

UTMB CARDIOLOGY DIVISION

AUSCULTATORY TRAINING AID SYSTEM

Background - Auscultation is a difficult skill which requires extensive practice—practice which is increasingly difficult for training programs to provide. These factors plus increasing emphasis on technology have reduced current levels of auscultatory ability.^{1,2,3}

Current availability of several advanced technologies such as magneto optical discs and digital sound in miniature, low cost packages when combined with suitable adjuncts offer the opportunity to enhance teaching of auscultation.

Problem - Existing training programs are limited by student access to patients with suitable sounds during the period practice is most needed. Previous attempts to avoid this problem by use of recorded and simulated sounds have several shortcomings which include:

- Absence of fidelity and realism in many of these programs
- Inadequate low frequency response i.e. inability to accurately reproduce S_{3,4}, some murmurs etc. by tape recorders, earphones, speakers and analog recording.
- Inadequate simulation of sound by existing trainers such as Harvey.
- Difficult access to computers in libraries etc. required to support current video CD disc programs.

¹ Travel, M.E. Cardiac Auscultation, A Glorious Past - But Does It Have a Future? Circulation 36:1250-3, 1996.

² Mangione, S. and L. Z. Nieman, Cardiac Auscultatory Skills of Internal Medicine and Family Practice Trainees, JAMA 278:717-22, 1997.

³ Ron Winslow, Some doctors Can't Find the Beat, Wall Street Journal, Sep 3, 1997, pp A3 & 6.

Potential for Improvement - The Auscultatory Training Aid (ATA) System currently in work should overcome most of these problems as described in the following.

The unique ATA hardware unit is a computer mouse sized unit which reproduces sound and pulse. Its sound is detected by a stethoscope which may be used in standard fashion; bell or diaphragm, variable pressure, etc. Pulse is detected by palpation in the usual fashion. This hardware has an advanced transducer capable of reproducing sounds even below the limit of human hearing and this capacity insures adequate reproduction of low frequency heart sounds from a digital disc replay unit. In addition to sound a second recorded channel will contain carotid pulse (or apical impulse) information which drives the motion transducer to provide a simultaneous tactile pulse or impulse to allow unambiguous timing of the sounds, an essential often overlooked in practice and a feature not previously available (except on patients and Harvey.) Data from patients are recorded and reproduced by state of the art, two channel mini disc digital system designed for the commercial market with low cost and simplicity of operation. The record reproducer is (small) pocket sized and battery (rechargeable) operated. Each mini disc contains 74 minutes recording time in up to 74 instantly accessible tracks which may be replayed as desired. Track access is completely flexible in any desired order and may be very rapidly selected or programmed.

A variety of recorded programs may be generated for teaching, individual learning, and testing. This system can also be used in respiratory, gastro intestinal and joint auscultation.

It is anticipated that small numbers of these units for take home use of students and others could greatly augment large fixed and sometimes inadequate teaching installations at small additional expense.

William Thornton, M.D.

Auscultatory training aid.doc

ATA Recorded Programs and Texts



Miniature optical discs with digital sound provide 74 minutes of sounds and pulses per disc with as many as 74 tracks. Each track is instantly and randomly accessible. The recorder may be programmed to play the entire sequence on the disc or to repeat any track.

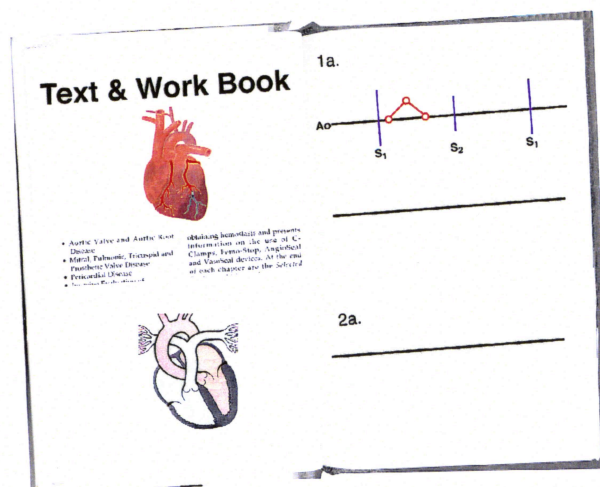
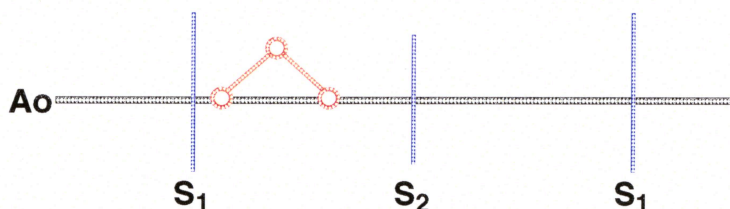
Texts will describe generation and characteristics of teaching examples on a given track. Additional practice examples will be given, as will a series of unknowns. Space for diagramming will be provided plus an "answers" section will be included.

Example:

Tracks are numbered with track number, sound location and identification on display:

- 01 — Ao Normal
- 02 — Pu Normal
- 03 — Tri Normal
- 04 — Mi Normal
- 10 — Pu Innocent M
- 11 — Ao A.S.
- 20 — Ao Unknown
- 21 — Pu Unknown

01. Ao Normal: S₁ precedes carotid pulse which is followed by S₂. S₂ is louder than S₁ and slightly higher in pitch.



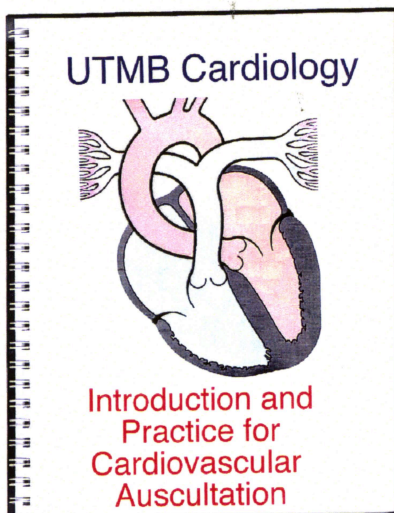
ATA System Hardware



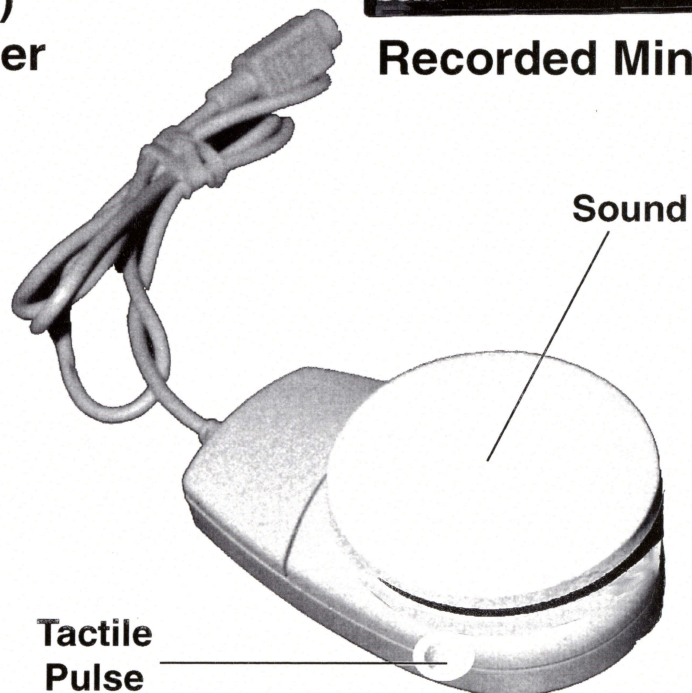
**Digital Two-channel
(Sound & Pulse)
Mini Disc Recorder**



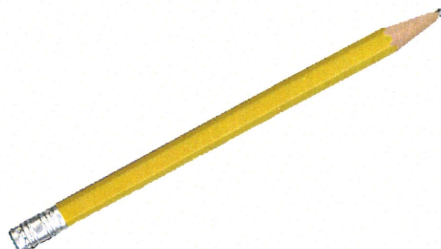
Recorded Mini Disc



**Text / Work
Book**

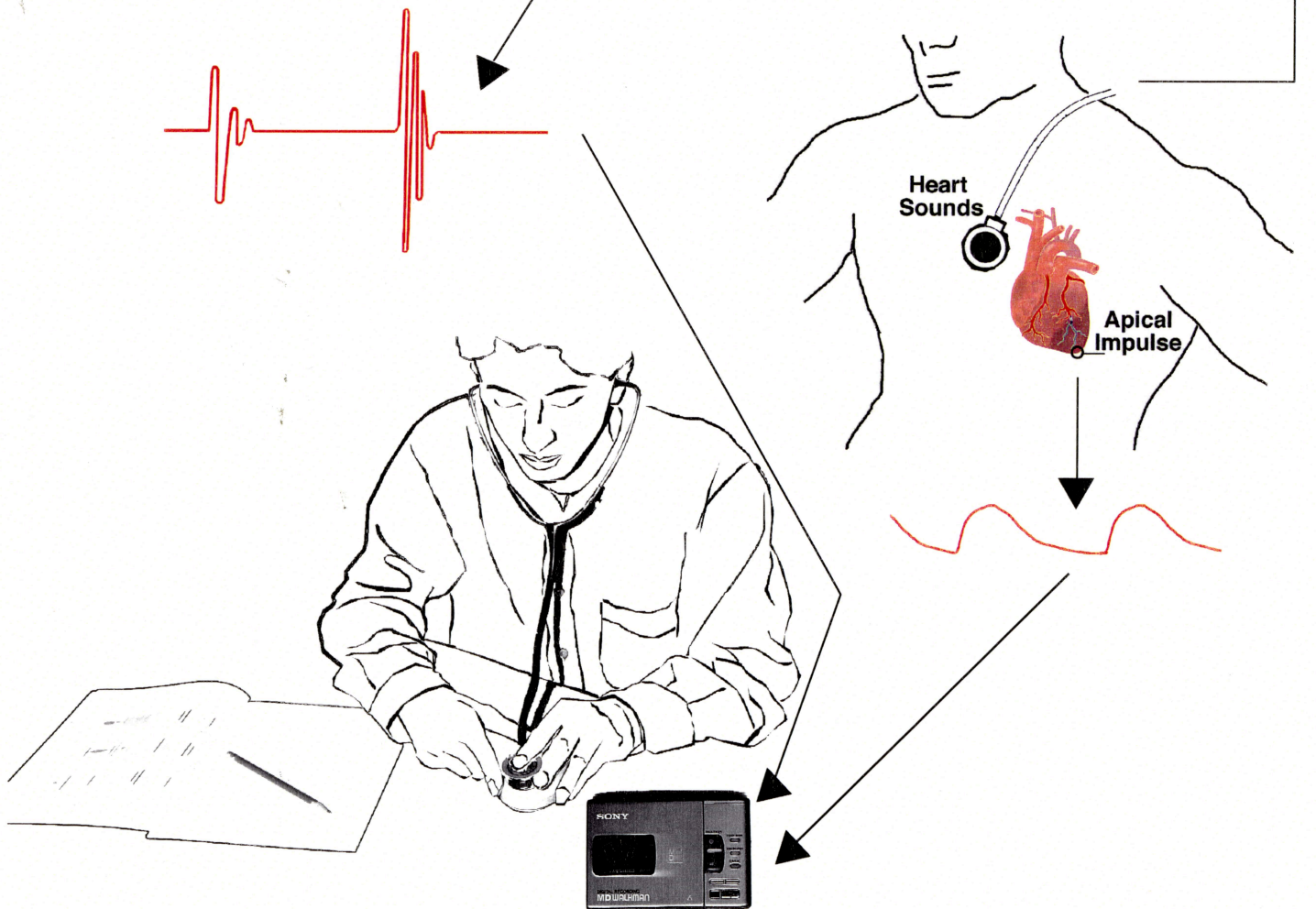
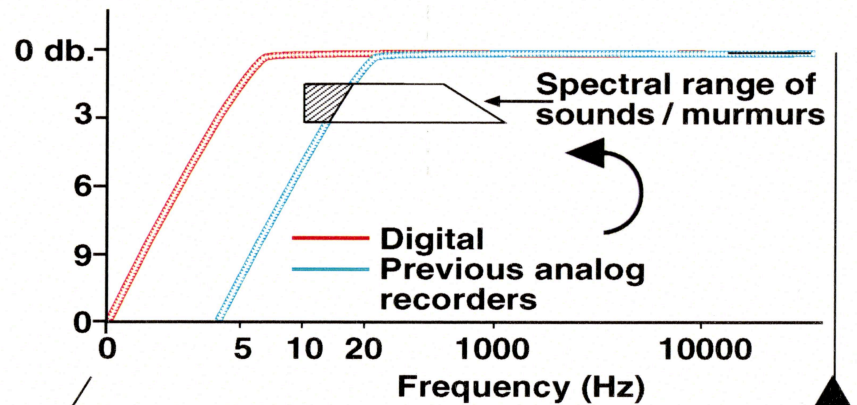


Battery charger for units not shown

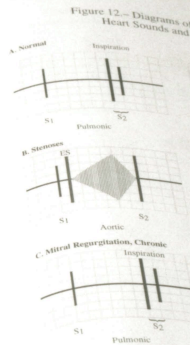


Auscultatory Training Aid System

Fidelity
Accessibility
Flexibility
Tactile pulse



Sounds and apical or carotid impulses are prerecorded from patients on miniature electro-optical digital discs, which preserve and reproduce their entire contents. The ATA disc program is listened to through a stethoscope while the user simultaneously palpates the corresponding carotid pulse or apical impulse. The recorder-reproducer system and ATA are battery operated, pocket-sized and may be conveniently used anywhere desired.



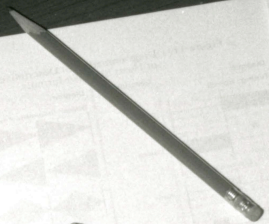


Figure 12.- Diagrams of Some Typical Heart Sounds and Murmurs

