

IMPROVED SCREENING TECHNOLOGY - EVALUATION AND IMPLEMENTATION

# IMPROVED SCREENING TECHNOLOGY- EVALUATION AND IMPLEMENTATION

NOVEMBER-DECEMBER 2010



HD Medical Group Limited

FOR AUTHORISED USE ONLY  
1

### Introduction

With the growing population and underserved resources in rural scenario, India has large number of cardio vascular abnormalities recorded for this decade.

HD Medical Group has developed a technology to screen the patients in the first place to ensure that they get immediate medical attention in the first place. The key concept of this innovation is the conventional art of "Auscultation".

Auscultation is considered as the 'art of listening to the body sounds' and manifests nature's source of exhibiting all the hemodynamic abnormalities. This art was developed into a concept called Phonocardiography which lost its importance in due course. For the first time in medical world, HD Medical Group has combined the audio and visual auscultation to effectively increase the way the patients are triaged. This technology is aimed to improve the quality of screening as an objective tool for clinicians to determine the next level of action.

### Screening Technology

The new technology does not compromise in its audio quality even when amplified and the sounds are digitized and processed encompassing a digital auscultation.

Secondly, the old art of phonocardiography (PCG) is revived, to document, as well as display the heart sounds, and aid in screening. This is also achieved in the same auscultation platform. This synchronization has given life to our break-through concept of audio- visual auscultation.

Thirdly, in order to bring back the lost art of PCG, it was realized that PCG needed a further assistance tool to detect and highlight abnormalities and murmurs. There comes the MURMUR DOC, an effective murmur indicator to



guide the patients to next level of medical attention in the right time.

### Evaluation and Implementation

The advanced algorithm has been layered on the patented HD fono visual auscultation platform. The device analyses the heart sounds and gives out an output of whether or not of a murmur being present. However, the decision of the clinician always remains final. It contributes valuable insight for the clinician to arrive at a diagnosis\*.

This algorithm was tested in various reputed institutions like JIPMER and Sathya Sai Hospital. The recent trials has taken place in GA Vasant Clinic in a population of 72 (46 normal and 26 abnormal).

This technology has offered highest sensitivity towards the mild and trivial murmurs as well. The technology has achieved a sensitivity of **96.15%** and a specificity of **91%**.

The results that verify the device performance has been detailed below for reference.

\*This technology must not be used in isolation, but contribute to the clinician's decision making the diagnosis. This is not a diagnostic device.

Clinical Trials and Device Validation - Murmur Doc in HD fonoDoc

Dates: 16 Nov 2010 - 06 Dec 2010

Venue: G A Vasant Clinic, Chennai, India

The clinical trials for the evaluation of the efficiency and accuracy of the device "Murmur Doc in HD fonoDoc and an R&D version took place in Chennai between the 16th of November and 06th of December 2010. A total of 72 patients were examined using the device after their Echocardiogram. The operator(s) were blinded to the Echo diagnosis of the patient thereby establishing a double-blinded study. After obtaining the Echo reports and Doctor's opinion, it was found that the sample had **46 normal** and **26 abnormal** cases.

The sensitivity and the Specificity of the device was calculated as follows:

$$\text{Sensitivity} = \text{TP} / (\text{TP} + \text{FN})$$

$$\text{Specificity} = \text{TN} / (\text{TN} + \text{FP})$$

where TP = Abnormal correctly detected as Abnormal  
TN = Normal correctly detected as Normal  
FP = Normal detected as Abnormal  
FN = Abnormal detected as Normal

The overall sensitivity and specificity for the population of 72 with the version is as follows:

**Sensitivity 96.15%**

**Specificity 91%**

Annexure 1: Clinical Trial and Device Validation forms attested by Dr. Alagesan

Annexure 2: Murmur Doc Evaluation, GA Vasant Clinic, Chennai

Results verified by: Mr.B.R.Ganesh Kumar

Head - Algorithm and Clinical Trials  
R& D, HD Medical Services (India) Pvt. Ltd  
Chennai, India

FOR AUTHORISED USE ONLY

3

**Prof. R. ALAGESAN, MD, DM (Card)**  
Professor and Head of Dept of Cardiology (Retired)  
Institute of Cardiology, Madras Medical College  
Cardiologist  
Govt. General Hospital, Chennai 600 003

IMPROVED SCREENING TECHNOLOGY - EVALUATION AND IMPLEMENTATION

**Results of Clinical Trial and Device Validation**

(Murmur Doc vs. Cardiologist diagnosis based on Echocardiogram)

Venue: G A Vasant Clinic, Chennai

Date	S.No	Ref.No	Age/Sex	Cardiologist diagnosis based on Echocardiogram	Murmur Doc Output	Test Outcome	Cardiologist diagnosis based on Auscultation
17-Nov-10	1	O09rd1	55/M	Moderate AR, Moderate MR	Murmur	TP	Systolic & Diastolic murmur
19-Nov-10	1	O20rd1	3m/M	Trivial TR	Murmur	TP	systolic murmur
	2	O21rd1	48/M	Normal	No murmur	TN	No murmur
	3	O22rd1	48/M	Normal	No murmur	TN	No murmur
22-Nov-10	1	O25rd1	49/F	Normal	No murmur	TN	No murmur
	2	O26rd1	53/M	Normal	No murmur	TN	No murmur
	3	O29rd1	34/M	Normal	No murmur	TN	No murmur
	4	O30rd1	20/M	Normal	No murmur	TN	No murmur
	5	O31rd1	47/M	Normal	No murmur	TN	No murmur
	6	O32rd1	76/M	Mild AS, Mild AR	Murmur	TP	Systolic & Diastolic murmur
	7	O33rd1	15/M	Normal	No murmur	TN	No murmur
	8	O34rd1	39/M	Normal	No murmur	TN	No murmur
	9	O35rd1	56/M	Normal	No murmur	TN	No murmur
23-Nov-10	1	O40rd1	68/M	Moderate AS	Murmur	TP	systolic murmur
	2	O41rd1	19/M	Normal	Murmur	FP	No murmur
	3	O42rd1	37/M	VSD	Murmur	TP	systolic murmur
	4	O43rd1	47/M	Normal	No murmur	TN	No murmur
	5	O44rd1	49/M	Normal	Murmur	FP	No murmur
24-Nov-10	1	NR 09rd	70/M	Moderate MR	No murmur	FN	Systolic murmur
	2	NR 10rd	4/F	ASD	Murmur	TP	Systolic murmur
	3	O46rd1	52/M	Normal	No murmur	TN	No murmur
	4	O47rd1	65/M	Mild MR	Murmur	TP	Systolic murmur
	5	O48rd1	41/M	Normal	No murmur	TN	No murmur
	6	O49rd1	55/M	Normal	No murmur	TN	No murmur

FOR AUTHORISED USE ONLY

4

**Prof. R. ALAGESAN, MD, DM (Card)**  
 Professor and Head of Dept of Cardiology (Retired)  
 Institute of Cardiology, Madras Medical College  
 Cardiologist  
 Govt. General Hospital, Chennai 600 003

IMPROVED SCREENING TECHNOLOGY - EVALUATION AND IMPLEMENTATION

25-Nov-10	1	O50rd1	62/M	Mild AS	Murmur	TP	systolic murmur
	2	O51rd1	54/M	Normal	No murmur	TN	No murmur
	3	O52rd1	77/F	Mild MR	Murmur	TP	systolic murmur
	4	O53rd1	36/M	Normal	No murmur	TN	No murmur
	5	O54rd1	66/M	Normal	No murmur	TN	No murmur
	6	O55rd1	13/M	VSD	Murmur	TP	systolic murmur
	7	O56rd1	2/F	VSD	Murmur	TP	Systolic murmur
26-Nov-10	1	O57rd1	45/M	Severe MS, MR	Murmur	TP	Systolic Diastolic murmur
	2	O58rd1	59/M	Moderate MS, Mild AR	Murmur	TP	Systolic Diastolic murmur
	3	NR11rd	59/M	Trivial MR	Murmur	TP	systolic murmur
	4	NR12rd	44/M	Normal	No murmur	TN	No murmur
	5	NR13rd	2m/M	VSD	Murmur	TP	systolic murmur
	6	NR14rd	46/F	Normal	No murmur	TN	No murmur
	7	O59rd1	47/M	Normal	No murmur	TN	No murmur
	8	O60rd1	23/M	Normal	No murmur	TN	No murmur
	9	O62rd1	58/M	Normal	No murmur	TN	No murmur
29-Nov-10	1	O63rd1	82/M	ASD	Murmur	TP	Systolic murmur
	2	O64rd1	56/M	Mild AS	Murmur	TP	Systolic murmur
	3	O65rd1	21/F	Normal	No murmur	TN	No murmur
	4	O66rd1	26/F	Normal	No murmur	TN	No murmur
	5	O67rd1	21/M	Trivial TR	No murmur	TN	Systolic murmur
	6	O68rd1	63/F	Normal	No murmur	TN	No murmur
	7	O69rd1	55/M	Normal	No murmur	TN	No murmur
	8	O70rd1	61/M	Normal	No murmur	TN	No murmur
	9	O71rd1	80/F	Moderate AS	Murmur	TP	Systolic murmur
30-Nov-10	1	O72rd1a or	45/M	Severe MR	Murmur	TP	Systolic Diastolic murmur
	2	O73rd1	78/M	Normal	No murmur	TN	No murmur
	3	O74rd1	75/M	ASD, Mild TR,	No murmur	TN	Systolic murmur

Prof. R. ALAGESAN, MD, DM (Card)  
 Professor and Head of Dept of Cardiology (Retired)  
 Institute of Cardiology, Madras Medical College  
 Cardiologist  
 Govt. General Hospital, Chennai 600 003

IMPROVED SCREENING TECHNOLOGY - EVALUATION AND IMPLEMENTATION

3-Dec-10	1	O75	2/F	PDA	Murmur	TP	continuous murmur
	2	O76rd1	61/M	Normal	No murmur	TN	No murmur
	3	NR15rd1	45/F	Normal	Murmur	FP	No murmur
	4	O77rd1	40/M	Normal	No murmur	TN	No murmur
	5	O78rd1	72/M	Mild AS	Murmur	TP	systolic murmur
6-Dec-10	1	NR16rd1	63/M	Normal	No murmur	TN	No murmur
	2	NR17rd1	12/F	Mild AR, Moderate MS	Murmur	TP	Systolic Diastolic murmur
	3	NR18rd1	43/M	Normal	No murmur	TN	Grade2/6 systolic murmur
	4	NR19rd1	48/M	Normal	No murmur	TN	No murmur
	5	NR20rd1	25/M	Trivial MR	Murmur	TP	Grade2/6 systolic murmur
	6	NR21rd1	48/F	Severe MS	Murmur	TP	Diastolic murmur
	7	NR22rd1	58/F	Normal	No murmur	TN	No murmur
	8	NR23rd1	67/M	Normal	No murmur	TN	systolic murmur
	9	NR24rd1	7/F	PDA	Murmur	TP	continuous murmur
	10	NR25rd1	56/M	Normal	No murmur	TN	No murmur
	11	NR26rd1	64/M	Normal	Murmur	FP	No murmur
	12	NR27rd1	52/M	Normal	No murmur	TN	No murmur
	13	NR28rd1	52/M	Normal	No murmur	TN	No murmur
	14	NR29rd1	29/M	Normal	No murmur	TN	No murmur
	15	NR30rd1	42/M	Normal	No murmur	TN	No murmur

Sensitivity		96.15%
Specificity		91%

FOR AUTHORISED USE ONLY

6

*R. Alagesan*  
**Prof. R. ALAGESAN, MD, DM (Card)**  
 Professor and Head of Dept of Cardiology  
 Institute of Cardiology, Madras Med  
 Govt. General Hospital, Chennai  
**Prof. R. ALAGESAN, MD, DM (Card)**  
 Professor and Head of Dept of Cardiology (F)  
 Institute of Cardiology, Madras Medical  
 Cardiologist  
 Govt. General Hospital, Chennai 600 003