Original article

A French national research project to the creation of an auscultation's school: The ASAP project

Emmanuel Andrès[a,*], Sandra Reichert[b], Raymond Gass[b], Christian Brandt[c]

[a] *Department of Internal Medicine, Clinique Médicale B, CHRU Strasbourg, Strasbourg, France*
[b] *Technical Academy Fellow, Alcatel-Lucent, Chief Technical Office, Strasbourg, France*
[c] *Center of Clinical Investigation and Research, CHRU Strasbourg, Strasbourg, France*

Abstract

Auscultation of pulmonary sounds provides valuable clinical information but has been regarded as a tool of low diagnostic value due to the inherent subjectivity in the evaluation of these sounds. This paper describes an ambitious study of in the so-called ASAP project or "Analyse de Sons Auscultatoires et Pathologiques". ASAP is a 3-year-long French collaborative project developed in the context of the *News Technologies of Information and Communication*. ASAP aims at making evolve the auscultation technics: by 1) the development objective tools for the analyse of auscultation sounds: electronic stethoscopes paired with computing device; 2) the creation of an auscultation sounds' database in order to compare and identify the acoustical and visual signatures of the pathologies; and 3) the capitalisation of these new auscultation techniques around the creation of a teaching unit: "Ecole de l'Auscultation". This auscultation's school will be destined to the initial and continuous formation of the medical attendants.
© 2008 European Federation of Internal Medicine. Published by Elsevier B.V. All rights reserved.

Keywords: Auscultation; E-auscultation; E-learning; Auscultation' school; Sound analysis

1. Introduction

Since the invention of the first stethoscope by the French physician René Laënnec in 1816, auscultation via a stethoscope is widely used by physicians as a simple, non-invasive and patient-friendly diagnostic method of chest diseases, where the sounds heard are correlated with the underlying pulmonary pathology [1,2]. Despite its popularity, however, a stethoscope is not an ideal acoustic instrument since it does not provide a frequency-independent transmission of sounds. Auscultation of pulmonary sounds provides valuable clinical information but has been regarded as a tool of low diagnostic value due to the inherent subjectivity in the evaluation of these sounds. In addition, auscultation is a subjective process that depends on the

experience and hearing capability of the individual, which may lead to a large variability in findings. Moreover since auscultation does not allow a permanent record of data, long-term monitoring of pulmonary sounds in follow-up studies is not possible. Over the last 30 years, advancements in the field consist of digital signal processing, analysis of waveforms by computer and recording of respiratory sounds but to date, there is only research and no development in clinical practice [1].

In the context of the MERCURE telemedicine platform, we started a project called ASAP. It deals in developing objective tools for the analysis of auscultation sounds and creating an auscultation sounds' database in order to compare and identify the acoustical and visual signatures of the pathologies. Finally, it aims at capitalizing of these new auscultation techniques around the creation of a teaching unit: the Auscultation's School.

2. Context of the project

ASAP or "Analyse de Sons Auscultatoires et Pathologiques" is a 3-year-long French collaborative project [1]. It is part of a

* Corresponding author. Service de Médecine Interne, Diabète et Maladies Métaboliques, Clinique Médicale B, Hôpital Civil-Hôpitaux Universitaires de Strasbourg, 1 porte de l'Hôpital, 67091 Strasbourg Cedex, France. Tel.: +33 3 33 88 11 50 66; fax: +33 3 33 88 11 62 62.

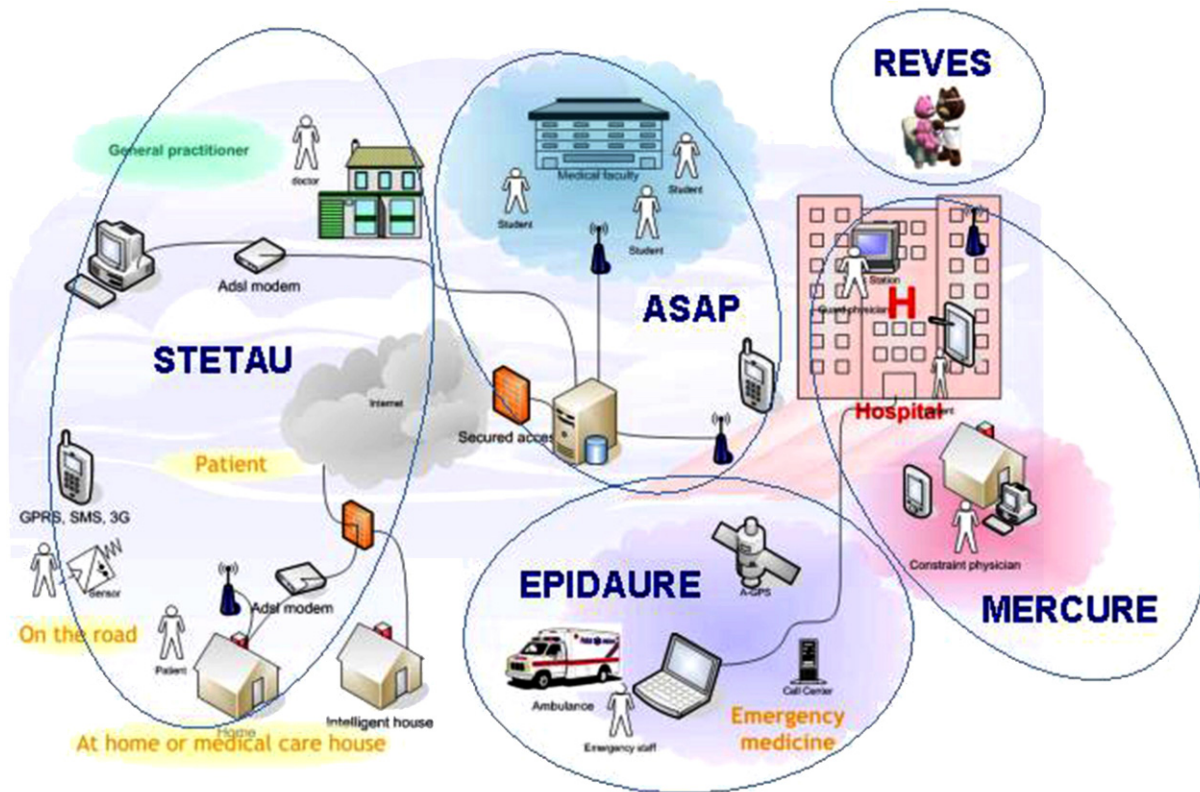*E-mail address:* emmanuel.andres@chru-strasbourg.fr (E. Andrès).

Fig. 1. The MERCURE platform with the projects STETAU and ASAP.

collaborative telemedicine platform called MERCURE or "Mobile Et Réseau pour la Clinique, l'Urgence ou la Résidence Externe". MERCURE deals with projects for remote monitoring or in clinical context thanks to modern tools principally coming from the *News Technologies of Information and Communication* (Fig. 1). STETAU is the first project of the MERCURE platform. It aims at providing the patient and medical staff, measurement tools that are non-invasive, mobile, communicant and that allows to transmit vital information by a secured way, objectively qualified by signal processing tools. Thus, physicians will have access to a tool for remote monitoring and exploration of cardiac and pulmonary sounds. ASAP aims at making evolve the auscultation techniques by:

–the development objective tools for the analyze of auscultation sounds: electronic stethoscopes paired with computing device

–the creation of an auscultation sounds' database in order to compare and identify the acoustical and visual signatures of the pathologies (Fig. 1)

–the capitalization of these new auscultation techniques around the creation of a teaching unit: «*Ecole de l'Ausculta-tion*». This auscultation's school will be destined to the initial and continuous formation of the medical attendants.

Auscultation is the first medical act that the medical students can realize on patients; it is realized empirically. Our project proposes to introduce an *evidence-based medicine* dimension at auscultation thanks to an association with signal processing,

visualization and archiving technologies [2]. These new technologies will be considered for the formation of the future physicians and will be accessible by e-learning. In the same way, the creation of a worldwide database named *WebSound* is an indispensable asset for capitalizing these news technologies around a pertinent and exhaustive knowledge base. An example of interesting utilization of the auscultation sounds database is the formation and the training of a physician to a specific pathology. Moreover, it will be possible to share auscultation sounds between experts thanks to a unified format. Thus, they will be able to discuss about a case and to affine their diagnosis. Finally, our project aims at initializing fundamental research works for the definition of a visual and acoustical signature of pathology. The first pathologies studied will be asthma, bronchitis, CODP and cardiac pathologies [2]. The success of the projects is conditioned by the definition of standard formats of the data and exchange protocols.

3. Goal of the project and main technological challenges

The studied system is a pair:

– a communicant electronic stethoscope: a stethoscope with possibilities of recording, send sounds to a computing device (PC, PDA…)

– a software to process auscultation sounds: auscultation enter in evidence-based medicine thanks to sounds transformed in images, objective and quantifiable data, transmission, comparisons, archiving [3,4].