AUSCULTAZIONE CARDIOPOLMONARE SU MANICHINO

CARDIOPULMONARY AUSCULTATION

**MEDIATE AUSCULTATION
WITH THE LAENNEC STETHOSCOPE**

IMMEDIATE AUSCULTATION

TEACHING
CARDIOPULMONARY AUSCULTATION

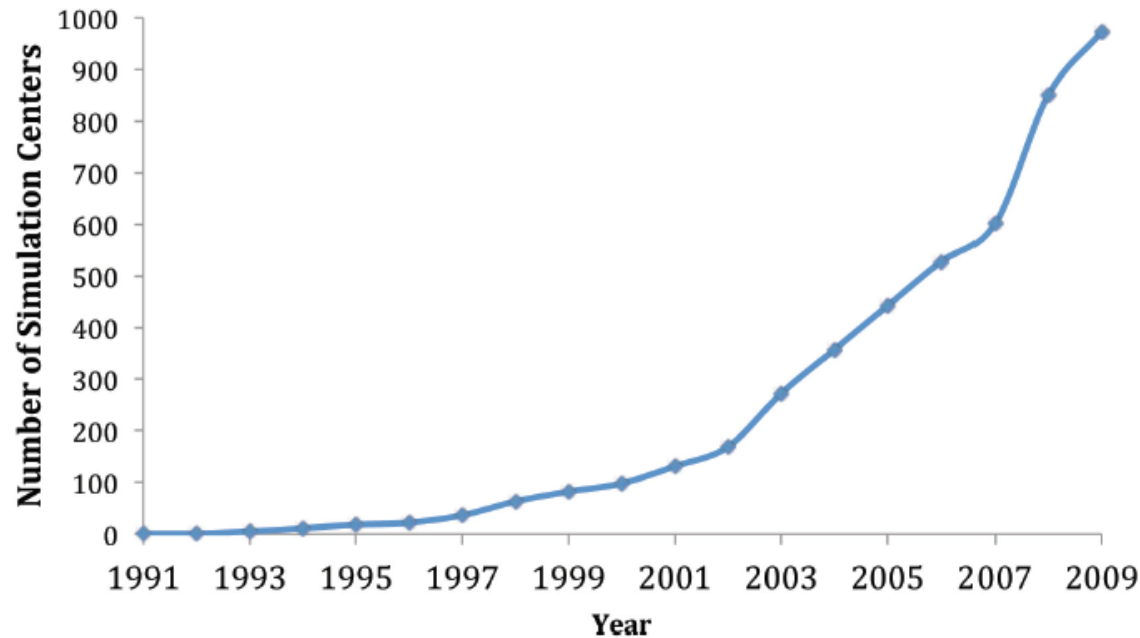
- Relatively large student-to-patient ratio
- Variability of clinical presentations
- Inconveniece of repeated physical examinations to patients with advanced disease

- Readily accessible at any time
- Standardized experience for all students
- Possibility to reproduce a wide range of sounds

Background (III)
MEDICAL SIMULATION CENTERS

- Mannequins are far-from-perfect approximations of patients
- Relatively large student-to-teacher ratio
- Lack of extensive/proper training on how to use this technology

... the teaching efficacy of this technology (patient simulators) remains to be fully determined

BMC Medical Education

A prospective study on the efficacy of patient simulation in heart and lung auscultation

Stella Bernardi* , Fabiola Giudici, Maria Fontana Leone, Giulia Zuolo, Stefano Furlotti, Renzo Carretta and Bruno Fabris

Abstract

Background: The use of simulation technology for skill training and assessment in medical education has progressively increased over the last decade. Nevertheless, the teaching efficacy of most technologies remains to be fully determined. The aim of this prospective study was to evaluate if a short individual training on a patient simulator could improve heart and lung auscultation skills in undergraduate students.

Methods: A group of fifth-year medical school students, who had trained on a patient simulator in their third year (EXP, $n = 55$), was compared to a group of fifth-year medical school students who had not previously trained on it (CNT, $n = 49$). Students were recruited on a voluntary basis. Students were evaluated in terms of their ability to correctly identify three heart (II sound wide split, mitral regurgitation, aortic stenosis) and five lung sounds (coarse crackles, fine crackles, pleural rubs, rhonchi, wheezes), which were reproduced in a random order on the Kyoto-Kagaku patient simulator.

Results: Exposure to patient simulator significantly improved heart auscultation skills, as mitral regurgitation was correctly recognized by 89.7% of EXP students as compared to 71.4% of CNT students ($p = 0.02$). In addition, a significantly greater percentage of EXP students correctly graphed all the heart diagnoses as compared to CNT students. There were no differences between the groups in lung auscultation.

Conclusions: This study demonstrates that training medical students with a patient simulator, individually for one hour, significantly ameliorated their heart auscultation skills. Our data suggests that patient simulation might be useful for learning auscultation skills, especially when it is combined with graphic sound display.
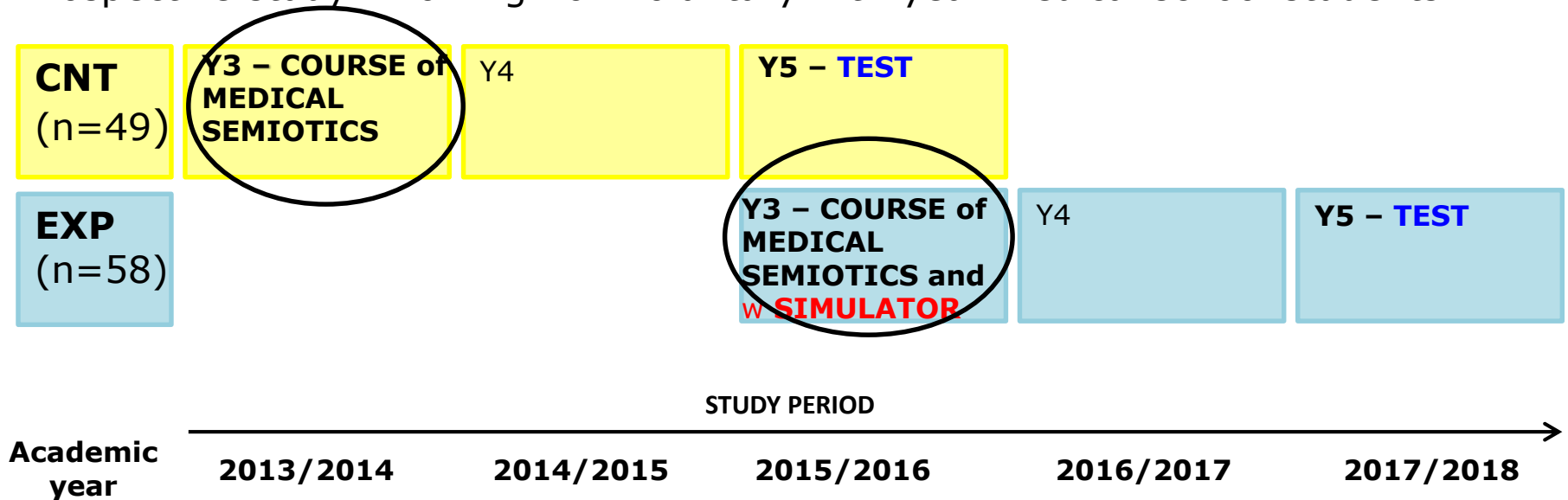
Keywords: Patient simulation, Patient simulators, Heart auscultation, Lung auscultation, Medical education, Clinical education, Medical semiotics

AIM of THE STUDY

To evaluate if an individual training on patient simulators could improve cardiopulmonary auscultation skills in undergraduate medicine students

Methods (I): **STUDY DESIGN**

Prospective study involving 107 voluntary fifth-year medical school students

CNT (n=49)	**Y3 – COURSE of MEDICAL SEMIOTICS**	Y4	**Y5 – TEST**	
EXP (n=58)		**Y3 – COURSE of MEDICAL SEMIOTICS and** w **SIMULATOR**	Y4	**Y5 – TEST**

STUDY PERIOD →

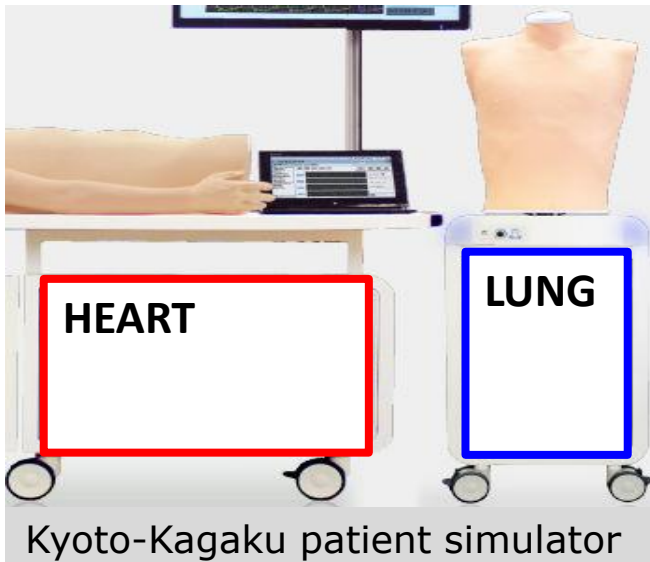| Academic year | 2013/2014 | 2014/2015 | 2015/2016 | 2016/2017 | 2017/2018 |

COURSE OF MEDICAL SEMIOTICS
3-hour lecture on cardiac and lung auscultation
1-hour listening tutorial with auditory simulators
2-hour bedside tutorial once a week for 8 weeks for small groups (4 students)

Methods (III): **TRAINING**

Kyoto-Kagaku patient simulator

1 h TRAINING WITH PATIENT SIMULATOR
- Listen to, graphically represent, and identify 3 heart sounds (II sound wide split, mitral regurgitation, aortic stenosis)
- Sounds/murmurs were played in a random order (5 minutes listening/3 minutes writing)
- Listen to and identify 5 lung sounds (wheezes, ronchi, fine crackles, coarse crackles, pleural rubs)
- Sounds were played in a random order (3 minutes listening/1 minute writing)
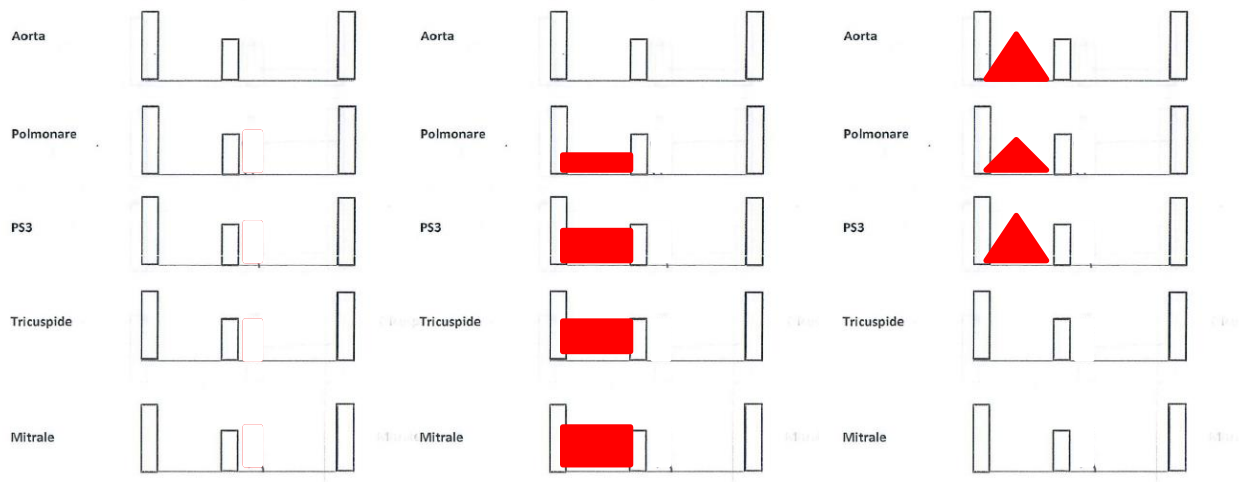
AUSCULTAZIONE POLMONE

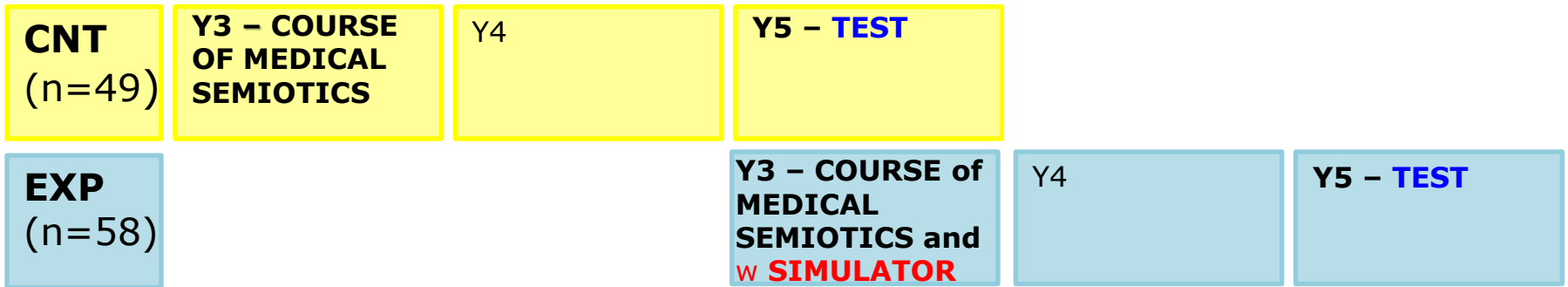| Studente		Tutore
5	Coarse crackles	
1	Fine crackles	
2	Wheezes	
4	Ronchi	
3	Pleural rubs	

Methods (III): **TESTING**

Prospective study involving 107 voluntary fifth-year medical school students

CNT (n=49)	**Y3 – COURSE OF MEDICAL SEMIOTICS**	Y4	**Y5 – TEST**
EXP (n=58)		**Y3 – COURSE of MEDICAL SEMIOTICS and** w **SIMULATOR**	Y4	**Y5 – TEST**

TESTING ON the PATIENT SIMULATOR

CNT and EXP students had to complete the paper that we used for training

5	Coarse crackles
1	Fine crackles
2	Wheezes
4	Ronchi
3	Pleural rubs

Results (I)

HEART

LUNG
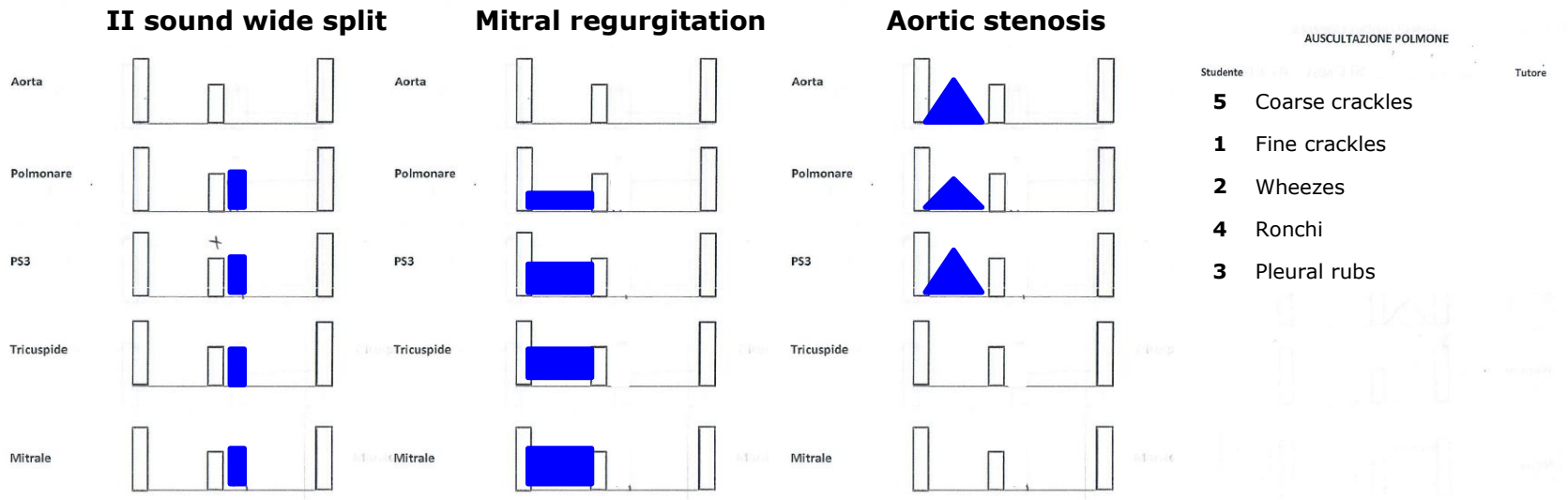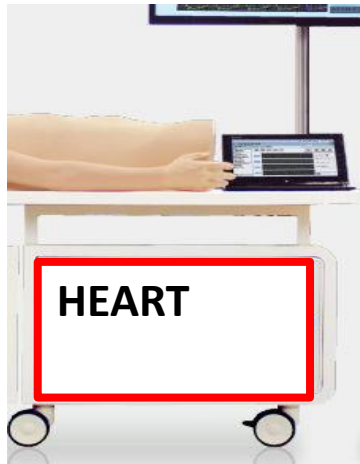
			CNT (=49)	EXP (=58)	p value
HEART	**AORTIC STENOSIS** (representation)	Correct (%)	71.4	87.9	p=0.03
		Incorrect (%)	28.6	12.1	
	MIRAL REGURGITATION (representation)	Correct (%)	67.3	86.2	p=0.02
		Incorrect (%)	32.7	13.8	
	II SOUND WIDE SPLIT (representation)	Correct (%)	30.4	55.2	p=0.01
		Incorrect (%)	69.4	44.8	
	AORTIC STENOSIS (diagnosis)	Correct (%)	77.6	84.5	n.s.
		Incorrect (%)	22.4	15.5	
	MITRAL REGURGITATION (diagnosis)	Correct (%)	71.4	89.7	p=0.02
		Incorrect (%)	28.6	10.3	
	II SOUND WIDE SPLIT (diagnosis)	Correct (%)	79.6	89.7	n.s
		Incorrect (%)	20.4	10.3	
LUNG	**WHEEZES** (diagnosis)	Correct (%)	91.7	91.4	n.s
		Incorrect (%)	8.3	8.6	
	RONCHI (diagnosis)	Correct (%)	75.0	74.1	n.s
		Incorrect (%)	25.0	25.9	
	COARSE CRAKLES (diagnosis)	Correct (%)	66.7	79.7	n.s
		Incorrect (%)	33.3	29.3	
	FINE CRACKLES (diagnosis)	Correct (%)	54.2	74.1	n.s
		Incorrect (%)	45.8	25.9	
	PLEURAL RUBS (diagnosis)	Correct (%)	62.5	63.8	n.s
		Incorrect (%)	37.5	36.2	
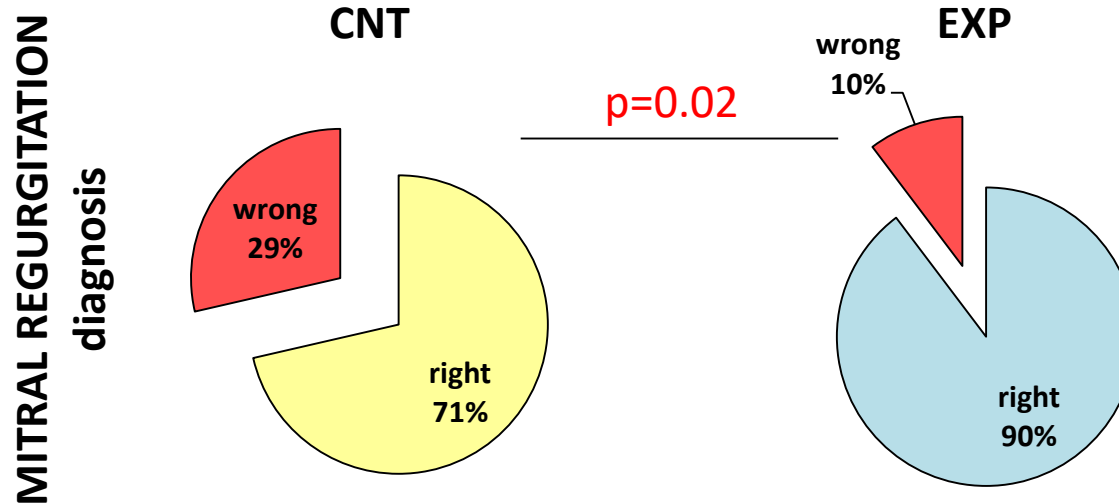
Bernardi, BMC Medical Education, 2019

Results (II)

A short individual training with a patient simulator significantly **improved heart auscultation skills**. A greater percentage of EXP students who trained on the simulator correctly recognized **mitral regurgitation**, as compared to CNT students.

Results (II)

EXP
(n=58)

Y3 – COURSE of MEDICAL SEMIOTICS and w **SIMULATOR**

Y4

Y5 – **TEST**
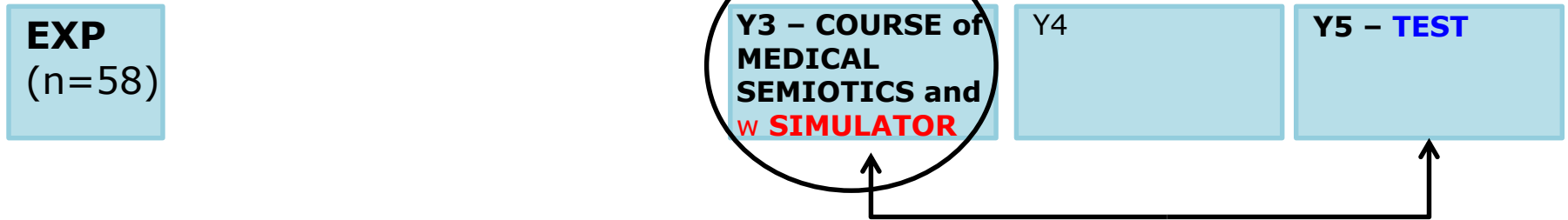
When examining the third-year responses, EXP students performed significantly better in heart auscultation than in lung auscultation. In **heart auscultation, 91% of the students** either correctly identified all the sounds/murmurs or at least the majority of them (2 out of 3). In **lung auscultation, only 73% of the students** correctly identified either all sounds or the majority of them (3–4 out of 5; $p = 0.03$ vs heart auscultation).

When we compared the performances of the same EXP students between **year three and year five**, there **were no changes in the heart auscultation results, whereas they significantly improved over time in lung auscultation**.

Discussion

A short individual training with a patient simulator significantly **improved heart auscultation skills**. A greater percentage of EXP students who trained on the simulator correctly recognized **mitral regurgitation**, as compared to CNT students. This did not happen for the lung.

→ *The differential impact that the use of the patient simulator had on heart as compared to lung auscultation could be ascribed to the different teaching/learning method that was used.* ***Graphical representation combined to auscultation***.

KOLB – esperienza-riflessione-concettualizzazione-sperimentazione/applicazione

No changes in cardiac auscultation when we compared the performances of the same EXP students between **their third and fifth year**, whereas they improved in lung auscultation.

→ *The skills acquired with the patient simulator (during the third-year course of medical semiotics) are **maintained** (and they might even improve) over time.*

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Thank you