EDUCATION

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**Are undergraduate paramedic students able to accurately identify breath sounds?
– A Pilot Study**

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Abstract

Background

The accurate interpretation of breath sounds in the prehospital setting is an important skill for paramedics as it ultimately may determine the patient's initial and ongoing management. These sounds may include normal breath sounds and abnormal breath sounds such as stridor, inspiratory/expiratory wheeze, fine crackles, and coarse crackles. Only one previous prehospital study investigating paramedic's ability to accurately determine the various breath sounds was located. The objective of this study was to determine if undergraduate paramedic students were able to accurately interpret a variety of breath sounds.

Methods

A prospective single-blinded observational pilot study using a convenience sample of undergraduate paramedic students to identify six different recorded breath sounds.

Results

The results demonstrate that Monash University undergraduate paramedic students are not accurate at interpreting a range of high quality recorded breath sounds likely to be heard in the prehospital setting. For sound one (coarse crackles), 20% of students correctly identified this breath sound. Sound two (stridor), 43% of students correctly identified this breath sound. Sound three (wheeze), 51% of students correctly identified this breath sound with 17% stating it was either an inspiratory/expiratory wheeze. Sound four (fine crackles), 6% of students correctly identified this breath sound whilst 14% thought it was a normal breath sound. Sound five (wheeze), 20% of students correctly identified this breath sound, with 49% unsure. Sound six (crackles), 40% of students correctly identified this breath sound with 23% being unsure.

Conclusions

This study demonstrates that Monash University undergraduate paramedic students are inaccurate at correctly identifying a variety of recorded breath sounds. The results from this study have provided Monash University paramedic teaching staff with evidence to facilitate change to the part of the curriculum that covers respiratory disorders.

Keywords

auscultation; breath sounds; chest auscultation; education; emergency medical technicians; paramedic.

Background

The accurate interpretation of breath sounds in the prehospital setting is an important skill for paramedics as it ultimately may determine the patient's initial and ongoing management. These sounds may include normal breath sounds and abnormal breath sounds such as stridor, inspiratory/expiratory wheeze, fine crackles, and coarse crackles. Chest auscultation is a relatively simple non-invasive skill that is the cornerstone of most medical examinations.

Only one prehospital study investigating paramedic's ability to accurately determine the various breath sounds was located. The study by Wigder et al compared new and experienced paramedics with emergency physicians and their ability to accurately identify five commonly presenting lung sounds.¹

The Bachelor of Emergency Health (BEH) students from Monash University in Victoria, Australia, currently receive instruction on breath sounds in semester 2 of their second year of study. The relevant teaching process includes face-to-face lecture material supplemented with video presentations, breath sounds online for students to listen at their convenience, and exposure to patients during their clinical placements in both prehospital and hospital settings.

The objective of this study was to determine if undergraduate paramedic students were able to accurately interpret a variety of breath sounds.

Methods

We conducted a pilot study using a prospective single-blinded observational methodology with a convenience sample of students during semester one in 2007. Students enrolled full-time in the BEH offered through Monash University, in Victoria, Australia were eligible for inclusion in the study.

Students were provided with six different breath sounds using a Microsoft PowerPoint™ presentation. Human breath sounds were sourced from the Delmar's Heart and Lung Sounds CD-Rom for the EMS Provider CD-ROM.² All sounds were single channel (mono) at CD-ROM quality. Students listened to the breath sounds via stereo speakers in a small lecture theatre. Each breath sound lasted for five breaths. Students were provided with a data collection form to list their interpretations.

Descriptive statistics were used to summarise the data. Statistical analysis was undertaken using SPSS (Statistical Package for the Social Sciences Version 15.0, SPSS Inc., Chicago, Illinois, U.S.A.).

Participation in the study by students was entirely voluntary. Ethics approval for the study was granted by the Monash University Standing Committee on Ethics in Research Involving Humans.

Results

Thirty five students participated in the study, approximately 80% of the total students, with 69% of students (n=24) between, 20 and 24 years of age. Seventy seven percent were females. All students were enrolled in year three of the BEH.

The results demonstrate that Monash University undergraduate paramedic students are not good at interpreting a range of breath sounds likely to be heard in the prehospital setting.

Sound one (actual sound – coarse crackles), 20% of students correctly identified this breath sound, although 48% thought it was “crackles”, but could not define what type. The remainder varied between normal sound and unsure. Sound two (actual sound – stridor), 43% of students correctly identified this breath sound, however 9% were unsure, whilst the remaining students thought it was either a wheeze, coarse crackles, or fine crackles. Sound three (actual sound – wheeze), 51% of students correctly identified this breath sound, with an additional 17% of students stating it was either an inspiratory/expiratory wheeze, the remainder varied. Sound four (actual sound – fine crackles), 6% of students correctly identified this breath sound, 26% thought it was crackles or coarse crackles, 14% thought it was a normal breath sound with 34% unsure. Sound five (actual sound – wheeze), 20% of students correctly identified this breath sound, 49% of students were unsure, the remainder varied. Sound six (actual sound – crackles), 40% of students correctly identified this breath sound, 20% of students thought it was either fine/coarse crackles, 23% were unsure, with the remainder varying.

Discussion

This pilot study has established that Monash University undergraduate paramedic students have great difficulty in accurately identifying a variety of breath sounds likely to be heard in the prehospital setting. Paramedics are required to identify a variety of breath sounds so that appropriate treatment may be initiated, and continued, this is especially so for patients with asthma, chronic obstructive pulmonary disease and heart failure.

The majority of prehospital based studies have investigated the ability of paramedics to interpret breath sounds in a moving road ambulance or helicopter and not the actual breath sound itself.³⁻⁵

Breath sounds in humans are known to have some variation, left to right side and anterior to posterior.⁶ By using recorded breath sounds in the teaching process we do not educate students to accept this natural variation as the exposure to real patients is minimal and spasmodic. Likewise the student's access to quality clinical instructors, during their clinical placement, who are aware of this natural variation and can guide a student through the interpretation process of breath sounds is very limited.⁷

A study by Mangione and Nieman who looked at the pulmonary diagnostic ability of medical students, family practice residence, internal medicine residence and pulmonary fellows found that medical students performed statistically worse than the other trainees. Mangione and Nieman also found that there was a significant improvement between the third and fourth year medical students.⁸

The study by Wigder et al comparing new and experienced paramedics against emergency physicians and their ability to identify five commonly presenting lung sounds found that the emergency physicians were significantly better at interpreting lung sounds. Wigder et al also found that novice paramedics (less than one year of experience) were no worse at identifying lung sounds than their experienced counterparts.¹ Based on this evidence, and that found by Mangione and Nieman with third and fourth year medical students, we would assume that undergraduate students' breath sound identification performance would improve over time with more experience, patient exposure and clinical supervision.

Monash University undergraduate paramedic students must at least be able to identify what normal breath sounds are like and they should also be able to identify the main abnormal or condition specific breath sounds, e.g. wheeze associated with asthma. We would expect students to identify a normal breath sound and those commonly heard abnormal breath sounds

in a classroom situation. However, more research is required to determine if new graduates are able to identify breath sounds in sick patients in a semi-supervised situation on the road.

This study has highlighted a need to better educate Monash University undergraduate paramedic students in the interpretation of breath sounds. Paramedics are required to accurately interpret breath sounds as this leads to initiation of management and also confirms ongoing management. Misinterpretation of a breath sound may be detrimental to a patient's short term outcome with a lack of, or inappropriate, management.

This study is potentially limited by students listening to the breath sounds in a lecture room via stereo speakers and not using headphones or real patients. Due to this being a pilot study using a small sample size the results potentially lack external validity and should be interpreted with caution.

Conclusions

This study demonstrates that Monash University undergraduate paramedic students are inaccurate at identifying a variety of breath sounds. The results from this study have provided Monash University paramedic teaching staff with evidence to facilitate change to the part of the curriculum that covers patient assessment and respiratory pathology. The study has also highlighted a requirement for additional research into how the university can better prepare undergraduate paramedic students for work in the health care sector.

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