Are Ontario Paramedics able to Identify Lung Sounds

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Clinical Relevance:
Bullet 17 of the *Patient Assessment Standard*, found within the most current *Basic Life Support Patient Care Standards*, *v3.0.1*, states the following: Paramedics shall “auscultate the patient’s lungs for air entry and adventitious sounds (e.g. wheezes, crackles), if the patient is exhibiting signs or symptoms of cardiovascular, respiratory or neurological compromise.” The purpose of this critically appraised topic is therefore to review the evidence surrounding a paramedic’s ability to identify lung sounds, to promote evidence based practice in Ontario based paramedics.

PICO (Population – Intervention – Comparison – Outcome) Question:
Are Ontario paramedics able to identify lung sounds when confounding factors (e.g. noise, stethoscope proficiency and type, lack of patient history) are controlled for?

Reproducible Search Strategy

Search Data: Monday, March 20, 2017 11:44:39 PM

#	Query	Limiters/Expanders	Last Run Via	Results
S13	(S5 OR S6 OR S7 OR S8 OR S9) AND (S10 AND S11)	Limiters - Published Date: 19950101-20171231 Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	234
S12	(S5 OR S6 OR S7 OR S8 OR S9) AND (S10 AND S11)	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	264
S11	S5 OR S6 OR S7 OR S8 OR S9	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	23,297
S10	S1 OR S2 OR S3 OR S4	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	120,360
S9	lung auscultation	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	1,345
S8	auscultation	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	12,743
S7	breath sounds	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	1,383
S6	respiratory sounds	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	10,737
S5	lung sounds	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	2,931

S4	emergency medical services	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	104,276
S3	prehospital care	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	17,770
S2	emergency medical technician	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	15,324
S1	paramedic	Expanders - Apply related words Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text;MEDLINE	7,280

Relevant Papers:

- Identified by reading the title of the first 100 articles when sorted by relevance, and the abstracts as appropriate
- Attempts to find grey literature were made by reviewing the in-text citations of relevant papers

Authors, Date	**Population-sample characteristics**	**Design (LOE)**	**Outcomes**	**Results**	**Strengths**	**Weaknesses**
Boyle and Williams (2007)	-35 undergraduate paramedic students from Monash University (Australia)	Prospective single-blinded observational study (LOE 2)	Identification of normal and abnormal breath sounds (stridor, wheezes, cackles…), on an audio file	-course crackles were correctly identified 20% of the time, 43% for stridor, 51% for wheezes, 6% for fine crackles, 20% for wheezes, and 40% for fine crackles	-strong internal validity (isolated for sound identification)	-convenience sampling introduces selection bias -weak statistical methodology (no P-values of CIs provided) -small sample size
Brown et al. (1997)	-n=26 -10 transport nurses -3 physicians -13 EMS providers	Prospective single-blinded observational study (LOE 3)	Breath sound identification in controlled environments versus moving ambulances	Breath sounds identified 91.3% of the time in control environments and 8.7% of the time in moving ambulances (P<0.001)	-520 trials completed, half in control environment, half in experimental environment	-small sample size -binarily considers only the presence or absence of breath sounds -statistical analysis is pooled and

						not stratified by cohorts
Authors, Date	**Population-sample characteristics**	**Design (LOE)**	**Outcomes**	**Results**	**Strengths**	**Weaknesses**
Wigder et al. (1996)	-n=107 American healthcare providers -67 experienced suburban paramedics (1-20 years experience) -22 new suburban/ private paramedics (<1-year experience) -18 emergency physicians	Prospective single-blinded observational study (LOE 2)	Identification of crackles, rhonchi, wheezing, stridor, and normal lung sounds, on an audio file	-median 60% success rate on first attempt -physicians scored higher than experienced and inexperienced paramedics ($P \leq 2.0$) -No statistical difference between experienced and inexperienced paramedics	-strong internal validity (isolated for sound identification)	-biased study design (testing in hospital conditions favours physicians
Williams, Boyle, O'Meara (2009)	-n=96 undergraduate students in Australia -35 Bachelor of Emergency Health (BEH) students from Monash University -61 Bachelor of clinical practice (BCP) students from Charles Sturt University	Prospective single-blinded observational study (LOE 2)	Identification of course crackles, stridor, wheezes, fine crackles, wheezes, and crackles, on an audio file	-course crackles were correctly identified 7.3% of the time ($P<0.001$), 22.9% for stridor ($P=0.578$), 52.1% & 8.3 for wheezes ($P<0.001$, <0.002), 2.1% for fine crackles ($P<0.001$), and 29.2% for crackles ($P=0.026$)	-strong internal validity (isolated for sound identification, very narrow CIs)	-Artificial time constraints do not mimic paramedic working conditions (5 breaths per sound)

Discussion:

- The PICO question cannot be answered conclusively as no research has specifically investigated the ability of Ontario Paramedics to identify lung sounds when confounding factors are controlled for.
- According to Wigder et al. (1996), an American paramedics' ability to identify lung sounds is both weak and independent of experience. Therefore, Boyle and Williams (2007), and Williams, Boyle, and O'Meara's (2009) utilization of undergraduate paramedic students is likely useful data as the evidence suggests that the ability to identify lung sounds does not improve with the additional field time (experience) that a paramedic will have had versus a paramedic student. If it is true that experience does not effect lung sound identification, then for research purposes, research conducted on student populations may hold true for working paramedics. Further research should compare the auscultation abilities of student paramedics versus paramedics to ensure the validity of this inference, and to explore possible reasons for any differences that arise, such as teaching methods, stethoscope quality, and experience.
- While these studies provide strong evidence that suggest paramedics are unable to effectively identify lung sounds, it does not suggest whether or not lung auscultation is an important skill for paramedics when differentially diagnosing patients. This was noted by Wigder et al (1996) as both experienced and inexperienced paramedics were more likely to correctly identify lung sounds with the provision of a detailed patient history. Therefore, despite the evidence that paramedics can unreliably identify adventitious lung sounds, lung auscultation may be still a clinically useful tool when used in conjunction with a patient history. Further research should determine the extent to which both auscultation and history gathering independently predict a paramedics ability to identify lung sounds.

Clinical Bottom Line:

An albeit limited body of evidence conducted on populations analogous to Ontario paramedics suggests that paramedics – regardless of experience – are unable to accurately identify lung sounds in laboratory settings. It is likely that paramedics ability to identify adventitious lung sounds would decrease in the field due to the introduction of stress and competing sounds. Therefore, the current BLS guidelines that mandate auscultation of the lungs during the primary survey are not supported by the emerging evidence.

References

Boyle, M., & Williams, B. (2007). Are undergraduate paramedic students able to accurately identify breath sounds? *Journal of Emergency Primary Health Care*, *5*(3), 1-5.

Brown, L. H., Gough, J. E., Bryan-Berg, D. M., & Hunt, R. C. (1997). Assessment of breath sounds during ambulance transport. *Annals of Emergency Medicine*, *29*(2), 228-231.

Canada. Ministry of Health and Long-term Care. (2016) Basic life support patient care standards v.3.0.1 Retrieved from http://www.lhsc.on.ca/About_Us/Base_Hospital_Program/Medical_Directives/BLSPCS-v3.0.1.pdf

Wigder, H. N., Johnson, D. R., Cohan, S., Felde, R., & Colella, R. (1996). Assessment of lung auscultation by paramedics. *Annals of Emergency Medicine*, *28*(3), 309-312.

Paramedic Critically Appraised Topic

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