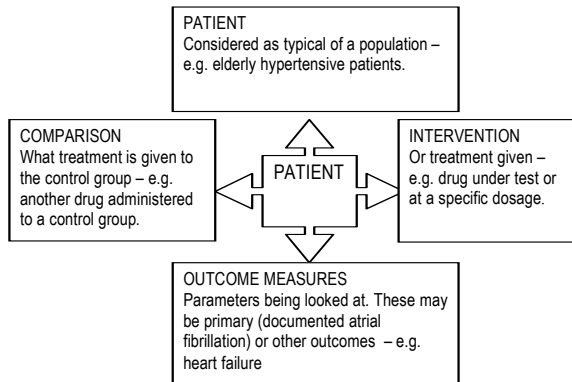


Figure 2. PICO - A method for formulating clinical questions.

The next teaching step in this model used EBM standards to read and evaluate a pool of research abstracts aimed at highlighting the characteristics of different research designs. Thus abstracts included both prospective and retrospective studies as well as longitudinal population studies and studies on selected cohorts. Another purpose of this series of abstracts analysis, decided collegially with Epidemiology, was to familiarize students with the different purposes of RAs and RCTs (*Randomized Clinical Trials*)³ and to relate the study design to the characteristics of the RCT. For the English classroom, students were asked to analyse a series of abstracts using a checklist for the presence of essential elements of RCTs. The purpose of giving many abstracts was to increase student exposure to different types of abstracts and the various methodological study designs used in the abstracts. In so doing, cognitive load is taken off the student while reading a new unknown text for content. Such scaffolding thus helps students to recognize the text type and associate it with the elements that constitute a good RA or RCT.

Following lessons in Epidemiology on experimental design, students were introduced to scientific RAs or RCTs and using a checklist of questions, they were asked to evaluate the entire text of a single RCT for language. This checklist of cognitive scaffolding consisted of identifying the presence or absence of elements characteristic of this sub-genre such as inclusion/exclusion factors, enrolment, patient/guardian consent, matched groups, length of follow-up of patients and the other elements present in RCTs. In the language lesson, new lexis, collocation, lexical bundles and

various semantic phrases were reinforced and experimented with for meaning.

In the following English lessons, a single research paper was deconstructed to identify the information structure and author moves with attention to linguistic features such as academic register, syntax and semantics, reader-writer interaction, lexico-grammatical choices and semantic meaning of the different sections of the research paper with particular attention to the introduction and the discussion. The same text was then explored for content of other medical areas such as Pathophysiology and Internal Medicine.

The language component was then tested in a single exercise set out as follows: students were given an unknown abstract from which the methods section had been removed and were asked to deduce information from the rest of the abstract to reconstruct a possible methods section in formal academic English. In the application of this teaching framework in the reconstruction of the methods section of an abstract, the didactic purpose was to activate medical content knowledge, cognitive as well as language characteristic of the genre of an authentic but unknown research article. This final test phase consisted of hypothesizing a methodologically sound procedure for a research abstract and writing the methods section of an abstract. This leaves cognitive energy for the production phase of the exercise, drawing on information of lexis and form that was introduced before. An example of this exercise was an authentic research paper which is given in Figure 3 and the rubrics for the exercise are described in the following section together with a justification of the expected answers.

3. Testing Method

In the rubrics, students were invited to reconstruct the text from which the methods section had been removed, using clues in the remaining sections (see Figure 3). Clues were identified by numbers in square brackets. The abstract required the following elements which were then used for grading the exercise:

1. RECRUITMENT of patients [2] with selection criteria of those with the clinical condition or disease [1]
2. TESTING such as the analysis of sera [4] or nasal aspirates [6]for

- antigens in children hospitalized to estimate the prevalence of *Chlamydia* spp. [3]
3. CONFIRMATION for the presence of *Chlamydia* using a sophisticated molecular test. [5, 7]
 4. TREATMENT OF THE DATA, which in this case was a simple calculation of a percentage [3] to indicate how prevalent this infection is among children hospitalized and whether a simple blood test would be sufficient to diagnose this infection [8,9]

Having been trained to examine abstracts and knowing the EBM elements necessary for a research article, students were expected to concentrate on the task of formulating the correct academic sentence that would fit into this genre.

<p><i>Chlamydia</i> sp. in hospitalised children with community acquired pneumonia. Jain R, J et al. Department of Microbiology, King George Medical University, Lucknow 226 003, India.</p> <p>Aim: to document the prevalence of chlamydial infection in children less than five years of age with Community Acquired Pneumonia (CAP)</p> <p>Methods: <i>ricomporre la sezione "methods" di questo abstract dall'informazione date nel resto del brano e renderlo in corretto inglese accademico.</i> Reconstruct the methods section of the following abstract and write it in correct academic English.</p> <p>Results: The prevalence [1] of <i>Chlamydia</i> species infection in CAP in children < 5 years of age [2] was 5.5% [3] corresponding to the 4/73 positive cases seen. Two cases were positive for <i>C. trachomatis</i> antibodies [4] using IgM microimmunofluorescence [5] studies ;while one case was positive for <i>C. pneumoniae</i> antibodies from nasal aspirates [6] and one case was positive for <i>C. pneumoniae</i> DNA on PCR [7]</p> <p>Conclusion <i>Chlamydia</i> sp. have an important role in CAP in children < 5 years and for early diagnosis of infection, use of more than one method [8] viz. PCR and serology is advisable [9]</p>

Figure 3. Example of an exercise requiring Language and Medical Methodology skills: reconstruction of the Methods section of an abstract.

A corpus of 55 student writings was collected with the aim of presenting one didactic model for language teaching within the Italian Medical Curriculum. The marking scheme consisted of two elements. The first was content-based and consisted of the 4 criteria above, which were allotted 10 marks if present. Another 10 marks were allotted for language fluency and form, the prior referring to correctness above the sentence and the latter, to below-the-sentence correctness. For language fluency, we were looking for

the appropriate structure of the paragraph and register, clarity of expression and cohesion and coherence devices. Form referred to the appropriate grammatical structures and choice of lexis.

4. Results

4.1 Validation of overall grade earned

The student grades were grouped into three levels of competence: “competent”, corresponding to >18 , “intermediate” for the interval 16-18 and, finally, “sufficient”, corresponding to an overall grade of <16 . There were no students with a grade less than 10, corresponding to 50% of the total points available. The distribution of grades is shown in Figure 4. Overall correlation measured by the Pearson coefficient between the 4 criteria and the student grade was calculated to be 0.341, well within the range for a moderately positive medium relationship.

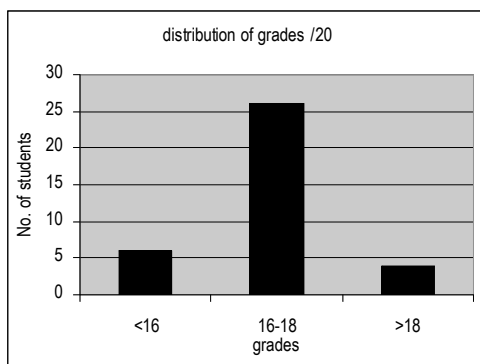


Figure 4. Grade distribution out of 20 marks in the corpus of student writing.

4.2 Linguistic descriptions of results

In the linguistic evaluation of each exercise, a global grade was given for items of academic register such as the use of passive rather than active sentences, the use of pre- and post-modifiers, the presence of complex nominal groups as the subject of a sentence and lexical variety in the choice of verbs. As already mentioned, the grades awarded were labeled “sufficient”, “intermediate” or “competent”. A selection of three examples from each of the three groups of competence is presented in the

Appendix. Each of the sentences is numbered in round brackets for ease of reference.

Within the first group of answers, the most common errors were: absence of verbs, absence of concordance between subject and verb, invented verbs and absence of complete sentences, as can be seen in (3) from student 2 of the corpus. Inventing verbs from similar-sounding Italian words and the absence of complete sentences indicated weaknesses in the lexical, grammatical and semantic parts of the syllabus. This response is quite unusual in that the student was able to infer and reconstruct the procedure used, but was unable to formulate correct sentences, giving answers in a note form.

The second group of answers again demonstrated the ability to understand the procedure, but clearly students were unable to formulate a procedure in keeping with the register of the abstract. For example, student 4 summarizes the results in (2) and (3) instead of describing a procedure. Student 55 mentions selection criteria, age of the patient population and two clinical tests but clearly demonstrates improper lexical choices and poor lexical variety in (1). The writing of student 27 is rudimentary in that notes rather than a text are presented in (1) and (2). However, in the final sentence of this answer (4), the student manages to formulate the sentence correctly with appropriate nominative and verbal groups and the correct use of the article. In (3), improper use of the possessive form is seen. Many of these errors indicate weaknesses in the first two prongs of the syllabus.

The last group, which was awarded the highest grades, generally used connectors for textual cohesion and all sentences were completely formed. Student 34 started clauses (1) and (2) with a verb, a common error among Italian native speakers. However, tight textual cohesion is seen in this text since every sentence starts with a connector showing anaphoric reference and the proper use of this pragmatic linguistic device. Several post-modifiers are present. This text also showed several deictic pointers like *this* or *that*. Student 46 demonstrated correct use of the article in clause (1), which also showed unusual negotiation of a series of adjectives. Prosodic variation in (4) is present since this student places the complement in the start of the sentence. Correct use of the articles is seen. This student was the only one to mention the statistical processing of data collected. A similar pattern is seen in the organization of the text of student 35.

5. Discussion

This exercise is not a simple one because it requires the processing of several contemporaneous tasks. The cognitive tasks used in this course are: extraction of information, assembling of a procedure/measurement of data and formulating the procedure in formal academic English. We recognize that this sequence of cognition has interesting parallels with the “Fitts-Possner Three Stage Theory of Acquisition of Motor Skills” (Reznick & MacRae, 2006). In their paper, these scholars suggest that students learning surgical skills go through three stages: cognition, integration and automation of tasks. Applying these stages to writing English, we can see that many students remain in the cognitive stage and never pass on to the others. For example most students were able to deduce the procedures from the remaining parts of the abstract but those getting the highest grades were only those able to formulate correctly this information in academic English in harmony with the rest of the paper. This corresponded to the group with grades 16-18 and over (see Figure 4). This group was able to pass from the stage of mere possessing information to the stage of integration and automation in applying the skills of formulating correct sentences, using lexico-syntactic variety and applying the appropriate academic register. Despite the complexity of this task, we believe that more practice with this kind of exercise would enhance student-writer’s writing skills and improve inter-personal aspects of writing by foregrounding a hypothetical reader.

The model we propose attempts to integrate content and language, with the addition of a study-skills component which functions as a schema support. This is effectively the structure of a CLIL methodology but it differs from a classic CLIL classroom which uses a foreign language as a medium of instruction. Such integration of content and language with explicit teaching of learning schema becomes meaningful and useful if it improves learners’ ability to process input, and frees them for higher level thinking skills, thus enhancing cognitive development. According to Johns (1997) and Bangert-Drowns, Hurley & Wilkinson (2004), the use of meta-cognitive prompts such as those proposed by Oxman et al. (1993) in the Users’ Guide series and the application of a mental schema or script, such as that suggested by Charlin, Tardif & Boshuizen-Henny, (2000) provide a theoretical framework for medical problem-solving. Similarly, Bhatia (2008) suggested that a closer interaction between discursive and professional practice would highlight the role of interdiscursivity in critical genre analysis. Such interaction, in our case, consists of the complex processing of information, together with

activation of knowledge base. From a practical point of view, an awareness of meta-cognitive strategies and can help mid- and lower-level students by enabling them to effectively assess their understanding of a subject and encouraging them to apply a more sophisticated learning approach, to even reach the stage of automation of writing tasks in the target language.

In this integrated teaching course, we used information from a hypothetical patient to explore the genre of research abstracts. The model presented in this paper (first lexico-grammatical aspects, followed by analysis and evaluation of a genre, followed by a criterion exercise in academic writing) was aimed at activating passive knowledge of language within a professional setting and applying grammar and lexis to a professional academic context. Hopefully this would improve language competence and encourage researchers to publish in authoritative journals or journals with high impact factors.

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NOTES

¹ With kind permission from Prof. Stefania Basili, course co-ordinator.

² EBM- Evidence Based Medicine, which is a school of thought for searching the medical literature for the best and most convincing evidence for options of patient care.

³ RCTs refer to research articles published on outcomes of clinical trials involving treatment of large cohorts of patients. Generally, the assignment of patient treatment is statistically randomized, hence the name *Randomized Clinical Trials*.

Appendix

Table showing a comparison between the original Methods section published (first row of the table) and a Selection of exercises from the Corpus of Written Methods section of Research Abstracts. Numbers correspond to student numbers in the course.

Original methods section		
Seventy three children, 1 month to 5 years of age, hospitalized with CAP were enrolled into this study over a period of one year. Microimmunofluorescence (MIF) was done to detect IgM antibodies against Chlamydia sp. in sera of all patients. PCR was performed to confirm the presence of specific <i>Chlamydia</i> spp. DNA in nasopharyngeal aspirates.		
Awarded grade of "Sufficient" <16 out of 20 marks	1	A total of 73 specimens was examined (1) the chlamyadzyme assay was performed according to the manufacturer's package.(2)
	2	73 children less than 5 years of age were studied for early diagnosis of the prevalence of Chlymidal spp infection because Chlamydia spp. have an important role in CAP(1). The authors use of more than one method to researcher case positive (2). IgM micro-immunofluorescence studies of <i>C. tracomatis</i> antibodies, nasal aspirates for <i>C. pneumoniae</i> and PCR for <i>C. pneumoniae</i> DNA(3)
	3	Patient specimens: a total of 73 hospitalised children< 5 years of age with CAP. (1) Diagnostic procedures: IgM microimmunofluorescence studies, assay on nasal aspirates, PCR(2)
Awarded grade of "Intermediate" 16-18 out of 20 marks	4	Chlamydia is an important organism un children less than5 years of age.(1) Infact, it is an important cause of CAP(2) The prevalence is 5.5% in this study there 2 cases positive of <i>C. tracomatis</i> anibosidies using IgM micro-immunofluorescence whereas only 1 case was positive for <i>C. pneumoniae</i> antibodies for nasal aspirates(3). Finally one was positive for <i>C. pneumoniae</i> DNA on PCR.(4)
	55	A total of x baby with CAP were selected by hospitalized children (1). All of them had less than 5 years(2). The study wanted to prove the prevalence of Chlamydial infection and used more than one early diagnosis methods DNA on PCR and serology (antibodies) on all the children (3).
	27	Patient specimens: 73 children< 5 years of age (1) Assay procedures: (2) IgM microimmunofluorescence: techniques of culture from nasal aspirates are required for identification of species by immunoselectivity to species-specific monoclonal antibodies PCR of amplification <i>C. pneumoniae</i> 's DNA (3). Molecular amplification techniques based on genomic sequences are now being used for the differentiation of <i>Chlamydia. spp.</i> (4)
Awarded grade of "Competent" <18 out of 20 marks	34	For this study, were selected 73 children < 5 years of age hospitalized for CAP (1). Authors looked for the principal species of Chlamydia that cause disease in human.(2) In particular, were used antibody using IgM microimmunofluorescence to detect <i>C. tracomatis</i> and antibodies from nasal aspirates for <i>C. pneumoniae</i> (3). In addition to serology a method involving DNA such as PCR was used to confirm results. (4)
	46	73 hospitalised children less than 5 years of age with CAP were enrolled to undergo IgM microimmunofluorescence studies antibody detection assays from nasal aspirated and nucleic acid amplification tests (PCR) to detect Chlamydia spp. infection (1). Inclusion criteria were children less than 5 years and CAP(2). Exclusion criteria were children more than 5 years without pneumonia not hospitalized and with other infectious diseases (3). For all of the tests mentioned, the page insert instructions were followed and prevalence was calculated by standard statistical techniques.(4)
	35	A total of 73 children age <5 years with a CAP diagnosis) were studied (1). Differences between sex, race, weight and length were not significant(2). The diagnosis was based on clinical symptoms and both anterior-posterior and lateral chest radiographs(3). Blood samples, bronchoalveolar lavages and nasal aspirates were collected from each child.(4) The 2ml blood sample for testing by PCR assay was processed according to the manufacturer's package insert.(5)

