

EVALUATION OF A NEW SMARTPHONE-BASED DIGITAL STETHOSCOPE FEATURING PHONOCARDIOGRAPHY AND ELECTROCARDIOGRAPHY IN ADULT HORSES



UNIVERSITÀ DI PISA

Bindi Francesca¹, Vezzosi Tommaso¹, Zucca Enrica², Caivano Domenico³, Freccero Francesca⁴, Sgorbini Micaela¹

INTRODUCTION

Smartphone-based devices have spread first in human medicine and then in veterinary medicine, and they have changed the modern approach to cardiology [1,3]

AIM

- ✓ To evaluate a novel smartphone-based digital stethoscope (DS) designed for simultaneous auscultation, recording of phonocardiogram and one-lead ECG in horses



MATERIALS AND METHODS

94 adult horses

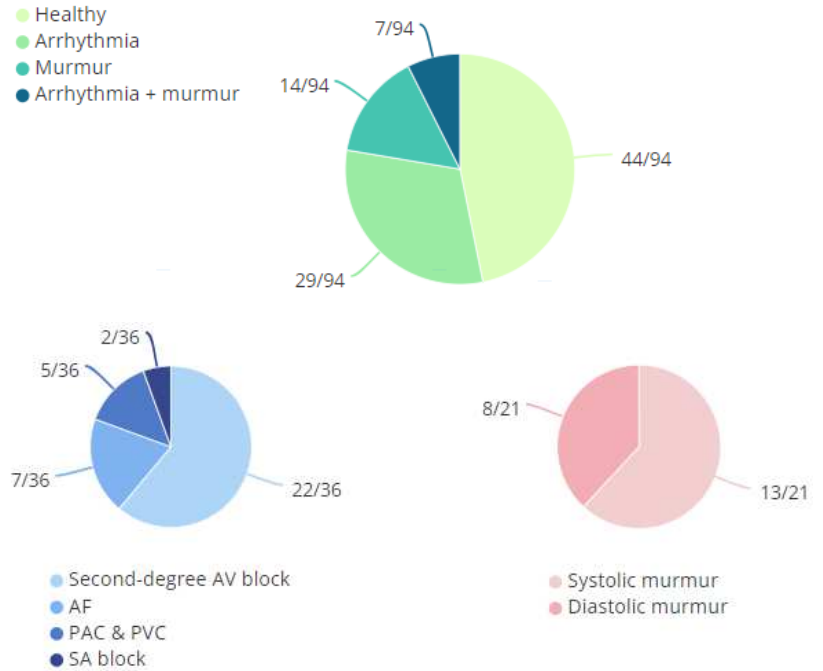
Each animal underwent:

1. *Conventional auscultation* with an acoustic stethoscope
2. *Standard base-apex ECG* (Televet 100, Engel Engineering Service GmbH, Germany) [3]
3. *Audio and phonocardiographic recording* with the DS (Eko duo, Eko Devices, Inc, USA)

Statistical analysis

- *Cohen's κ* → agreement between conventional auscultation and standard ECG vs. DS
- *Bland Altman plot* → agreement between standard ECG and DS ECG tracings

RESULTS



Agreement between conventional auscultation and DS

Optimal → diagnosis of heart murmurs (k=1) and arrhythmias (k=0.98)

Suboptimal → P polarity (k=0.68)

Moderate → QRS polarity (k=0.48)

Bias between standard ECG and DS

Heart rate (bpm)	0.08 (-4.34-4.51)
P wave duration (sec)	0.02 (-0.01-0.05)
PR interval duration (sec)	-0.37 (-7.40-6.66)
QRS complex duration (sec)	0.008 (-0.03-0.04)
QT interval duration (sec)	-0.02 (-0.22-0.18)
Artifacts duration (sec)	-0.005 (-2.23-2.22)

DISCUSSION & CLINICAL RELEVANCE

- ✓ The DS exhibited good feasibility and diagnostic accuracy in detecting both heart murmurs and arrhythmias in adult horses
- ✓ The DS could be a useful device for equine cardiac screening, especially in field conditions

REFERENCES

1. Nguyen HH et al (2016). Use of smartphone technology in cardiology. Trends Cardiovasc Med, 26(4):376-386
2. Vezzosi T et al (2018). Evaluation of a smartphone electrocardiograph in healthy horses: comparison with standard base-apex electrocardiography. J Equine Vet Sci, 67:61-5
3. Vitale V et al (2021). Evaluation of a new portable 1-lead digital cardiac monitor (eKuore) compared with standard base-apex electrocardiography in healthy horses. PLoS ONE, 16:e0255247