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Chest X-ray (mania) in pediatric emergency departments

To the editor,

I read with appreciation the article written by Sarria et al.[1] on the difficulties of radiological diagnosis of acute infectious lung disease. The theme is creative, without necessarily being original, dispensing with high technology, and with imaginative methodology, an inspired analysis of the results and, rather than a conclusion, an invitation to reflect on a problem that confronts all of us, every day and every hour of those days.

I have been making these reflections, both in writing and speech, for a long time, calling attention to the X-ray *mania* (of the thorax and the sinuses) that takes place at our emergency services. Children with coughing and fever and/or chest crackles rarely escape X-ray. The resulting images are predictable and extremely difficult to interpret making no distinction between viral and bacterial processes. They end up serving as justification for not employing antibiotics ("it's just catarrh") or as a pretext for prescribing an antimicrobial agent ("there are small foci of bronchopneumonia"), which, in the great majority of cases, is an abuse. Such conduct increases expenses and delays care, obliging family members to spend hours waiting for the results, blocking up the emergency room and, a not uncommon situation, making the job of the next doctor on duty, who hasn't requested the X-ray, and who will have to start everything over, more difficult.

This is not just a matter of personal opinion. The prestigious British Thoracic Society's guidelines establish that "radiological findings are poor indicators of etiology" since viral and bacterial cases occur in equal numbers.[2] X-rays should be reserved for serious cases, those with complications or where clinical signs suggest consolidation. For intermediate cases, where there is doubt, the best resources to use are hematological studies, leukogram (leukocytes > 15,000 and neutrophils > 10,000), ESR (above 30) and C-reactive protein, which is not so readily available (values over 9 and especially so above 12). The bedrock of all reasoning remains the intensity of the infectious state (general impression) and observation by the pediatrician.[3] It is only thus that the quality of diagnosis can be improved and, as a consequence, rational antibiotic usage achieved, as the authors of the original article concluded.

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Authors' reply

We are grateful to Prof. Murahovschi for the interest shown in our article.

Despite the great scientific advances achieved by humanity, particularly during the last 200 years, at the start of the twenty-first century the diagnosis of pneumonia in children remains a challenge.

Obviously there have been important advances in understanding its pathophysiology, epidemiology and risk factors, but in the practicalities of diagnosis and etiologic investigation, advances have not been equal to needs. The perversity of this situation is revealed in developed countries, where, with more economic resources and technology available there has been a marked fall in mortality,[1] based on improving the socio-economic conditions of their populations. In developing countries, social and environmental determinants result in a different reality with pneumonia mortality rates remaining elevated.

The strategies adopted by WHO/PAHO to control acute respiratory infections (ARI), nowadays integrated into the IMCI strategy, allow for improved identification and earlier treatment of pneumonia cases in countries in the developing world. Reduced technology costs and better coverage are supported by the use of clinical criteria for diagnosis (basically retraction and tachypnea) and by the use of antibiotics in outpatients and clinics.[2]

The arguments for renouncing chest X-rays (CXR) and laboratory tests that this strategy employs are based on the critical features of diagnosis: 1) interobserver variation between X-ray interpretations; 2) the questionability of differential diagnosis between virus and bacteria equally by x-ray or laboratory tests (blood test, ESR, C-reactive protein).

Recent studies have demonstrated that there is much yet to be understood about the inflammatory reactions that occur during infection.[3] An individual's genetics and the balance between pro-inflammatory and inflammatory mediators control the inflammatory response during the acute phase. Lamentably not all microorganisms trigger an inflammatory response

during the acute phase and there are variations between those that do. These explanations, far from ratifying the low level of utility of current laboratory tests, allow us to better understand their limitations, which could contribute to their future improvement. Guidelines based on available evidence[4] do not recommend routine laboratory tests of the acute phase response (evidence level I: high quality systematic review or high quality trial).

The limitations of CXR for pneumonia diagnosis cannot be denied, but this is not a reason to demonize them. We should make a distinction between limitations well understood and indication abuses, just as between interpretive errors and baseless excuses for prescribing antibiotics in the face of any kind of image findings in the lungs. The CXR remains the most important diagnostic tool for pneumonia. Within the WHO itself, the Vaccines Group takes this view and is currently developing a study aimed at standardizing radiological findings for the diagnosis of pneumonia in children with a view to using the results in a study evaluating the impact of pneumococcus vaccination on the occurrence of the disease.[5]

In cases of mild pneumonia, diagnosed in clinics or outpatients and not requiring hospitalization, the guidelines recommend the use of just the clinical criteria employed by the WHO for diagnosis (evidence level II: prospective studies), doing without CXR. Similarly, they do not recommend CXR for follow-up (evidence level II). In cases of severe or complicated pneumonia, the use of CXR should be personalized, depending on the characteristics and severity of each case.

While clinical indicators are useful for ARI control strategy, they also present limitations. There is interobserver variation with respect of clinical indicator definition. According to a systematic review published in JAMA, *kappa* values for clinical indicators exhibit agreement between regular and good.[6] This is similar to interobserver agreement for CXR used to diagnose pneumonia as described in a number of different, including ours. The sensitivity and specificity of clinical indicators, compared or associated with CXR, were also similar in a number of studies, according to a report by the *ad hoc* group for pneumonia in developing countries[7].

The incapacity of clinical indicators to differentiate between viral and bacterial etiology leads to antibiotics usage that is far from ideal. In personal correspondence (2001), Dr. Frank Shann, a member of the original group that proposed the use of clinical criteria, aware of this, commented that the elevated mortality in developing countries weighed more when balancing this decision. The problem is that co-trimoxazole resistance rates have increased markedly during the last twenty years, and resistance to amoxacillin is increasing rapidly. Equally, the increase in incidence and prevalence of wheezing in developing countries makes it necessary to review standards, since retraction and tachypnea are always present with wheezing crises. This being so, Dr. Yehuda Benguigui, who is the PAHO's ranking officer concerned with the development and implementation of ARI control standards, also in personal correspondence (2001), stated that the standards are under review and that both antibiotic resistance and increased wheezing will be integrated. The guidelines assume that an association with wheezing initially rules out antibiotics (evidence level II).

Two final comments. Medical education can perform a significant role in this situation. It is necessary to reinforce the strategies used to teach outpatients Medicine and reduce the bias towards suppressing learning within the hospital environment. Sometimes, the abuse of diagnostic methods is in practice intended to compensate for deficiencies in basic diagnostic techniques which are little stimulated in environments with greater resource availability.

Finally, certain subjective factors should be taken into account. The lack of adequate conditions for medical work in the majority of emergency rooms in public hospitals weighs heavily on the performance of professionals. The lack of a public network with a better infrastructure creates a predisposition towards undue use of emergency rooms and patient overload there. On the one hand, doctors on duty have little time for more precise diagnosis, but, on the other hand, litigation against doctors has increased. Defensive medical practice is ever more common and this leads to the use of more laboratory examinations and generous antibiotics prescription, irrespective of scientific evidence.

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