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Influence of language skills on the choice of terms used to describe lung sounds in a language other than English: a cross-sectional survey of staff physicians, residents and medical students

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ABSTRACT

Introduction The value of chest auscultation would be enhanced by the use of a standardised terminology. To that end, the recommended English terminology must be transferred to a language other than English (LOTE) without distortion.

Objective To examine the transfer to Hebrew—taken as a model of LOTE—of the recommended terminology in English.

Design/setting Cross-sectional study; university-based hospital.

Participants 143 caregivers, including 31 staff physicians, 65 residents and 47 medical students.

Methods Observers provided uninstructed descriptions in Hebrew and English of audio recordings of five common sounds, namely, normal breath sound (NBS), wheezes, crackles, stridor and pleural friction rub (PFR).

Outcomes (a) Rates of correct/incorrect classification; (b) correspondence between Hebrew and recommended English terms; c) language and auscultation skills, assessed by crossing the responses in the two languages with each other and with the classification of the audio recordings validated by computer analysis.

Results Range (%) of correct rating was as follows: NBS=11.3–20, wheezes=79.7–87.2, crackles=58.6–69.8, stridor=67.4–96.3 and PFR=2.7–28.6. Of 60 Hebrew terms, 11 were correct, and 5 matched the recommended English terms. Many Hebrew terms were adaptations or transliterations of inadequate English terms. Of 687 evaluations, good dual-language and single-language skills were found in 586 (85.3%) and 41 (6%), respectively. However, in 325 (47.3%) evaluations, good language skills were associated with poor auscultation skills.

Conclusion Poor auscultation skills surpassed poor language skills as a factor hampering the transfer to Hebrew (LOTE) of the recommended English terminology. Improved education in auscultation emerged as the main factor to promote the use of standardised lung sound terminology. Using our data, a strategy was devised to encourage the use of standardised terminology in non-native English-speaking countries.

Strengths and limitations of this study

- ► To our knowledge, this is the first study to examine the transfer to language other than English of the recommended lung sound terminology in English.
- ► True sound classification was validated by computer-based sound analysis.
- ► Participants were from the same hospital—which tends to limit the study generalisability—but had different clinical and educational background.
- ► Use of more complex sounds (eg, rhonchus and squawk) might have further hampered the observers' ability to classify the sounds.

INTRODUCTION

Lung auscultation has been a traditional part of the chest examination since the invention of the stethoscope.[1] While no other method equals auscultation in providing quick, cost-effective and easily obtained relevant information about the respiratory system, its value is limited by the confused terminology.[2] Even though recommendations on terminology have been developed,[3–5] significant variation in the terms used to describe the sounds persists among health professionals.[6–11]

To examine this variation, we invited staff physicians (SPs), residents (R) and medical students (MS) working in a university-based hospital in Israel to spontaneously classify a set of common lung sounds presented to them in audio recordings. They were asked to classify the sounds successively in English and Hebrew, taken as a model of a language other than English (LOTE). Different aspects of the survey were highlighted in two companion papers. The first, published recently, found that poor auscultation skills were the main

factor influencing the choice of English terminology.[11] The second, reported herein, examined the influence of language skills on the transfer to a LOTE (ie, Hebrew) of the terminology recommended currently by scientific societies.[3–5] This aspect has practical importance. First, between-language differences hamper communication in teaching and in meaningful exchanges of auscultation findings between clinicians and researchers from different countries.[10] Moreover, they can cause divergent interpretations of the same sound even by caregivers from the same country. This study aimed to compare the Hebrew terms used by our observers with those recommended currently[3–5] and with the English terms they used to classify the same sounds previously.[11]

MATERIALS AND METHODS

Recruitment of the raters

From February 2017 to March 2018, we recruited 143 caregivers, including 31 SPs, 65 R and 47 MS working at Shaare Zedek Medical Center, affiliated with the Hebrew University of Jerusalem.[11] Participants were informed about the study by word of mouth.

Questionnaire

On arrival, participants were invited to complete an anonymous questionnaire on background information, including demographics, medical status, years of practice and specialty. We avoided questions likely to facilitate participants' identification.

Presentation of the sounds

Next, the participants were invited to listen through loudspeakers to the audio files of five common lung sounds stored in a computer placed in a silent room. The sound files were taken from a set of processed files in the movie.mp4 format, which were deemed to be clean and devoid of artefacts, as required for an article published previously.[2] The following sounds were presented, in the following order: (1) normal breath sound, (2) wheezes, (3) crackles, (4) stridor and (5) pleural friction rub.

Classification of the sound files

The observers were asked to classify the sounds successively in English and Hebrew in the order they were played (ie, 1–5). No pre-established list of sound nomenclature was given in either language, and the observers were asked to describe the sounds in a 'free-form' format, with their own words. No sonograms, waveform analysis or clinical information was provided to substantiate the nature of the sounds. To attempt to compensate for the lack of clinical context, the observers were informed that all recordings started at the onset of inspiration. Additionally, the site of recording of each sound was indicated on a diagram, as follows: (1) normal breath sound: posterior left basal lung region at a point situated in the scapular line, 3 cm below the angle of scapula; (2) wheezes: anterior right upper lung zone at the intersection of the midclavicular line and the second intercostal space; (3) inspiratory crackles: right posterior basal region at the intersection of the scapular line and a point situated 3 cm below the angle of scapula; (4) stridor: over the trachea, 2 cm above the suprasternal notch; and (5) pleural friction rub: left axillary region at the intersection of the midaxillary line and the fifth intercostal space.

Correct versus incorrect sound classification

The ability to correctly identify the sounds was determined for each sound file by comparing the observers' response with the true classification, that is, clinical classification validated by computer analysis.[2] In this process, an expert selected a segment of the recorded normal sounds that was free of artefacts. A rating was considered correct if a recommended term or an accepted synonym was used to describe the sound (term use ascribed to preference). The use of any incorrect term was ascribed to lack of skills on chest auscultation.

Language and auscultation skills

The ability to correctly classify the sounds depends on both language skills and auscultation skills. For each observer, we crossed the sound classification in Hebrew with the corresponding classification in English, performed previously by the same observers.[11] Four classes of combined skills were identified, as follows: (1) dual-language skills *and* good auscultation skills: use of *accepted* terms in the two languages *to correctly* classify a sound (eg, use of the English term 'wheeze' and the Hebrew term 'tziftzufim' to classify the wheezes of sound sample number 2), (2) dual-language skills and poor auscultation skills use of *accepted*, corresponding terms in the two languages to *incorrectly* classify a sound (eg, use of the English term 'pleural friction rub' and its *corresponding* Hebrew equivalent 'shifshuf pleurali' to wrongly classify the wheezes of sound sample number 2), (3) *single-language skills and* good auscultation skills: use of a *correct* term in one language and an *incorrect* (or no) term in the other language to correctly classify a sound (eg, use of the English term wheeze coupled with, say, the *incorrect* Hebrew term 'hirhurim' to classify the wheezes of sound sample number 2} and (4) poor language skills *and* poor auscultation skills: use of different, incorrect terms in the two languages to classify a sound (eg, use of 'crackle' and 'shifshuf pleurali' to classify the wheezes of sound sample number 2).

Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting or dissemination of this study.

Data analysis

Baseline characteristics are presented as mean (SD) and proportions. For each audio sample, the difference in the proportion of correct versus incorrect rating was tested using the χ^2 test; a $p<0.05$ was considered significant.

Table 1 Comparison of Hebrew terms with recommended English terms used by three groups of caregivers to classify five lung sounds

Audio sample	Recommended terminology in the English language	Hebrew terms			Frequency of use	
		Standard	Phonetic	English meaning	n	By group
# 1	Normal breath sound	תילמרונ המישנ	Neshima normalit	Normal breathing	8	SP=1; R=3; MS=4
		תירלוקסו המישנ	Neshima vesicularit	*Vesicular breathing**	2	SP=2
		תיעוב המישנ	Neshima buit	*Alveolar breathing**	10	SP=3; R=4; MS=3
# 2	Wheezes	ם יפוצפצ	Tziftzufim	Wheezes	116	SP=24; R=51; MS=41
# 3	Crackles	תויצטיפירק	Crepitatziot	*Crepitations**	42	SP=12; R=17; MS=13
		ם יצופציפ	Pitzputzim	Crackles	1	MS=1
		ם ייעקפ	Pkaim	*Fine crepitations**	1	MS=1
		ם ירוחרח	Hirhurim	*Rales*	42	SP=5; R=22; MS=15
# 4	Stridor†	רודירטס‡	Stridor	Stridor	110	SP=26; R=55; MS=29
# 5	Pleural friction rub†	ילרואלפ חושפש	Shifshuf pleurali	*Pleural rubbing**	10	SP=8; R=1; MS=1
		ן שקירפ	Friction	Friction	1	R=1

*Term considered correct but not recommended.
†Term suggested.[2]
‡The correct term—שׁ ִ ר ֻ ק (shirnuk)—was not used by any rater.
MS, medical students; R, residents; SP, staff physicians.

RESULTS

Characteristics of participants

Participants' mean (SD) age was as follows: SP=48.4 years (10.4), R=32.5 years (3.5) and MS=28.4 years (4.5). Overall, 17 (54.8%) SPs declared more than 20-year experience with auscultation; in turn, 60 (92%) R and 47 (100%) MS declared <5-year experience.

Language profile and specialty of SPs

The first language of 27 SPs who provided responses to this question was Hebrew, n=16; English, n=4; Arabic, n=2; French, n=2; Russian, n=2; and Portuguese, n=1. All respondents reported the learning of unspecified versions of the lung sound terminology in English and Hebrew (n=23). The repartition by specialty was as follows: pulmonology, n=7; paediatrics, n=6; internal medicine, n=4; cardiology, n=2; oncology, n=2; geriatrics, n=1; haematology, n=1; emergency medicine, n=1; rheumatology, n=1; palliative care, n=1; and family medicine, n=1. Twenty-four SPs practised medicine in both English and Hebrew, while three practised only in Hebrew.

Correct Hebrew terms versus recommended English terminology

Table 1 lists (1) the standard and phonetic forms of the *correct* Hebrew terms used by the three groups, (2) their meaning in English and (3) the corresponding recommended English terminology. Overall, the rates of correct identification were high for the wheeze (SP=80%; R=79.7%; MS=87.2% (p=0.944)) and the stridor (SP=96.3%; R=90.2%; MS=67.4% (p=0.544)), fair for the crackles (SP=58.6%; R=67.2%; MS=69.8% (p=0.899)) and low for the normal lung sound (SP=20%; R=11.3%; MS=15.5% (p=0.624)) and the pleural friction rub (SP=28.6%; R=3.6%; MS=2.7% (p=0.002)).

Preference versus poor auscultation skill

Altogether, the observers used 60 Hebrew terms to classify the five sounds; of these, 11 (18.3%) were correct, being therefore ascribed to preferences regarding terminology, while 49 (81.7%) were incorrect, being ascribed to lack of chest auscultation skills.

Correct terms by group

Sample sound number 1 (*normal breath sound*): Of 137 participants classifying this file, 20 (14.6%) correctly classified it as normal. Of three Hebrew terms used, only one corresponded to the recommended English term 'normal breath sound'.

Sample sound number 2 (*wheezes*): Of 141 participants classifying this file, 116 (82.3%) used a single Hebrew term—'tziftzufim'—corresponding to the recommended English term 'wheeze'.

Sample sound number 3 (*crackles*): Of 130 participants classifying this file, 86 (66.2%) used four Hebrew terms to correctly classify it as crackles. However, only one term—'pitzputzim'—corresponded to the recommended English term crackle.

Sample sound number 4 (*stridor*): Of 131 participants classifying this sound, 110 (84%) correctly classified it by means of a Hebrew transliteration of the recommended English term 'stridor'.

Sample sound number 5 (*pleural friction rub*): Of 121 participants classifying this sample, 11 (9.1%) correctly classified it as pleural friction rub. They used two terms,

Table 2 Language and auscultation skills among staff physicians, residents and medical students: English versus terminology in language other than English

Sound classification	Possible number of sessions of sound identification for all observers (n=715)								
	Observers providing classification in the two languages (n=597)				Observers providing classification in one language only (n=90)				
	Similar terms in the two languages (n=586)		Different terms in the two languages (n=11)		English (n=27)		Hebrew (n=63)		No classification in either language (n=28)
	Both terms correct* (n=321)	Both terms incorrect† (n=265)	English correct‡ (n=7)	Hebrew correct‡ (n=4)	Correct‡ (n=14)	Incorrect§ (n=13)	Correct‡ (n=16)	Incorrect§ (n=47)	
1. Normal	19 (5.9%)	106 (40%)	1	0	0	3	1	10	3
2. Wheeze	110 (34.3%)	19 (7.2%)	2	1	2	0	5	4	0
3. Crackle	77 (24%)	34 (12.8%)	2	3	4	2	6	8	7
4. Stridor	104 (32.4%)	17 (6.4%)	2	0	5	3	4	4	4
5. Pleural friction rub	11 (3.4%)	89 (33.6%)	0	0	3	5	0	21	14

*Dual-language skills *and* good auscultation skills, n=321 (46.7%).
†Dual-language skills *and* poor auscultation skills, n=265 (38.6%).
‡Single-language skills and good auscultation skills, n=41 (6%).
§Poor language skills *and* poor auscultation skills, n=60 (8.7%).

of which 'shifshuf pleurali', meaning 'pleural rubbing', was used on 10 occasions.

Incorrect Hebrew terms

The 49 incorrect Hebrew terms are listed in the online supplemental table 1. Of these, 10 were used to classify the normal breath sound, 11 to classify the wheezes, 10 to classify the crackles, 8 to classify the stridor and 10 to classify the pleural friction rub.

Transfer to Hebrew of the English terminology

Identification of five sounds by 143 subjects would have resulted in 715 instances of identification. However, on 28 occasions, the observers declined to classify a sound in either language, thus giving a total of 687 (96%) instances of sound identification. On 597 (87%) of these occasions, the observers provided terms in the two languages for all sounds, while on 90 (12.9%), they provided terms in one language only. The combination of language skills and auscultation skills, obtained by crossing the correct and incorrect responses in the 687 sessions, is given in detail in table 2. The resulting combination of language skills and auscultation skills was as follows:

1. Dual-language skills *and* good auscultation skills, n=321 (46.7%).
2. Dual-language skills *and* poor auscultation skills, n=265 (38.6%).
3. *Single-language skills and* good auscultation skills, n=41 (6%).
4. Poor language skills *and* poor auscultation skills, n=60 (8.7%).

DISCUSSION

In his original work, Laennec used the terms 'rale' and 'rhonchus' interchangeably, to denote all classes of adventitious sounds.[1] Successive translations—first into English and then into other languages—and redefinitions of the original terminology gave different meanings to these terms, starting a confusion that persists to this day. To overcome this drawback, recommendations for use of a standardised terminology in the English language were made by the ad hoc committees of scientific societies.[3–5] The recommended terms—simple and precise—are based on the physics of the sounds, without assumptions about their mechanism of generation or site of production.[3–5] In a population of caregivers working in Israel, we compared the Hebrew terms used to classify five common sounds with (a) the recommended terminology in English and (b) the terms used by the same caregivers to classify the same sounds in the English language.

In similarity with our companion study,[11] the observers' ability to classify the sounds in Hebrew was high for the wheezes and the stridor, fair for the crackles and low for the normal breath sounds and the pleural friction rub, with the three groups of caregivers performing similarly in classifying all sounds. Even though the SPs performed better than the other groups in classifying the pleural friction rub, the overall performance of the three groups was too low to be considered clinically meaningful. This similarity of performance regarding the two languages is interesting, because, in theory, one could expect the caregivers to perform better in their working language—Hebrew—than in English.

Of three correct Hebrew terms used to classify sound file number 1, just one corresponded to the recommended term 'normal breath sound' in English. The other two, 'vesiculari' and 'buyit'—meaning, respectively, 'vesicular' and 'alveolar', are deemed inappropriate as they convey the incorrect assumption that the normal sound originates from the *entrance of air*

into and out of the air cells of the lungs.[1] As a quick aside, although the *exact* locale and mode of production of the normal breath sound have not been established, there is evidence to support the view that it has a double origin: the lobar and segmental airways for the inspiratory component and a more central source for the expiratory component.[12 13]

Consistent with our previous study,[11] all observers used the classic Hebrew term 'tziftzufim' to classify the wheezes. This homogeneous description is interesting. Indeed, the term 'wheezing' has been in use long before Laennec's invention of the stethoscope, while 'wheeze', as used nowadays, corresponds to the 'rale sibilant sec' described by Laennec.[14] We speculate that the traditional attribution of this sound to a single mechanism—airway obstruction—might have contributed for the use of a single term to describe it. Consequently, the translation from the source language (ie, English) to other languages was kept relatively uniform, as found in the present study.

The term 'stridor'—from the Latin *stridere* (harsh, shrill or creaking noise)—describes the high-pitched, musical sound produced by turbulent flow passing through a narrowed segment of the upper respiratory tract.[15] In similarity with the classification of the wheezes, all correct raters used a single term. However, instead of the Hebrew term 'שִׁ֫ירְקוּנ' ('shirnuk'), they used the term 'stridor' itself, spelled in the Hebrew alphabet. This peculiar choice suggests that, rather than searching for a suitable terminology, the caregivers preferred a term familiar to them. This finding is similar to that reported in a recent survey of lung sound nomenclature carried out in 34 European countries, which showed that caregivers from *all* the countries—representing 29 languages of which five had non-Latin alphabets—spelled the term 'stridor' verbatim in all languages but Greek.[16]

With two categories—'fine' and 'coarse'—crackles can be defined as brief, non-musical, explosive, adventitious sounds.[17 18] In this study, the Hebrew equivalent of 'crackles' was used just once, by a MS. Of the other acceptable terms, 'crepitatziot' is solely an adaptation of 'crepitations', while 'hirhurim' is the classical Hebrew term for 'rales'. It should be noted that both these terms are considered superfluous or inadequate: 'crepitations' because it merely means high-pitched crackling and 'rales' because, as stated above, it was originally a generic term applied to every variety of adventitious pulmonary sound.[1] Incidentally, the accepted mechanism of production of fine crackles is not the presence of secretions in the airways, but the sudden opening of airways in deflated territories of the lung as observed in restrictive lung disorders (eg, interstitial lung disease).[17–19]

Of the presented sounds, the pleural friction rub is probably the less well studied. Purportedly, it is produced by the sudden release of tangential tension in a superficial portion of the lung momentarily arrested in its sliding movement by a frictional force between the two pleurae.[18] The tiny group of observers who correctly classified this sound used two terms (vs four terms in the English part of the survey[11]): pleural and friction, alone or in combination.

A novel information provided by this study is that poor skills in chest auscultation largely surpassed deficient language skills as a cause of incorrect lung sound classification. Of 90% of participants found to have good language skills, 50% had poor auscultation skills. Consistent with our previous study,[11] this finding further illustrates the fact that the use of recommended terminology is meaningful only among observers with good auscultation skills. In fact, observer agreement on a wrong classification can be detrimental to the patients, as it may lead to unnecessary and expensive investigations as well as improper treatment.[11]

Most of our SPs practised medicine in both Hebrew and English. This aspect has clinical relevance. The ability of non-native English-speaking doctors to communicate with patients in English is now considered a core competency. Consistent with its status of global lingua franca, the English language is the universal means of communication between people with different native languages. In this context, ensuring the similarity of terminology between English and a LOTE is important, as language-concordant healthcare contributes to prevent expensive tests and poor patient follow-up.

To our knowledge, there is no research similar to this study that can provide data for comparison. Searching the literature, we found that the importance of the correct understanding of the original English terminology by caregivers working in a LOTE has been examined only peripherally. For instance, in a survey of seven European countries, lack of familiarity with the English nomenclature was invoked to explain the lower agreement of Russian and Dutch practitioners to classify crackles and wheezes from video recordings.[20] Also, in the European terminology survey quoted above, the terms used across the countries were generally non-uniform, some countries having their own terminology and others simply adopting the English terminology.[16]

This study has limitations. First, for the sake of feasibility, we recruited caregivers from the same hospital, which may limit the generalisability of the findings. However, compensation was provided by their heterogeneity in terms of clinical and educational background. Second, we did not investigate all adventitious sounds. For simplicity, we stuck to the the most common ones, intentionally excluding more complex sounds such as the rhonchus or the squawk, whose inclusion might have further hampered the observers' ability to classify the sounds. Finally, the experimental conditions were not representative of those in clinical practice. The study design prevented the participants to auscultate all over the chest, at will, or to command the respiratory manoeuvres, which may have altered outcomes compared with real life. However, to avoid more detrimental biases, we were forced to standardise the study conditions across participants.

CONCLUSION

In this study, the Hebrew terms used to classify common lung sounds corresponded only partly to the

recommended terminology. Many Hebrew terms were adaptations or transliterations of inappropriate English terms (eg, 'vesicular sound' and 'crepitations'). Noticeably, a high proportion of matched Hebrew/English terms was incorrect. These data support the conclusion that poor auscultation skills surpassed poor language skills as a factor hampering the meaningful transfer of the recommended terminology to a LOTE (Hebrew). In this context, improved education in chest auscultation should be the main prerequisite for the successful dissemination of the recommended terminology. Based on our results, some suggestions can be made to encourage the widespread use of a standardised lung sound terminology in non-native English-speaking countries. Countries with a high knowledge of English could simply adopt the recommended English terminology verbatim. Alternatively, countries with a lower knowledge of English could opt for the translation of the recommended terms by professionals skilled in both the source (English) and the target (LOTE) language. Finally, if resources for translation are not available, transliteration of the recommended terms seems a viable option. Adopted spontaneously by many observers in this study, transliteration requires no special language skills and can be performed in any language, including those with non-Latin alphabets. For its simplicity, it should be given consideration by the medical societies of all concerned countries.

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Contributors Original idea/study design, data interpretation, statistical analysis and drafting: AB; data collection: HA, AR, AJ, GK and AB; grant application: GI; responsibility for data: AB, AR, HA and AJ; GK and GI are guarantors for the study and take responsibility for the integrity of the data and the accuracy of the data analysis; critical revision of the manuscript: all authors.

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Data availability statement All data relevant to the study are included in the article or uploaded as supplemental information. The study data are available from the corresponding author on reasonable request, after removal of all personal identifiers.

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e-Table 1. Incorrect Hebrew Terms Used by the Three Groups

Sound Sample	Standard Hebrew	Phonetic Hebrew	English Meaning	n	Repartition by group
#1 NBS	קריפיטציות	Crepitatziot	Crepitations	60	SP=10 R=37 MS=13
N=10	חרחורים	Hirhurim	Rales	32	SP=3 R=11 MS=18
	נשימה ברונכיאלית	Neshima bron**ch**ialit	Bronchial breathing	18	SP=8 R=6 MS=4
	אקספיריום מאורך	Expirium meorah	Prolonged expiration	1	MS=1
	ירידה עם חירחורים עדינים	Yerida im hirhurim adinim	Diminished with fine rales	1	MS=1
	שפשוף	Shifshuf	Friction	1	SP=1
	ציפצופים	Tziftzufim	Wheezes	1	MS=1
	שיפשוף פליאורלי	Shifshuf pleurali	Pleural friction	1	SP=1
	פיכפוך	Pichpuch	Bubbling	1	R=1
	רישרוש של פלוירה	Rishrush shel pleura	Pleural friction	1	SP=1
#2 Wheeze	סטרידור	Stridor	Stridor	4	SP=1 R=2 MS=1
N=11	חרחורים	Hirhurim	Rales	1	MS=1
	קרפיטציות	Crepitatziot	Crepitations	1	MS=1
	נשימה ברונכיאלית	Neshima bronchialit	Bronchial breathing	2	SP=1 R=1
	חיכוך פליאורלי	Chikuch pleurali	Pleural friction	1	SP=1
	אקספיריום מאורך	Expirium meorah	Prolonged expiration	8	SP=2 R=5 MS=1
	גניחות	Genihot	Groan	1	R=1
	אנחות	Anahot	Sigh	1	SP=1
	אוושה סיסטולית	Ivsha sistolit	Systolic murmur	4	R=3 MS=1
	מיוזיקלי	Musicali	Musical	1	R=1
	קולות ממקור עליון	Kolot mimakor elion	Sounds from upper source	1	MS=1
#3 Crackle	נשימה ברונכיאלית/תקינה	Neshima bronchialit tekina	Normal bronchial br.	19	SP=7 R=10 MS=2
N=10	נורמלי	Normali	Normal	6	SP=1 R=2 MS=3
	נחירות	Nehirot	Snoring	1	SP=1
	כניסת אוויר מופחתת	Knissat avir mufhetet	Diminished air entry	1	MS=1
	כניסת אוויר מופחתת,רשרוש אקספירטורי	Knissat avir mufhetet im rishrush expiratoy	Diminished air entry with expiratory rustle	1	MS=1
	נשימה ברונכיאלית	Neshima bronchialit	Bronchial breathing	2	R=1 MS=1
	ציפצופים	Tziftzufim	Wheezes	2	R=1 MS=1
	נשימה בועית	Neshima buyit	Vesicular breathing	9	SP=3 R=3 MS=3
	כניסת אוויר ירודה	Knisat avir yeruda	Decrease air entry	2	R=1 MS=1
	אקספיריום מאורך	Expirium meorah	Prolonged expiration	1	R=1
#4 Stridor	ציפצופים	Tziftzufim	Wheezes	14	SP=1 R=5 MS=8
N=8	ויזינג	Wizing	Wheezing	1	MS=1
	השתנקות	Histankut	Gasping	1	MS=1
	שריקה	Shirika	Whistle/wheezing	1	MS=1
	דיבור	Dibur	Talk	1	MS=1
	ברונכוספאזם	Bronchospasm	Bronchospasm	1	MS=1
	מיוזיקל	Musical	Musical	1	R=1
	חריקה/שרנוק	Harika	Creak/Friction	1	MS=1
#5 PFR	ריילס	Rales	Rales	1	SP=1
N=10	קריפיטציות	Crepitatziot	Crepitations	13	SP=4 R=5 MS=4
	חרחורים	Hirhurim	Rales	78	SP=15 R=36 MS=27
	ירידה בכניסת אוויר	Yerida beknissat avir	Decrease air entry	1	MS=1
	ציפצופים	Tziftzufim	Wheezes	1	R=1
	נשימה ברונכיאלית	Neshima bronchialit	Bronchial breathing	12	R=9 MS=3
	שיפשוף פריקרדיאלי	Shifshuf pericardiali	Pericardial friction rub	1	MS=1
	פיכפוך	Pichpuch	Bubbling	1	R=1
	איוושה	Ivsha	Murmur	1	R=1
	גודש ריאתי	Godesh reiati	Pulmonary congestion	1	R=1

NBS: Normal breath sound; PFR: Pleural friction rub SP= Staff physicians; R= Residents; MS= Medical students