A Heart Sound Simulator as an Effective Aid in Teaching Cardiac Auscultation to Medical Students and Internal Medicine Residents

Enseñanza de auscultación cardíaca a estudiantes y residentes de medicina mediante el uso de un simulador de ruidos cardíacos

To the Editor,

Cardiac auscultation is a reliable and cost-efficient clinical skill,1,2 but is being replaced by sophisticated, costly techniques. Moreover, recent experiences have shown that proficiency in this skill has declined among physicians in training.3 The objective of this report was to evaluate auscultation skills in undergraduate and postgraduate students and determine whether a training program involving a heart sound simulator can improve these skills.

This study included 32 fifth-year medical students (in Chile, undergraduate medical degrees take 7 years to complete) and 18 first- and second-year internal medicine residents. The SAM (Student Auscultation Manikin, Cardionics Inc.; Texas, United States) was used, which is capable of reproducing heart sounds at the 4 standard locations (mitral, aortic, pulmonary, and tricuspid). All of the participants underwent a baseline evaluation that included auscultation of the following sounds: normal heart sounds; mitral stenosis (loud first sound, opening snap, and a rumbling murmur); mitral regurgitation (apical holosystolic murmur); aortic stenosis (ejection click, harsh early-to-midsystolic murmur at the base of the heart); aortic regurgitation (diastolic murmur); third and fourth sounds; and pericardial friction rub. Half of the students and half of the residents were randomly assigned to 1 of 2 groups; each group (the SAM group, participants who underwent a training program in cardiac auscultation using the SAM, and the control group, participants who continued their usual training program) was made up of 25 individuals.

In the SAM group, training consisted of three 45-min sessions of heart sound auscultation with the simulator; in total, each student and resident listened to every sound at least 300 times. Participants were told which sound was being reproduced and could ask the instructor any questions they might have. The order in which the murmurs were auscultated in each session was randomized. Once the training period was over, 4 weeks after the baseline evaluation, all of the participants underwent the final evaluation in which the same manikin was employed; in addition to the 8 sounds described above, the participants were required to listen to 2 additional heart sounds (atrial septal defect and patent ductus arteriosus), in order to reduce the possibility of their identifying the sounds correctly by chance. These new sounds were not evaluated.

This study received the approval of the ethics committee of our institution; the participants had been free to decide whether or not they wished to enroll in it. Participation had no effect on the students’ grades.

In the baseline auscultation, the participants (students and residents) correctly identified an average of 31% of the heart sounds presented to them; there were no significant differences between residents and students (36% vs 26%; P=.22).

In the final, post-training auscultation, the percentage of correct responses by the participants in the SAM group improved from 28% to 73% (P<.01); in the control group, this percentage increased from 32% to 41.5% (P=.2). The percentage of correct responses in the SAM group was significantly higher than that of the control group (73% vs 41.5%; P=.01) (Figure).

**Figure.** Percentage of correct diagnoses based on auscultation of heart sounds according to type of training. SAM, Student Auscultation Manikin.

REFERENCES


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