



IHS Information System  
Advisory Committee

**Ronald S. Weinstein, M.D.**  
*Director*  
**Arizona Telemedicine Program**

# Origins of Multi-Specialty Telemedicine

Massachusetts General Hospital, Boston, MA



Dr. Kenneth Bird

1967

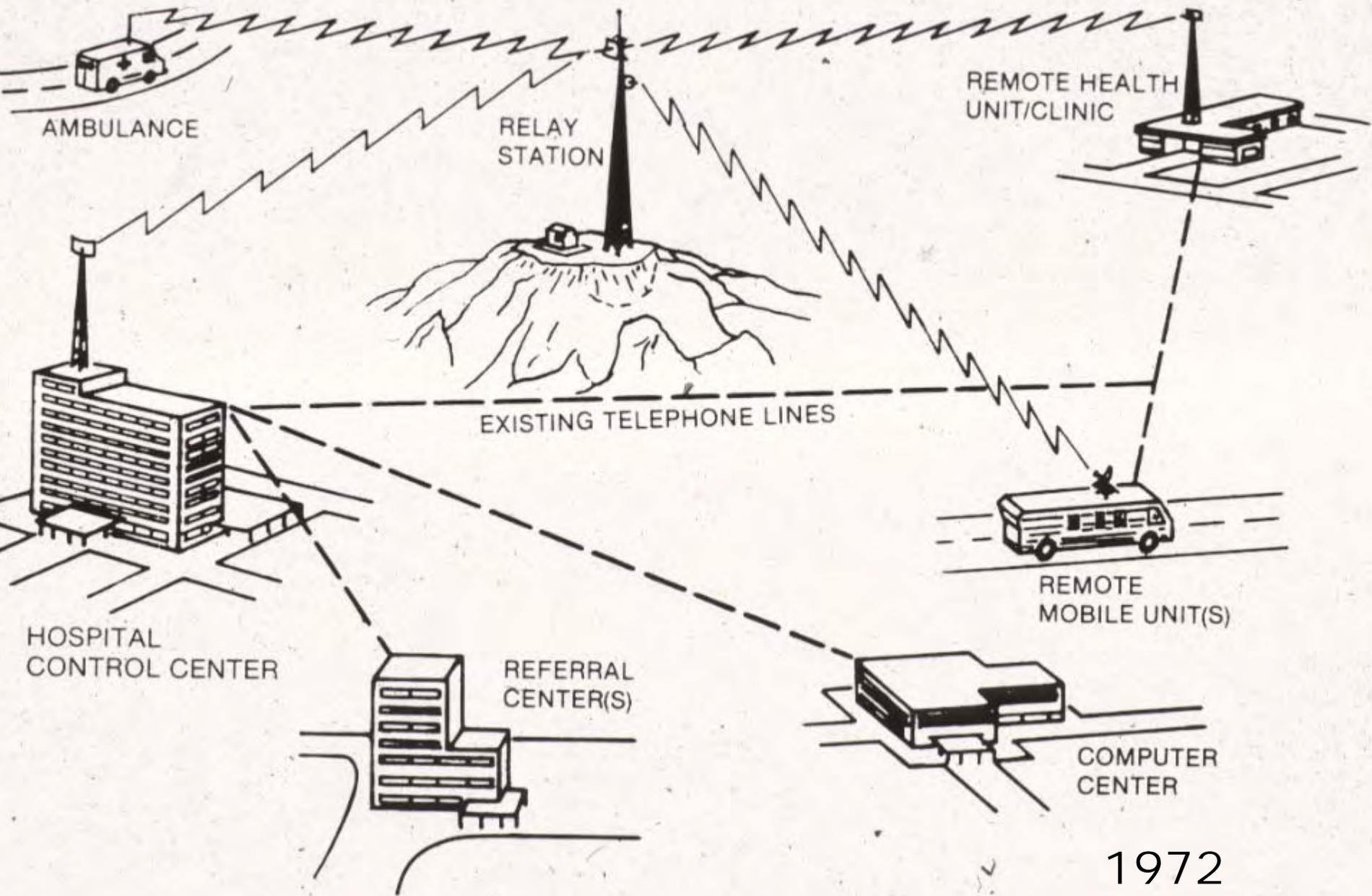
TECHNOLOGY



SERVES THE PEOPLE

OFFICE OF RESEARCH AND DEVELOPMENT  
TUCSON, ARIZONA

1970



1972



1972

# LOCAL HEALTH SERVICE CENTER



- EXTERIOR OF CLINIC
- MICROWAVE ANTENNA & DISH

## SANTA ROSA

- EMERGENCY ROOM
- PATIENT TABLE AND O/H CAMERA
- OPERATIONAL CONSOLE WITH DATA TERMINAL
- PATIENT VIEWING SCOPE



- LAB AREA
- TRINOCULAR MICROSCOPE
- COLOR TV CAMERA & MONITOR



1972

# HEALTH SERVICES SUPPORT CONTROL CENTER



SELLS, ARIZONA (POP. - 2800)  
INDIAN HEALTH SERVICES HOSPITAL COMPOUND  
60 MI SW OF TUCSON  
"CAPITAL" - TRIBAL HEADQUARTERS



SELLS HOSPITAL

- PHYSICIANS CONSOLE
- T.V. CAMERA, MONITOR, AND REMOTE CONTROLS
- DATA TERMINAL
- OVERHEAD T.V. AND X-RAY BOX



MOUNT QUIJOTOA RELAY STATION

# MOBILE HEALTH UNIT



EXTERIOR VIEW WITH  
GENERATOR/UTILITY TRAILER

## RECEPTION ROOM



- TRINOCULAR MICROSCOPE
- REFRIGERATOR/STORAGE
- DOOR INTO X-RAY ROOM

- DATA TERMINAL
- TV MONITOR
- COMMUNICATION RACKS
- PATIENT RECORDS





IHS - Arizona - 1972



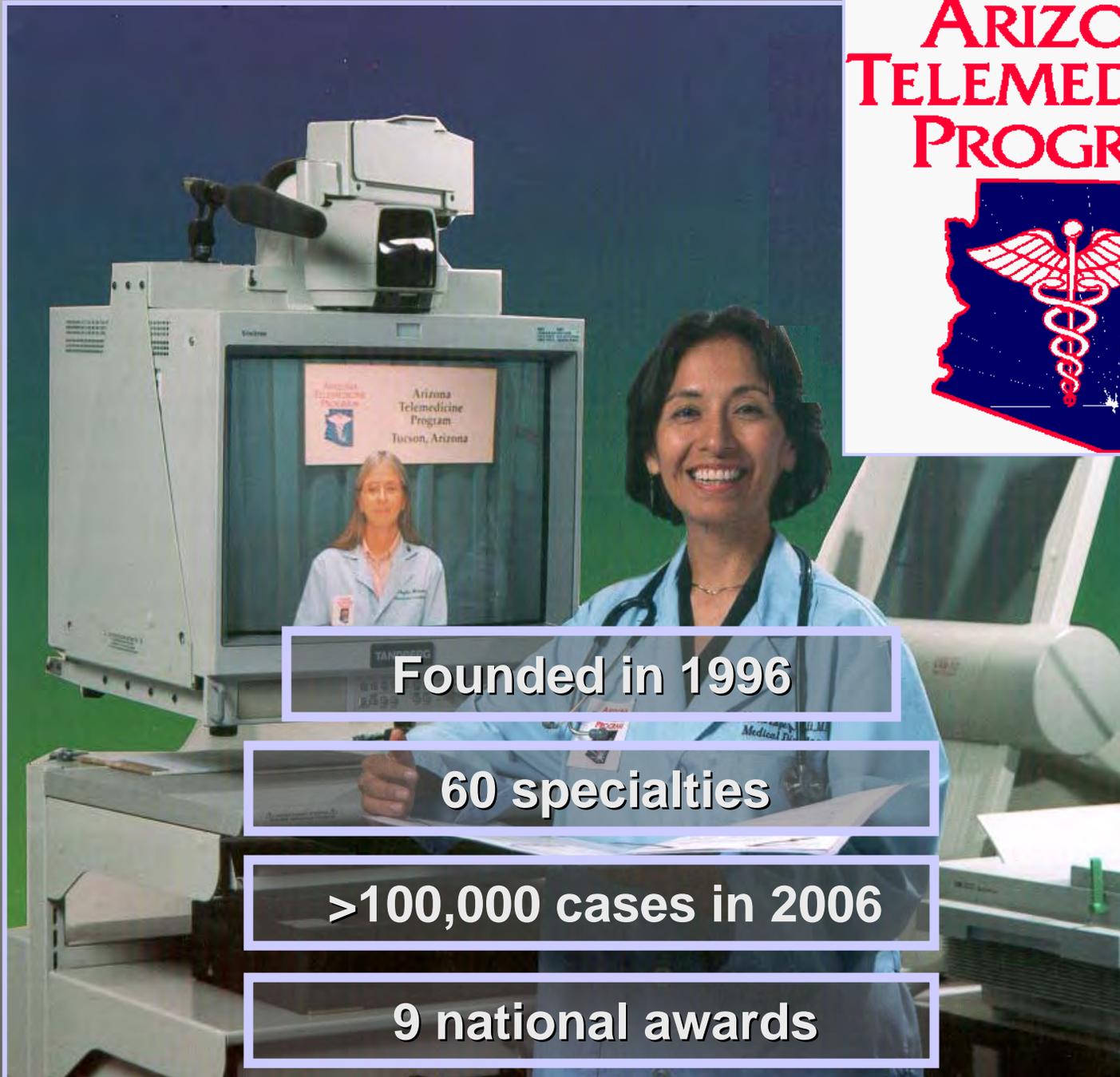
1972

# Founders of The Arizona Telemedicine Program



**Richard A. McNeely    Ronald S. Weinstein, M.D.    Rep. Robert "Bob" Burns    John J. Lee**  
**Rep. Lou-Ann Preble    Rachael Anderson**

# ARIZONA TELEMEDICINE PROGRAM

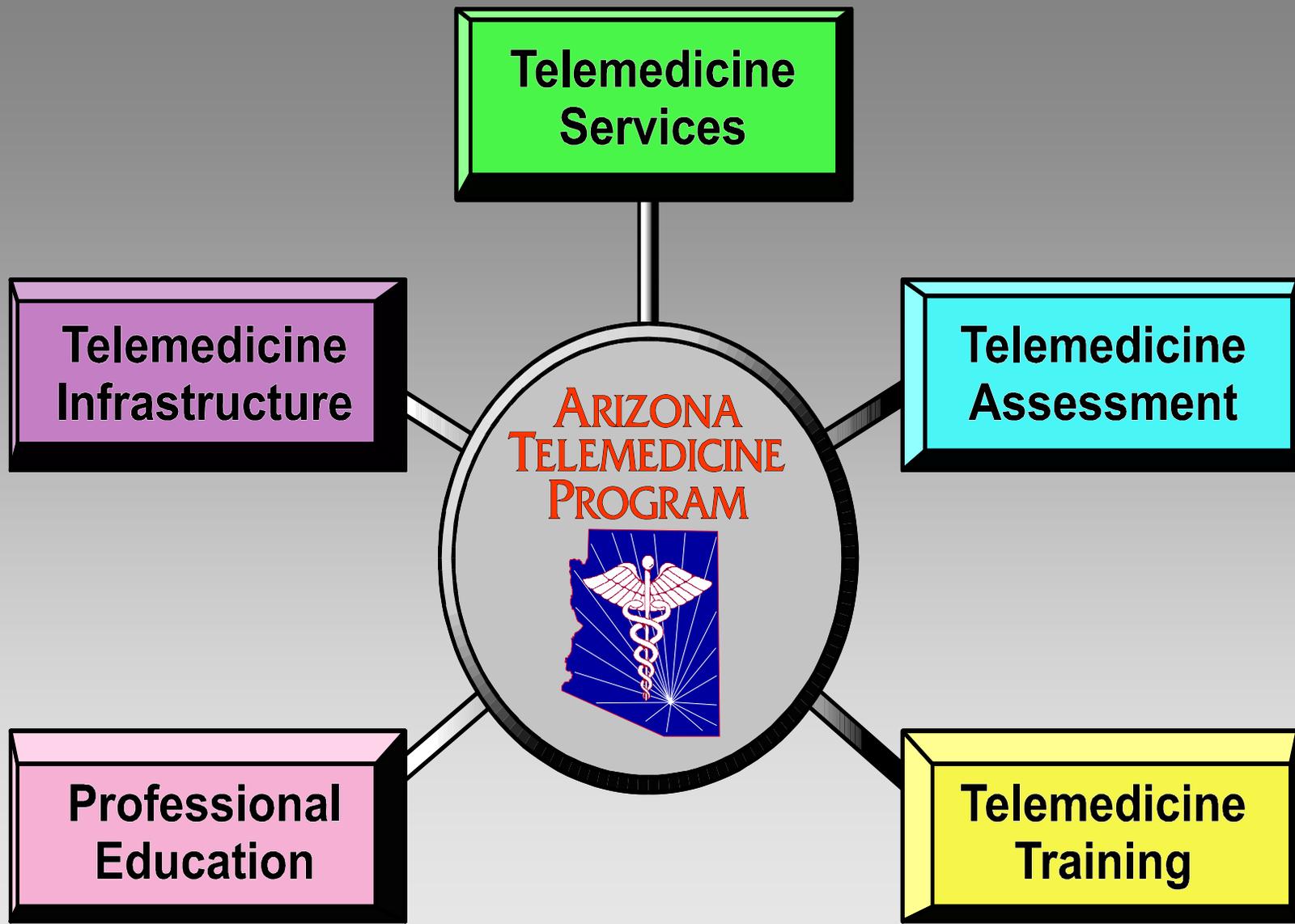


**Founded in 1996**

**60 specialties**

**>100,000 cases in 2006**

**9 national awards**





## Action Items 1996

- Implement a regional telecommunications strategy for telehealth.
- Draft a comprehensive telehealth business plan.
- Establish a Telemedicine Training Program.
- Develop telemedicine standards for Arizona

# ARIZONA TELEMEDICINE NETWORK

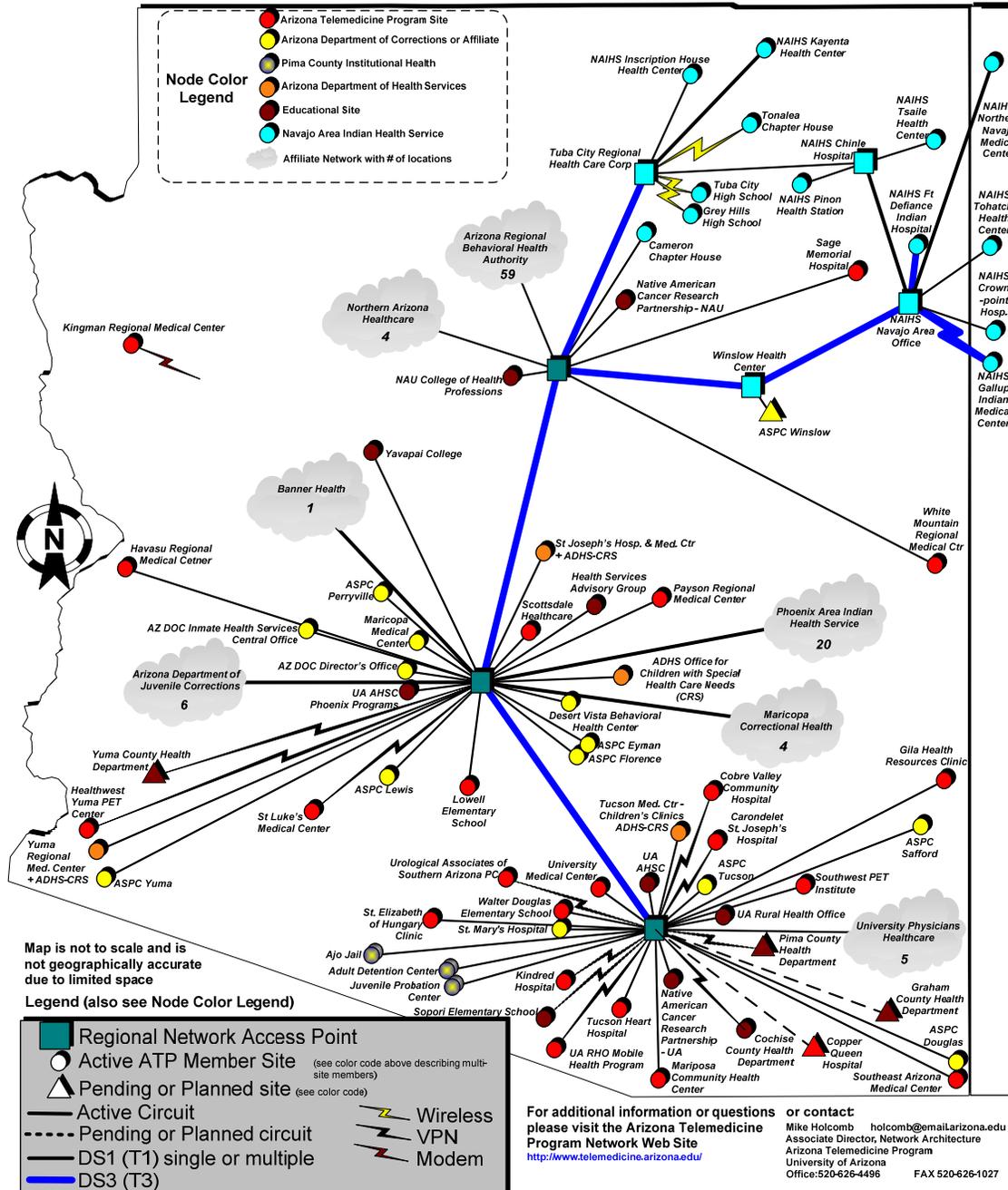
Current and Pending WAN Connections as of May 2006

## Telemedicine Communities

- Ajo, AZ
- Amado, AZ
- Apache Junction, AZ
- Avondale, AZ
- Benson, AZ
- Bisbee, AZ
- Bloomfield, NM
- Buckeye, AZ
- Bullhead City, AZ
- Cameron, AZ
- Casa Grande, AZ
- Chinle, AZ
- Cibecue, AZ
- Cottonwood, AZ
- Crownpoint, NM
- Douglas, AZ
- Eloy, AZ
- Flagstaff, AZ
- Florence, AZ
- Ft. Defiance, AZ
- Ft. Duchesne, UT
- Gallup, NM
- Ganado, AZ
- Globe, AZ
- Goodyear, AZ
- Green Valley, AZ
- Holbrook, AZ
- Kayenta, AZ
- Kearny, AZ
- Kingman, AZ
- Lake Havasu City, AZ
- Laveen, AZ
- Marana, AZ
- Mesa, AZ
- Morenci, AZ
- Nogales, AZ

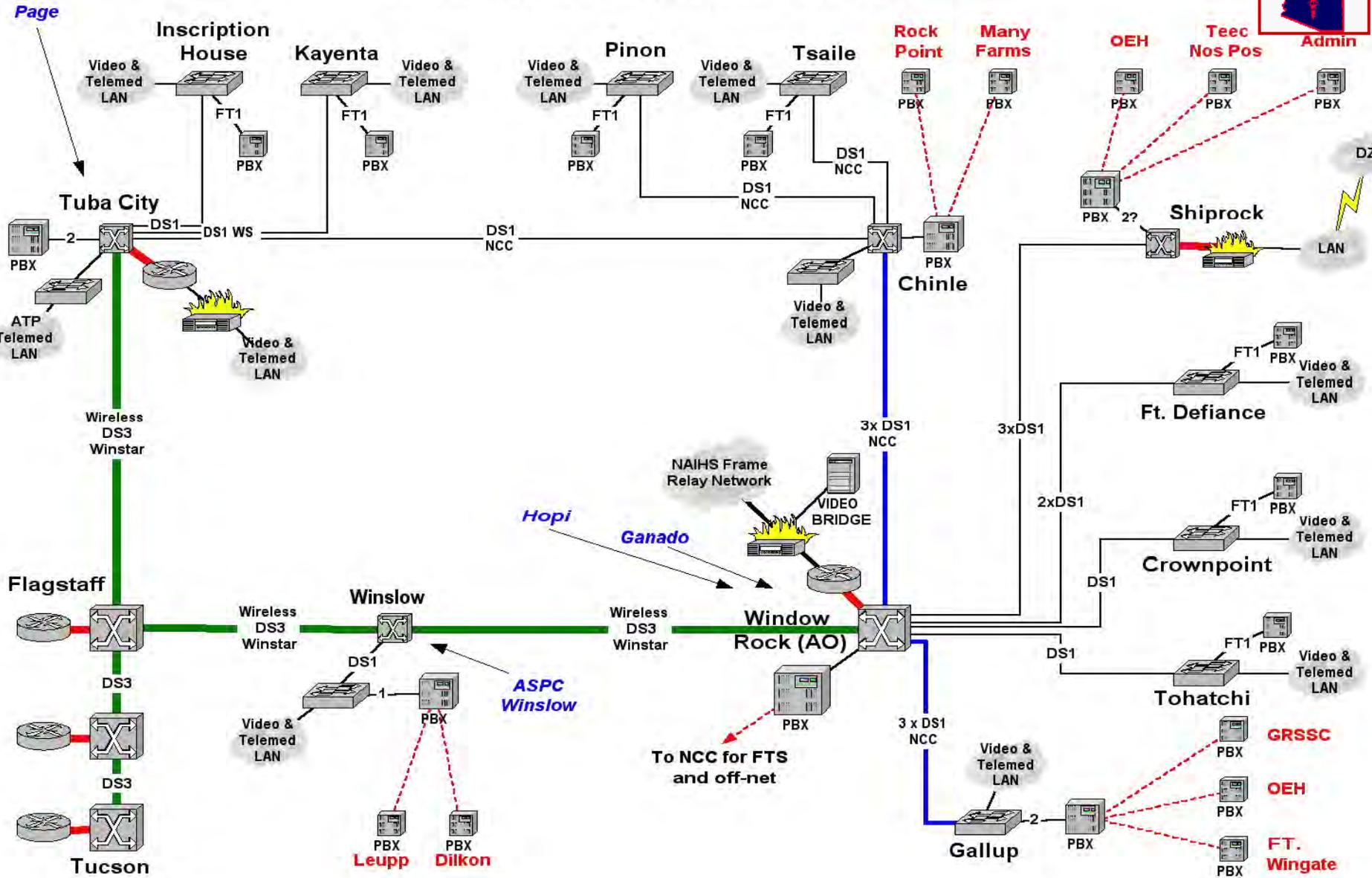
## Telemedicine Communities

- Oracle, AZ
- Page, AZ
- Parker, AZ
- Payson, AZ
- Phoenix, AZ
- Pinon, AZ
- Polacca, AZ
- Prescott, AZ
- Prescott Valley, AZ
- Quartzite, AZ
- Sacaton, AZ
- Safford, AZ
- Salt Lake City, UT
- San Carlos, AZ
- San Luis, AZ
- Scottsdale, AZ
- Sells, AZ
- Shiprock, NM
- Shonto, AZ
- Show Low, AZ
- Sierra Vista, AZ
- Springerville, AZ
- St. Johns, AZ
- Supai, AZ
- Tempe, AZ
- Tohatchi, NM
- Tonalea, AZ
- Tsaile, AZ
- Tuba City, AZ
- Tucson, AZ
- Wellton, AZ
- Whiteriver, AZ
- Window Rock, AZ
- Winslow, AZ
- Yuma, AZ



# NAVAJO AREA IHS NETWORK BUILD-OUT – APRIL 2002

## NAVAJO AREA IHS / ARIZONA TELEMEDICINE PROGRAM INTEGRATED REGIONAL TELEMEDICINE NETWORK

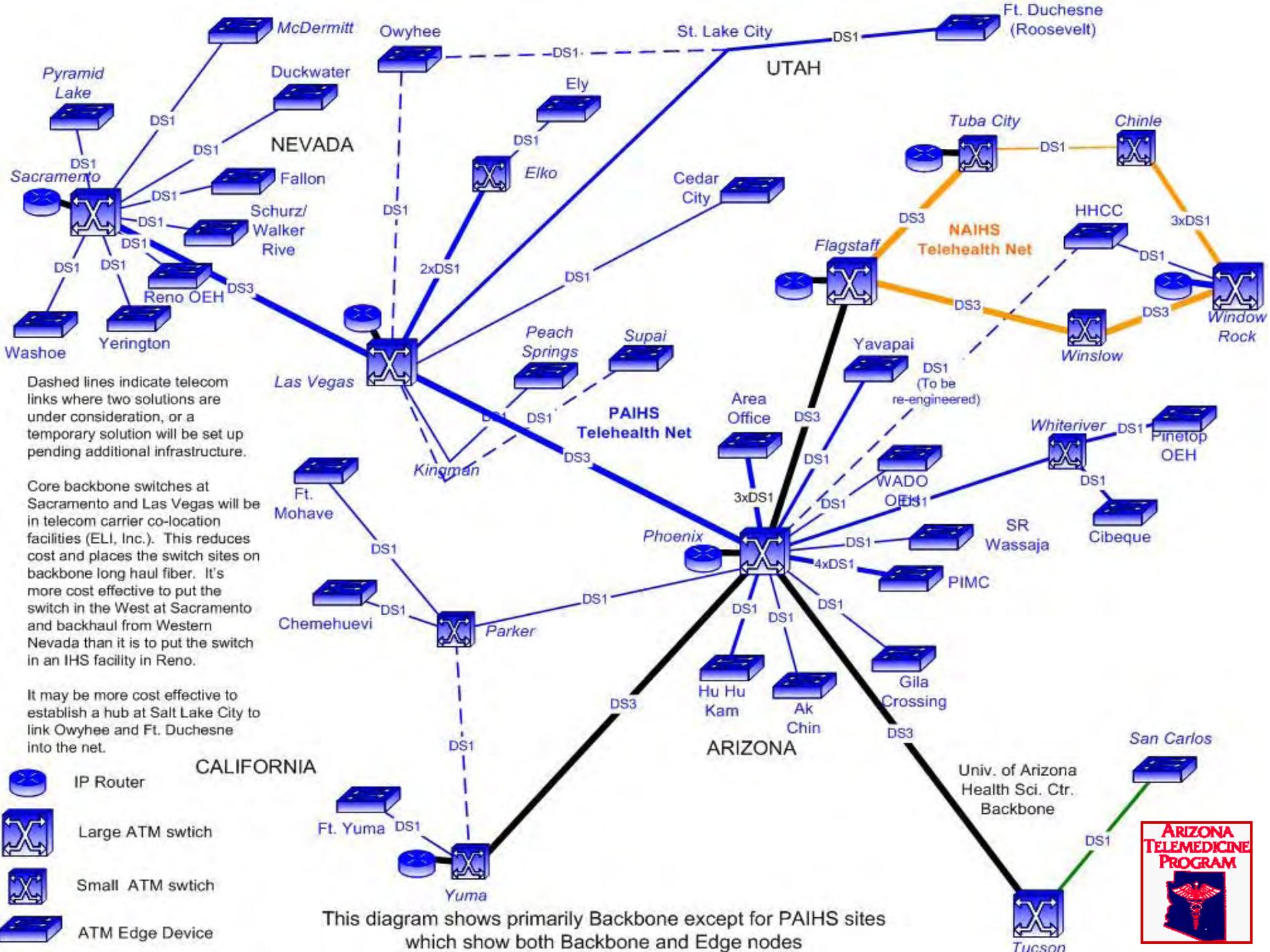




# Arizona Telemedicine Program

## 170+ Sites

- Native American Healthcare (Navajo, Apache, Hopi, and others)
- Prisons and their service providers
- Jails
- Non-IHS Rural Hospitals
- Community Health Centers
- Schools
- Distance Learning Affiliates
- International sites





## Action Items 1996

- Implement a regional telecommunications strategy for telehealth.
- Draft a comprehensive telehealth business plan.
- Establish a Telemedicine Training Program.
- Develop telemedicine standards for Arizona

# Business Plan

ARIZONA  
TELEMEDICINE  
PROGRAM



Application Service Provider Enterprise

**Client Layer**

**Professional Services Layer**

**Operations Services Layer**

**Infrastructure Services Layer**

**Vendor Services Layer**

***Membership based***

**\$\$\$**

**Arizona Telemedicine Reimbursement**

**AZ Department of Corrections**

**Fee-for-Service Providers**

**HMOs**

**Medicaid**

**Medicare**



## Action Items 1996

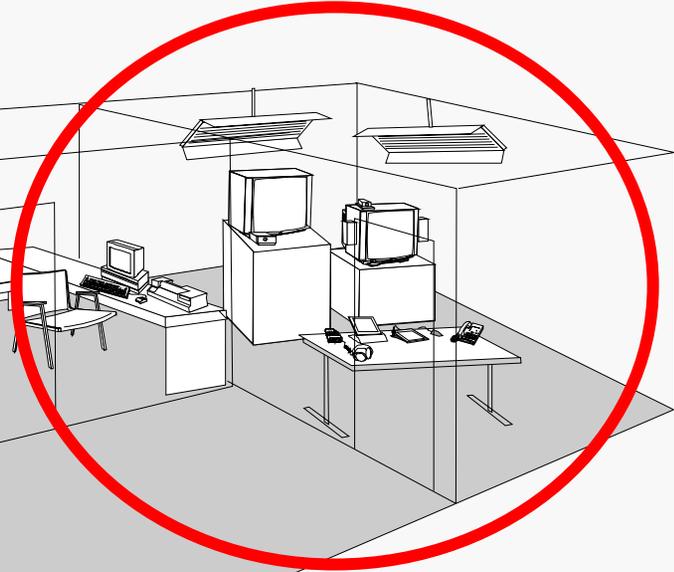
- Implement a regional telecommunications strategy for telehealth.
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- Develop telemedicine standards for Arizona

ARIZONA  
TELEMEDICINE  
PROGRAM



# Telemedicine Training Center

The University of Arizona Health Sciences Center  
Tucson, Arizona



**Rural site simulator**

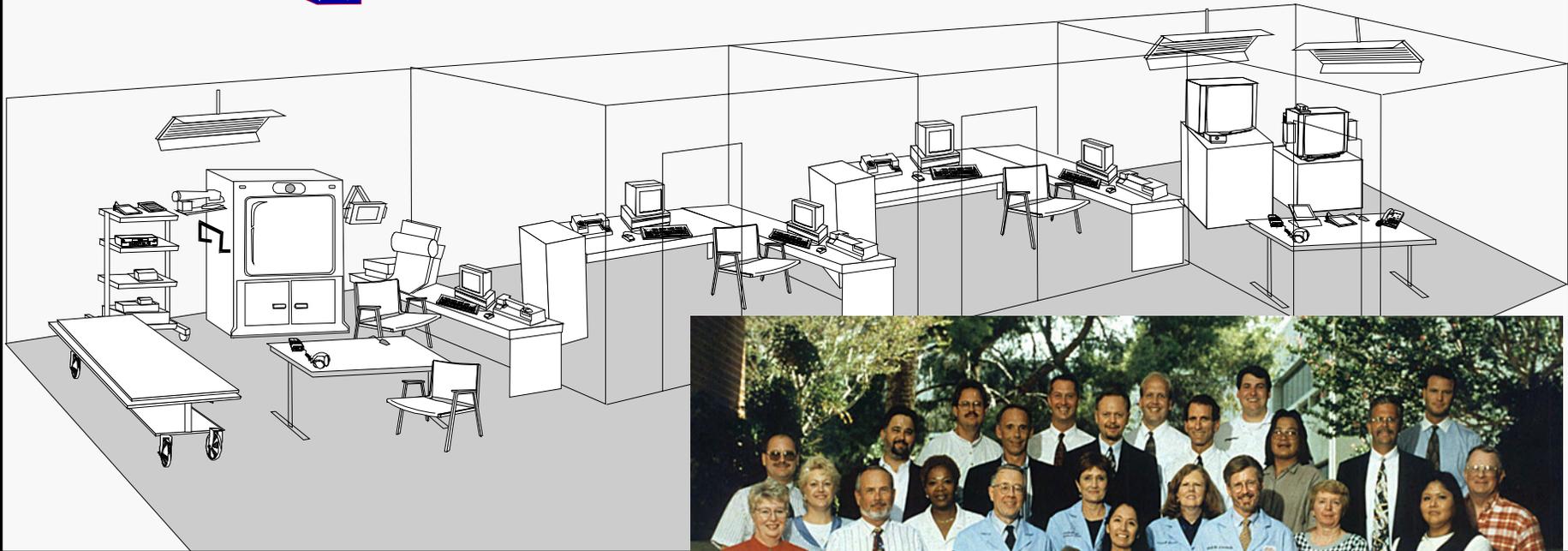
**Consultants  
module**

ARIZONA  
TELEMEDICINE  
PROGRAM



# Telemedicine Training Center

## The University of Arizona Health Sciences Center Tucson, Arizona



**Rural site simulator**

- Over 600 graduates
- 50+ Organizations





## Action Items 1996

- Implement a regional telecommunications strategy for telehealth.
- Draft a
- Establish
- Develop telemedicine standards for Arizona.

### Arizona Telemedicine Technology Assessment Center



## Action Items 1996

**Applications  
Clearing House**

- Facility Design
- Vendor Selection

**Standard Operating  
Procedures**

# Arizona Telemedicine Technology Assessment Center

**Clinical Practice Protocols**  
• Best Practice Guidelines

**Basic and Clinical Research**  
• Grants and Contracts

Color-corrected  
Fluorescent Tubes

Matte Blue  
Walls

Store & Forward Subsystem

Digitizers

Gen. Patient  
Exam/Derm.  
Camera

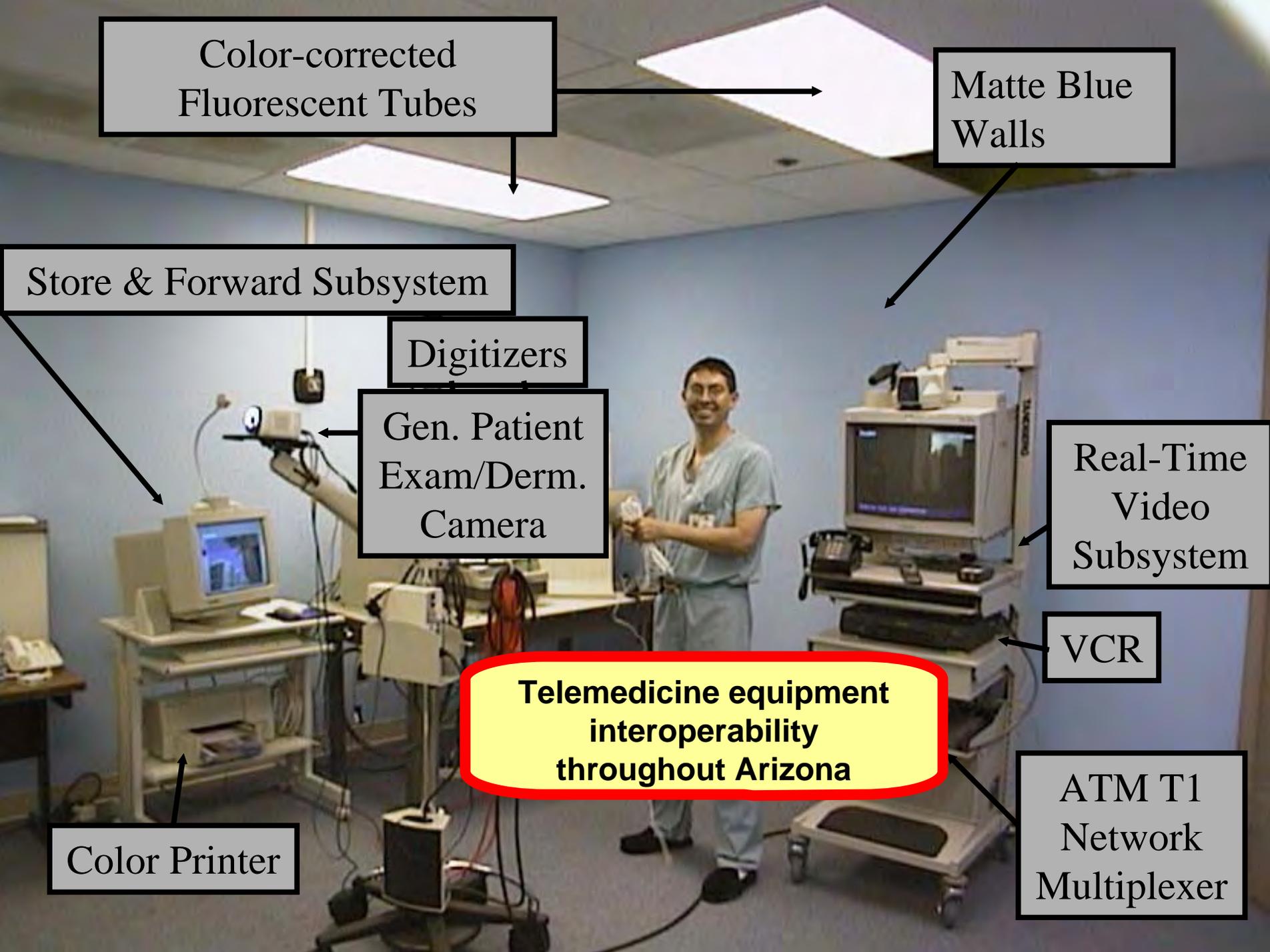
Real-Time  
Video  
Subsystem

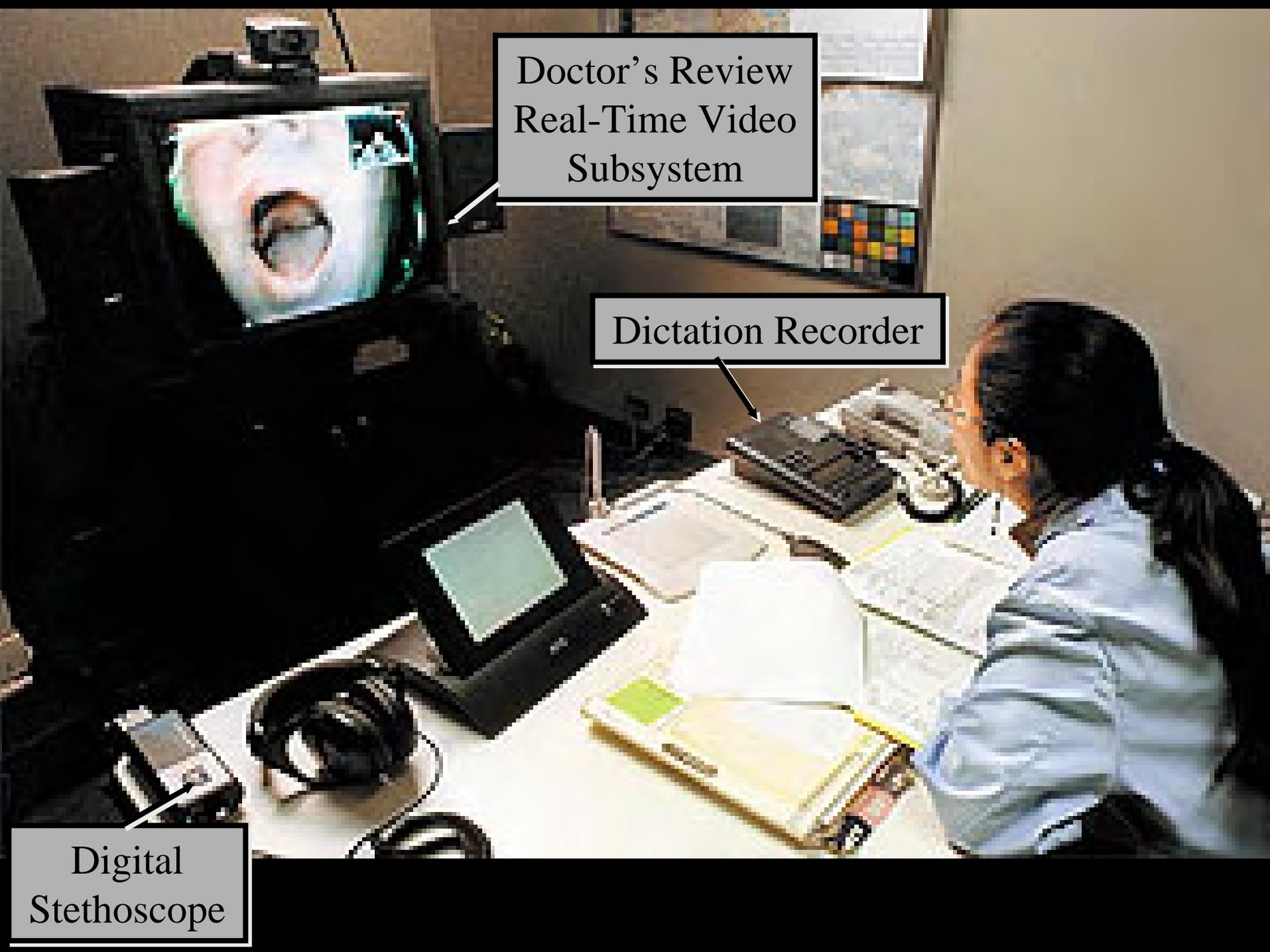
VCR

**Telemedicine equipment  
interoperability  
throughout Arizona**

ATM T1  
Network  
Multiplexer

Color Printer

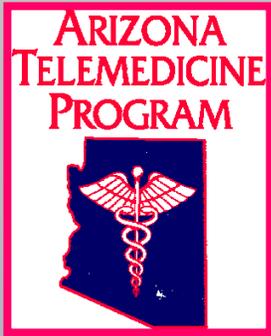




Doctor's Review  
Real-Time Video  
Subsystem

Dictation Recorder

Digital  
Stethoscope



# Arizona Telemedicine Program

- **Distance Education**

# Distance Education

<http://video.biocom.arizona.edu>

The screenshot shows the website for the University of Arizona Health Sciences Center's Biomedical Communications Streaming Video Server. At the top left is the university's logo. Below it, a banner reads "Biomedical Communications" and "Streaming Video Server". On the left, there are two options: "Live Video" with a camera icon and "Video Files" with a VHS tape icon. In the center, a RealPlayer window is open, displaying a video titled "Surgery Grand Rounds: New Approaches to Deafness" by Glen E. Green, MD. The RealPlayer interface includes standard playback controls and a status bar at the bottom showing "225.1 Kbps" and a timestamp of "00:07:0/15:28.6".



**15,000+ hours of CME/CE**

**Medicine, Surgery, Pediatrics, Psychiatry  
Nursing, Public Health, Informatics, etc.**

<http://video.biocom.arizona.edu>



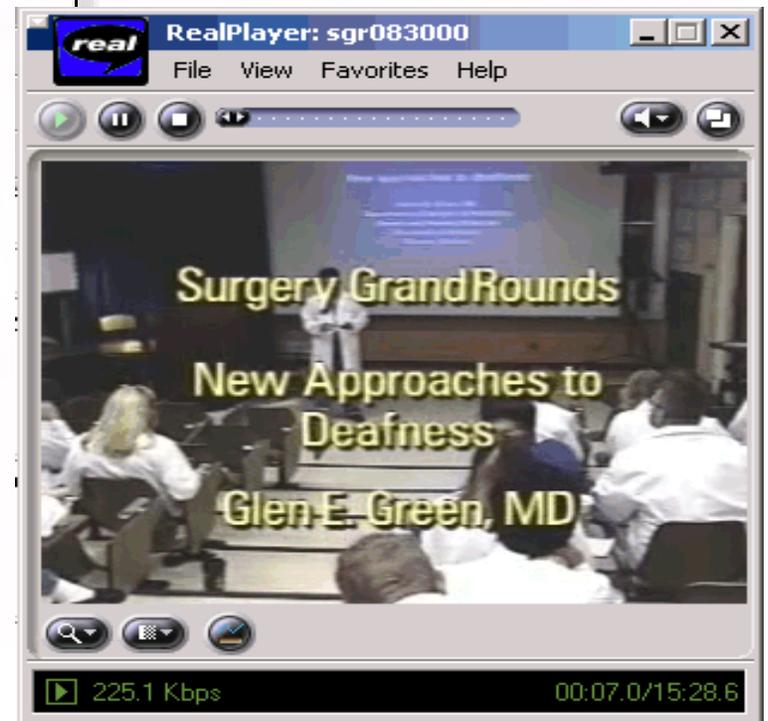
Biomedical Communications

Streaming Video Server

Live Video



Video Files

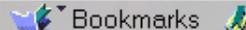




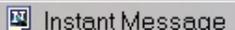
Back



Forward



Bookmarks



Instant Message

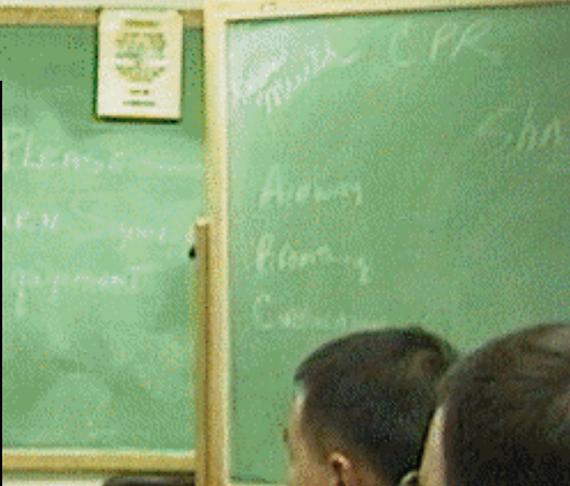
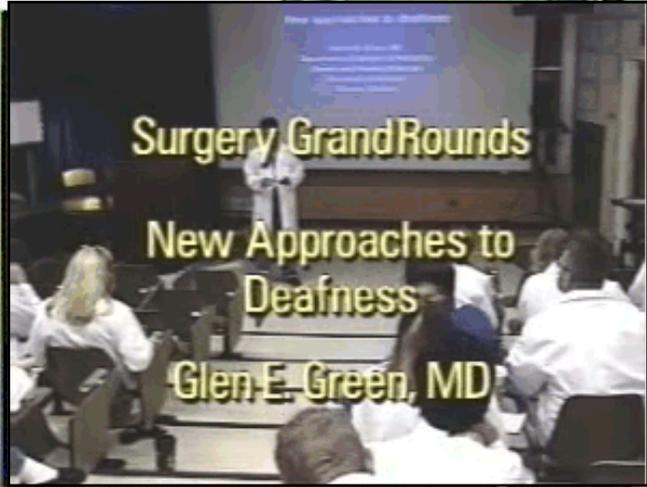
<http://aztel.arizona.edu/calendar>  
 username: atpguest password: atp123



related

<p><u>17</u></p> <p>7:30 a.m. - 8 a.m.  <u>Satellite Test Time: WRSU, SMH, SAMC</u></p> <p> <b>Satellite Programming</b>        8 a.m. - 12 p.m.  <u>Cultural Aspects of Death and Dying Speaker: Cheryl Mallernee McGaffic, PhD, RN, CCRN</u></p> <p>12 p.m. - 12:30 p.m.  <u>SGR Test Time: SAMC, WRSU, PRMC, MCHC</u></p> <p> <b>Surgery Grand Rounds</b>        12:30 p.m. - 1:30 p.m.</p>	<p><u>18</u></p> <p>10:45 a.m. - 11:15 a.m.  <u>Cardio Test Time: TCIMC, ADCPXC, ASPCEYM, ASPCDOU, ASPCFLO, ASPCYUM, SAMC</u></p> <p>10:45 a.m. - 11:15 a.m.  <u>Cardio Test Time: TCIMC, SMG</u></p> <p> <b>Cardiology Grand Rounds</b>        11:15 a.m. - 12:15 p.m.</p> <p>11:15 a.m. - 12:15 p.m.  <u>Cardiology Lecture Series (IHS Sites Only)</u></p>	<p><u>19</u></p> <p>11:30 a.m. - 12 p.m.  <u>MGR Test Time: ADCPX, ASPCEYM, ASPCFLO, ASPCYUM, ASPCDOU, SAMC, WRSU, PRMC</u></p> <p> <b>Medicine Grand Rounds</b>        12 p.m. - 1 p.m.  <u>Clinicopathological Conference</u></p> <p>3:30 p.m. - 4 p.m.  <u>Psych GR - Test Time - NARBHA, SAMC, TCIMC</u></p> <p> <b>Psychiatry Grand Rounds</b>        4 p.m. - 5:30 p.m.</p>	<p><u>20</u></p> <p>11:30 a.m. - 12 p.m.  <u>PHGR Test Time:</u></p> <p> <b>Public Health Grand Rounds</b>        12 p.m. - 1 p.m.</p>	<p><u>21</u></p>
<p><u>24</u></p> <p>11:30 a.m. - 12 p.m.  <u>SGR Test Time: SAMC, WRSU, PRMC, MCHC</u></p> <p> <b>Surgery Grand Rounds</b>        12 p.m. - 1 p.m.</p>	<p><u>25</u></p> <p>12 p.m. - 12:30 p.m.  <u>Peds GR Test Time:</u></p> <p> <b>Pediatric Grand Rounds</b>        12:30 p.m. - 1:30 p.m.</p>	<p><u>26</u></p> <p>11:30 a.m. - 12 p.m.  <u>MGR Test Time: ADCPX, ASPCEYM, ASPCFLO, ASPCYUM, ASPCDOU, SAMC, WRSU, PRMC</u></p> <p> <b>Medicine Grand Rounds</b>        12 p.m. - 1 p.m.</p>	<p><u>27</u></p>	<p><u>28</u></p>





# Arizona State-wide Diabetes Round Tables



# Nogales, AZ (Hispanic) – Tuba City, AZ (Navajo)

## *Middle School Diabetes Plays*



**Nogales, AZ (Hispanic) – Tuba City, AZ (Navajo)**  
*Middle School Diabetes Plays*





# Arizona Telemedicine Program

- **Distance Education**
- **Telehealth Services**

# Teleradiology



Over 400,000 cases to date

# Ultra-rapid Digital Mammography



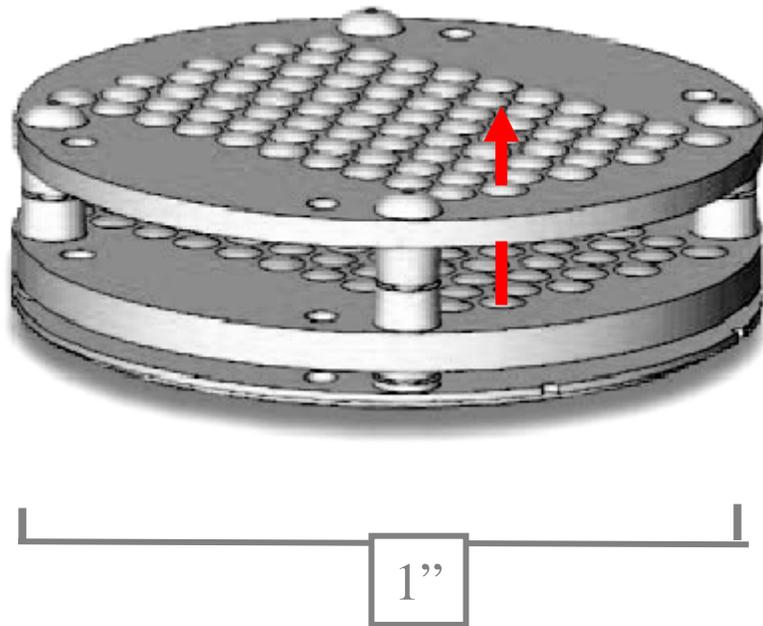
## Ultrarapid Digital Mammography

6,700 cases

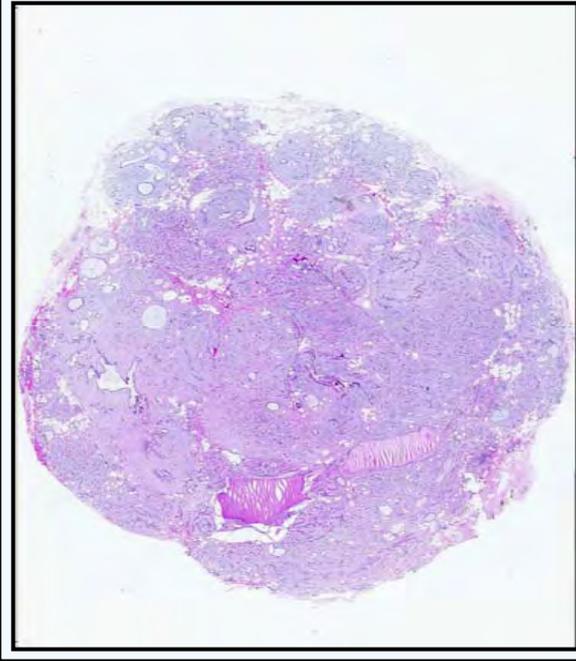
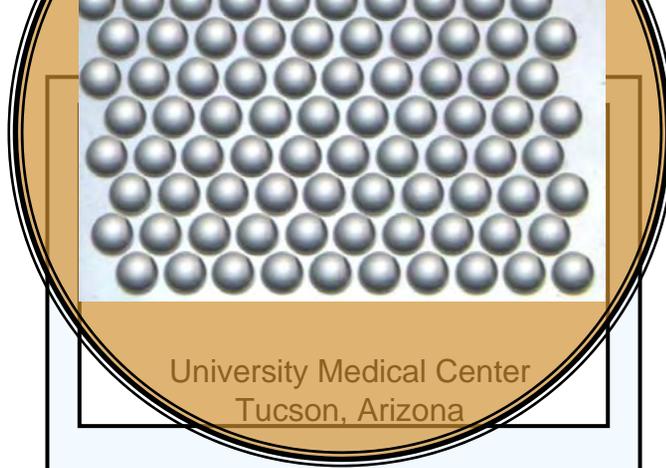
45 minute TAT - 75% of cases

90 minute TAT - 100% of cases

# Telepathology *Ultrarapid Virtual Slide Processor*



Reinvention of Light Microscopy





Click on picture

NBC Tucson, AZ UltraClinics®

# Telepsychiatry



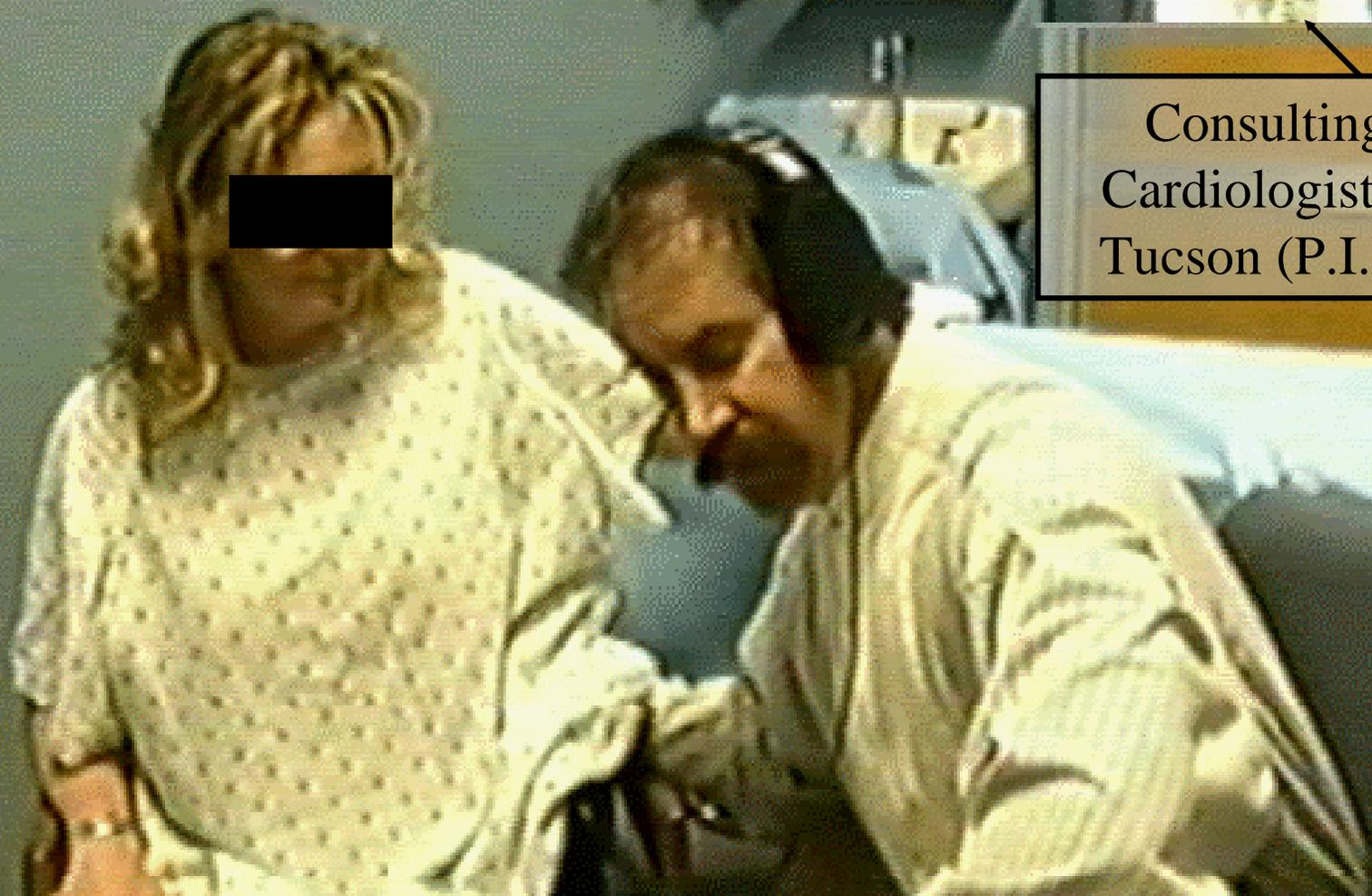


**Teledermatology**

# Telecardiology



Consulting  
Cardiologist in  
Tucson (P.I.P.)



# TeleTrauma/TeleEmergency Medicine



# Home TeleHealth Nursing



# Home Tele-Health

Gilbert, AZ



Transplant patient  
waiting for a donor

Tucson, AZ



Transplant surgeon  
checking left-sided  
assist device

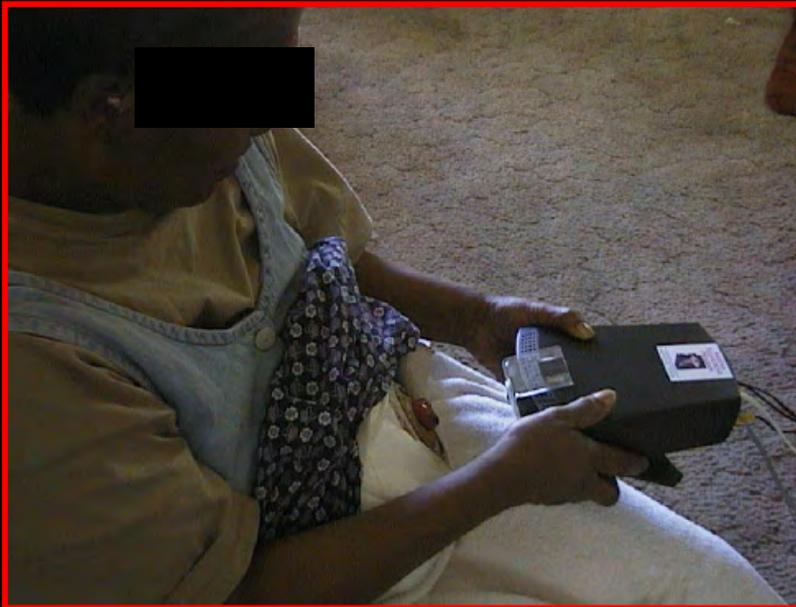
# Home Health - Ostomy Care



Colostomy



Urostomy



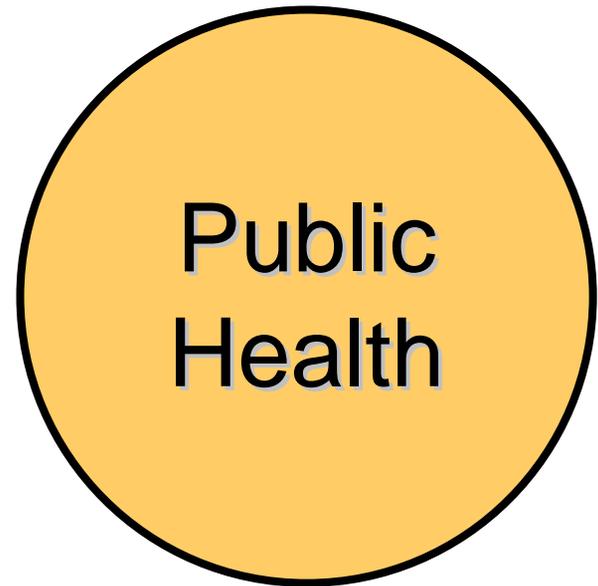
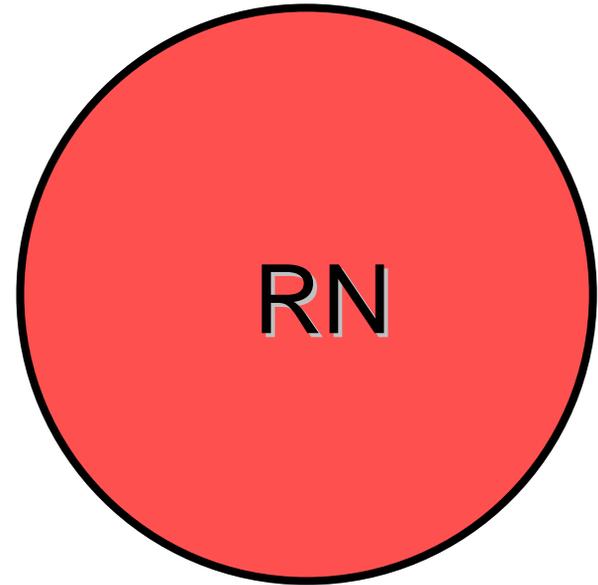
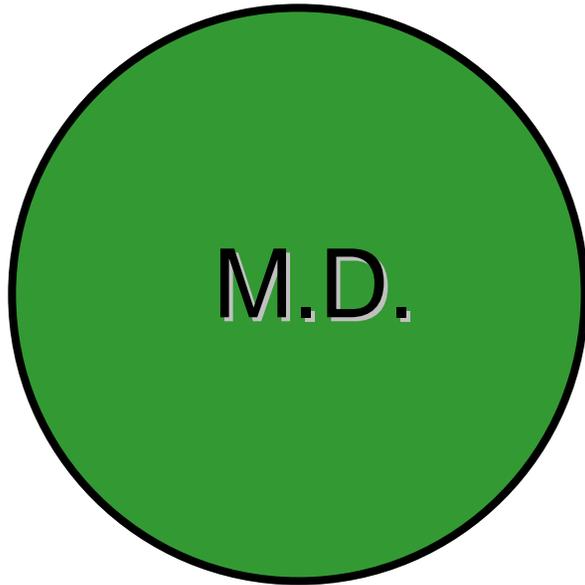
# Health Professions Curriculum (1900 -present )

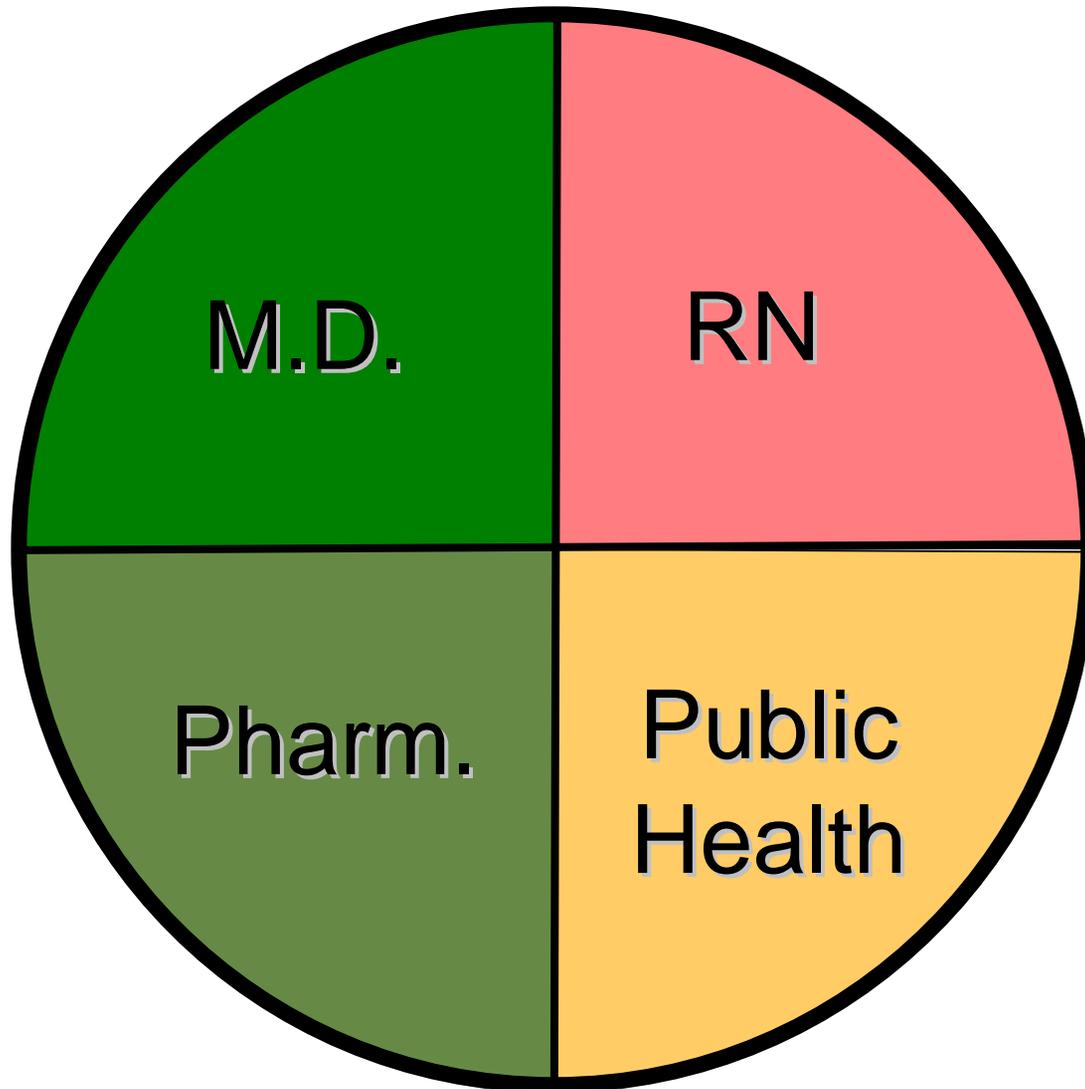
M.D.

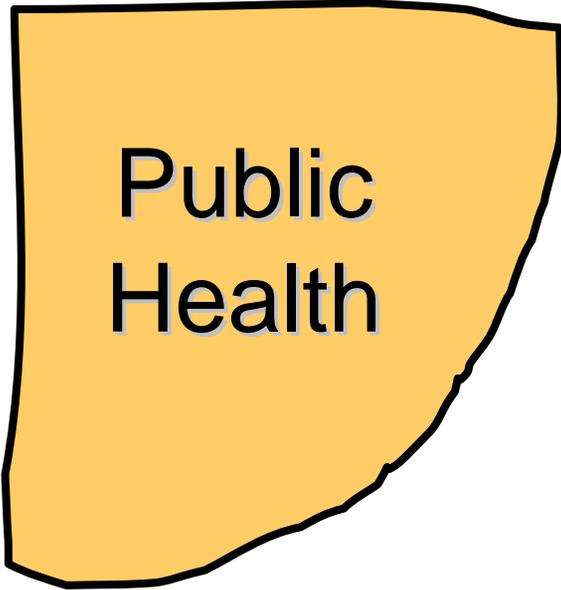
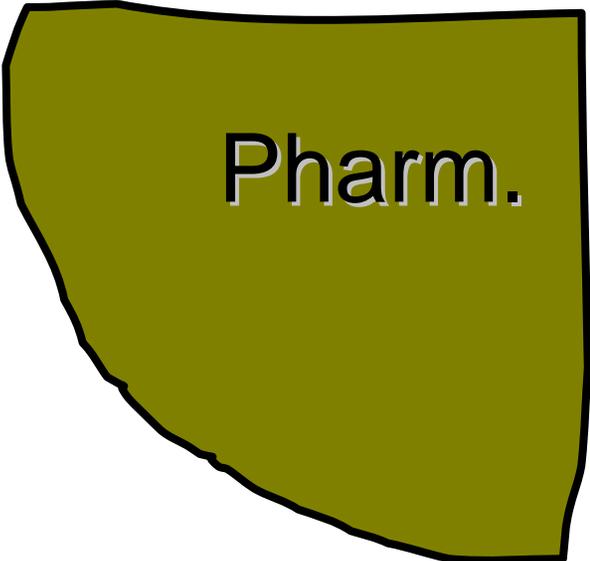
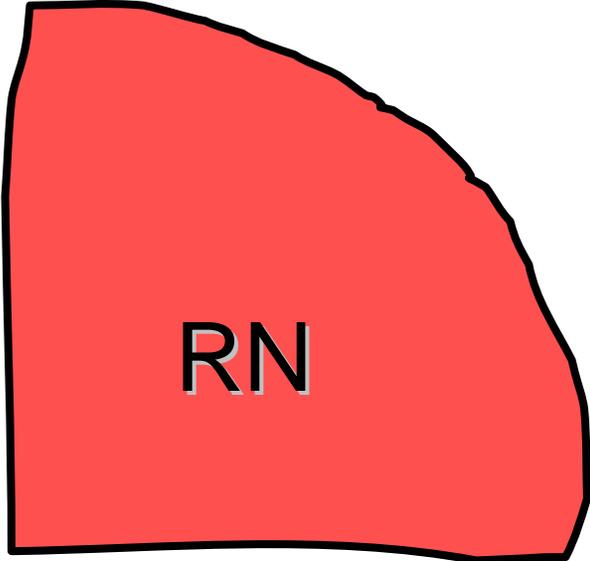
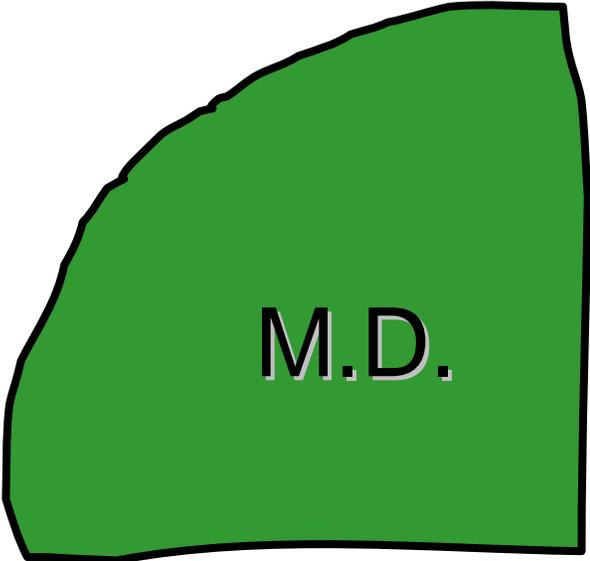
RN

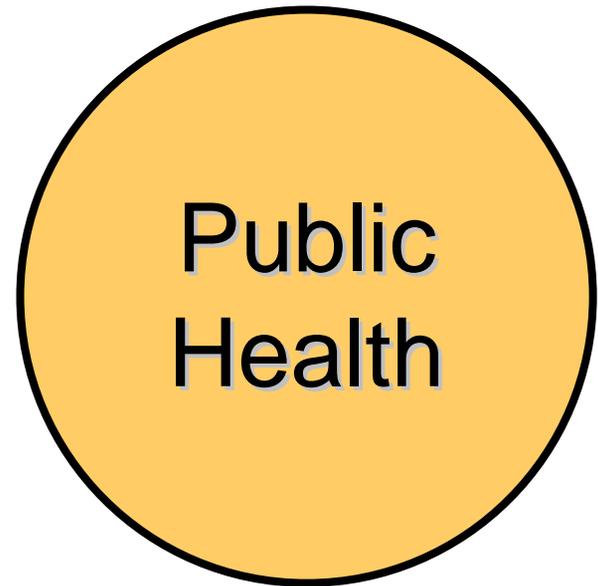
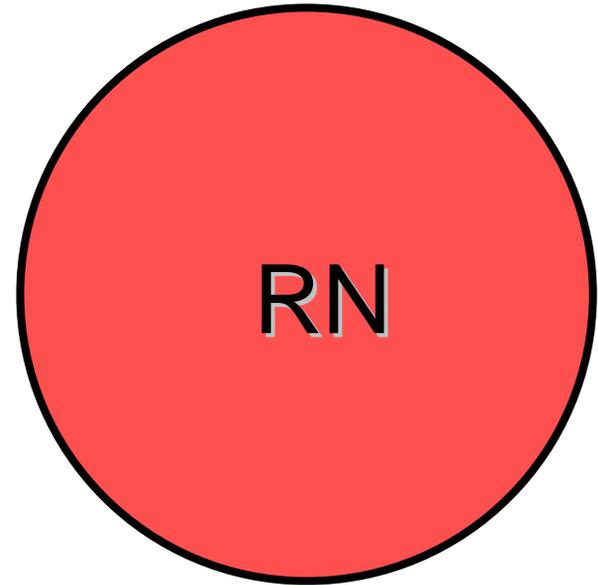
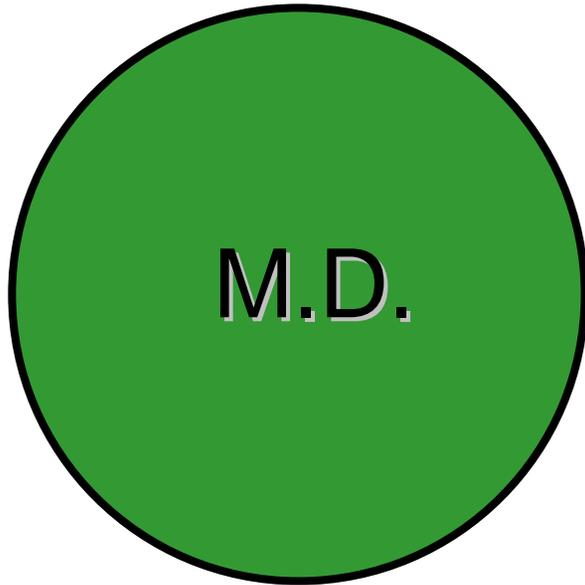
Pharm.

Public  
Health









INSTITUTE OF MEDICINE



# CROSSING THE QUALITY CHASM

*A New Health System for the 21st Century*

2001

# IOM Report

## *Crossing the Quality Chasm*

“If substantial improvement is to be achieved over the next decade, **INFORMATICS** must play a central role in the redesign of the health system.”

# IOM report - Informatics

## 3 main domains

1. Communication (email, telemedicine)
2. Knowledge management (electronic medical record, databases)
3. Decision support (expert information systems)

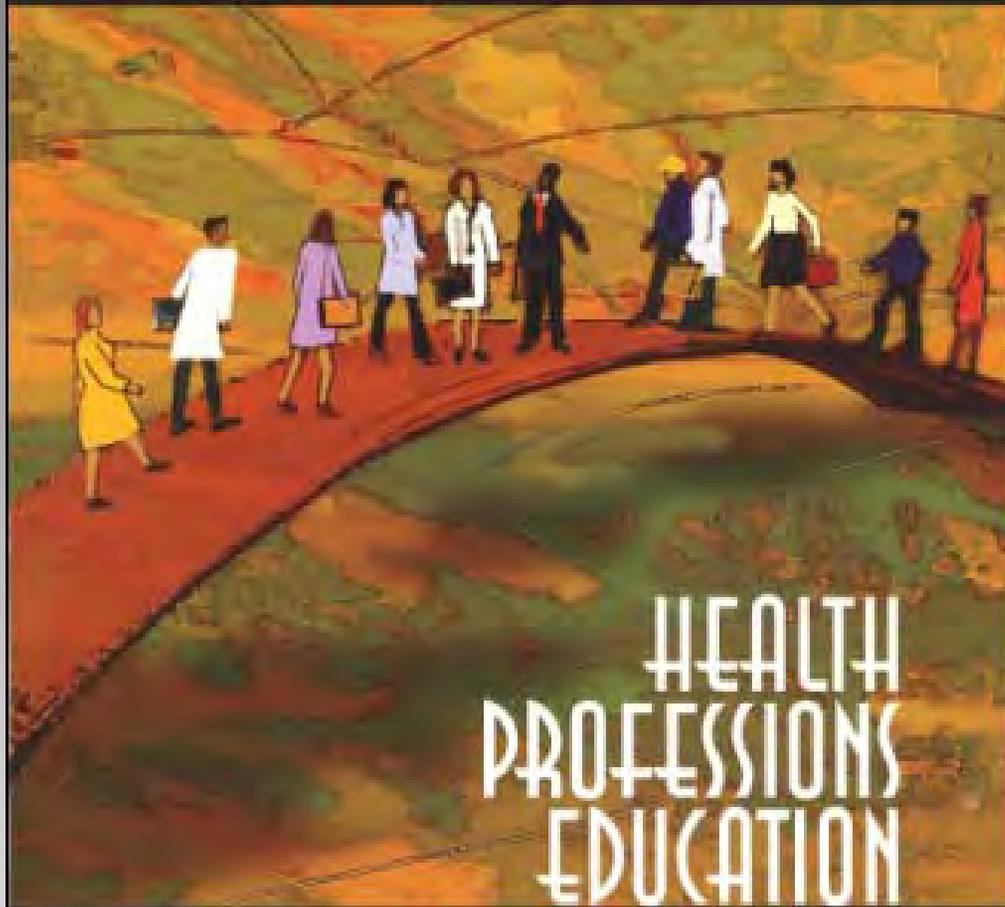
# IOM report - Informatics

## *1. Communication (email, telemedicine)*

*Inter-professional Team Training*

*(doctors, nurses, pharmacists, allied health, etc)*

QUALITY CHASM SERIES



# HEALTH PROFESSIONS EDUCATION

A BRIDGE TO QUALITY

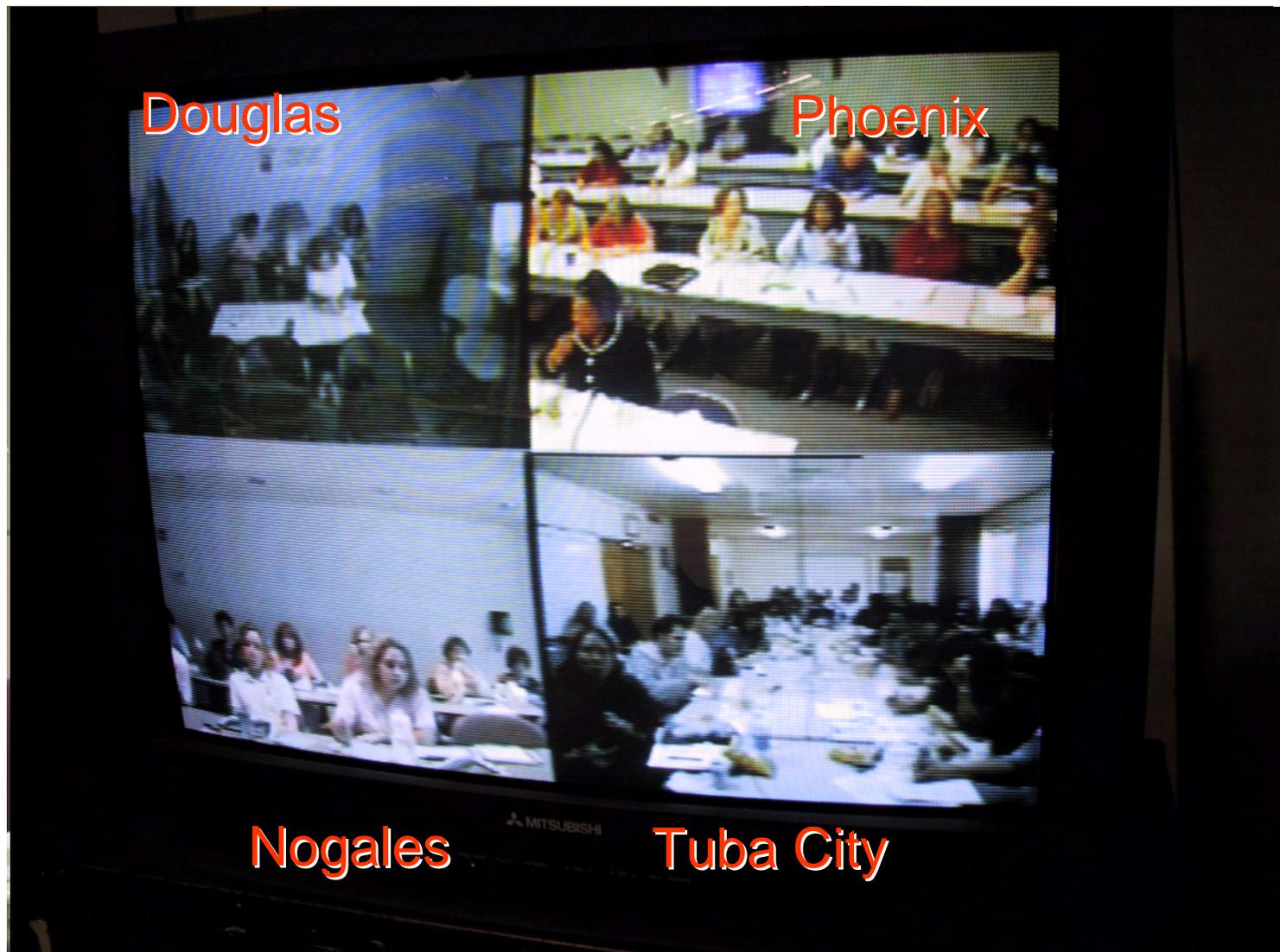
INSTITUTE OF MEDICINE  
OF THE NATIONAL ACADEMIES

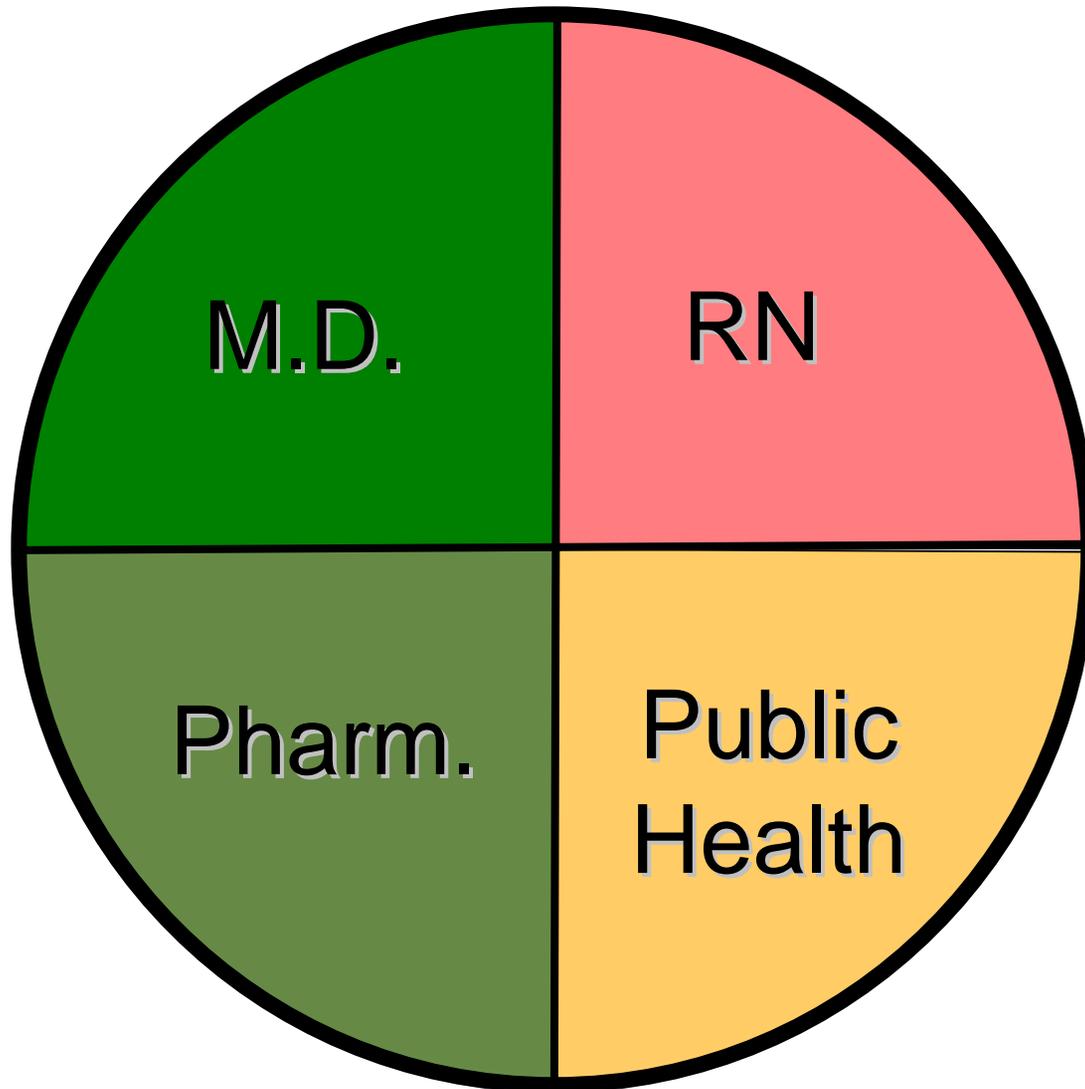
2003

# Arizona State-wide Diabetes Round Tables



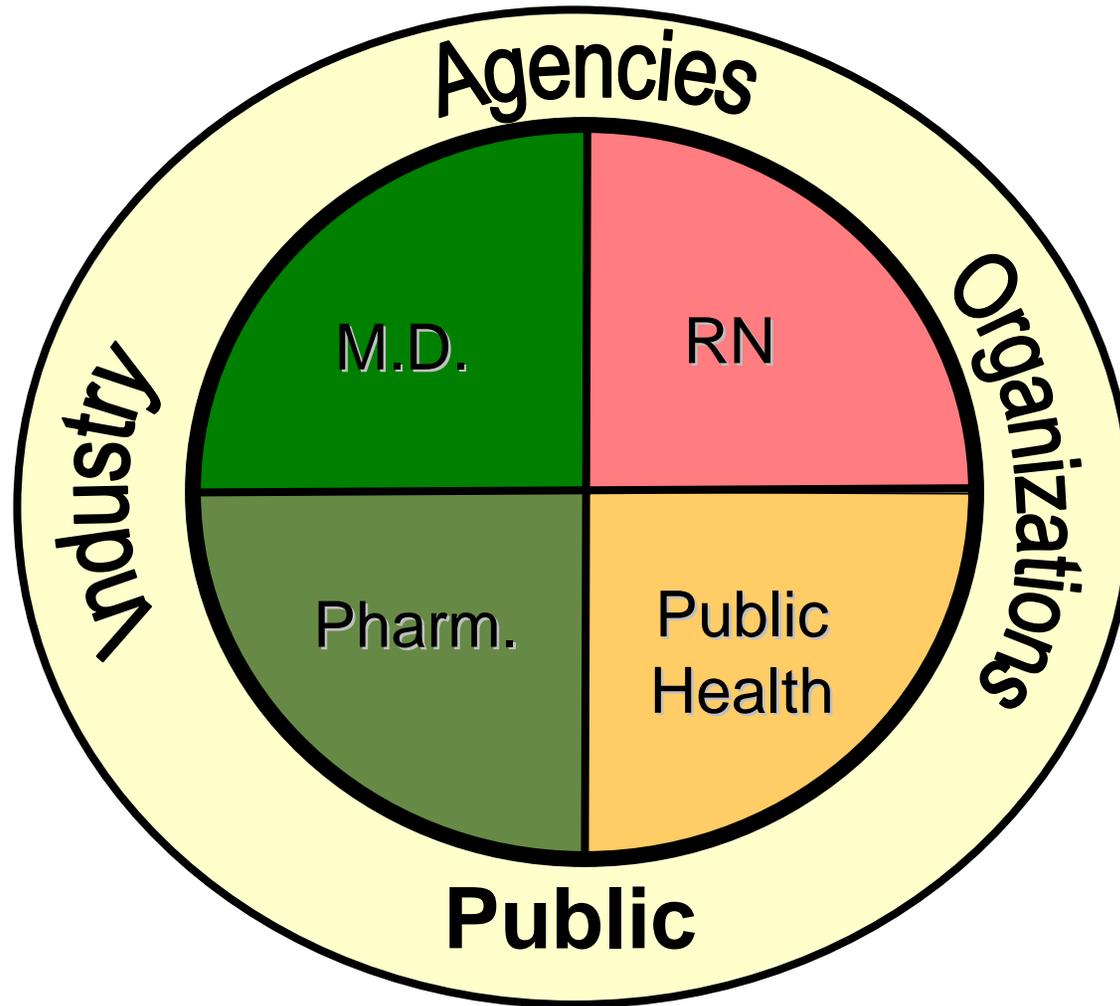
# Arizona State-wide Diabetes Round Tables





# “Institute of Medicine-Plus”

*An Arizona Experimental Curriculum  
in Multidisciplinary Education*



THE UNIVERSITY OF  
**ARIZONA**®  
COLLEGE OF MEDICINE-*PHOENIX*

THE UNIVERSITY OF  
**ARIZONA**<sup>®</sup>  
COLLEGE OF MEDICINE-PHOENIX



Van Buren Street



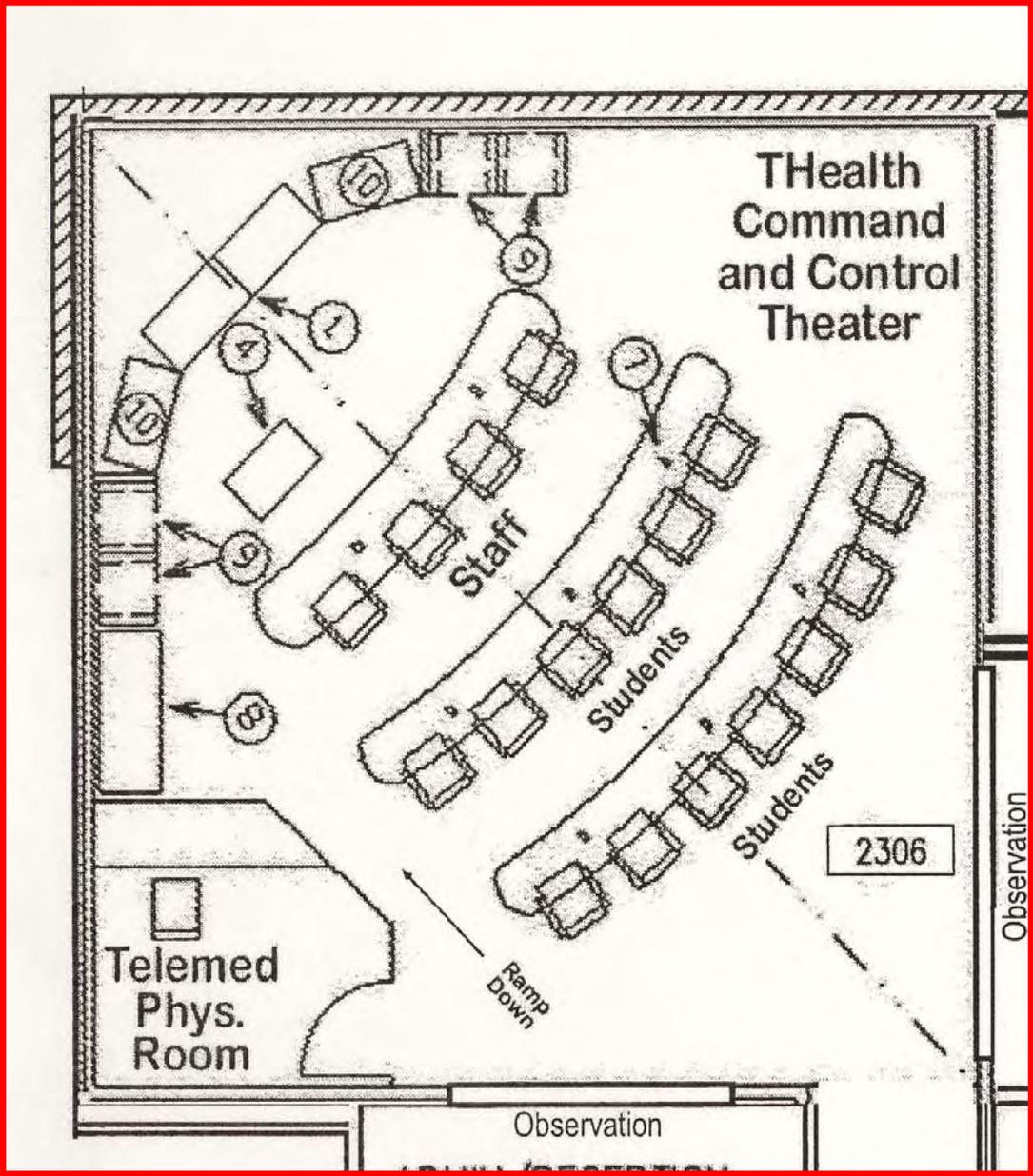
Institute for Advanced Telemedicine and Telehealth  
(T-Health Institute)

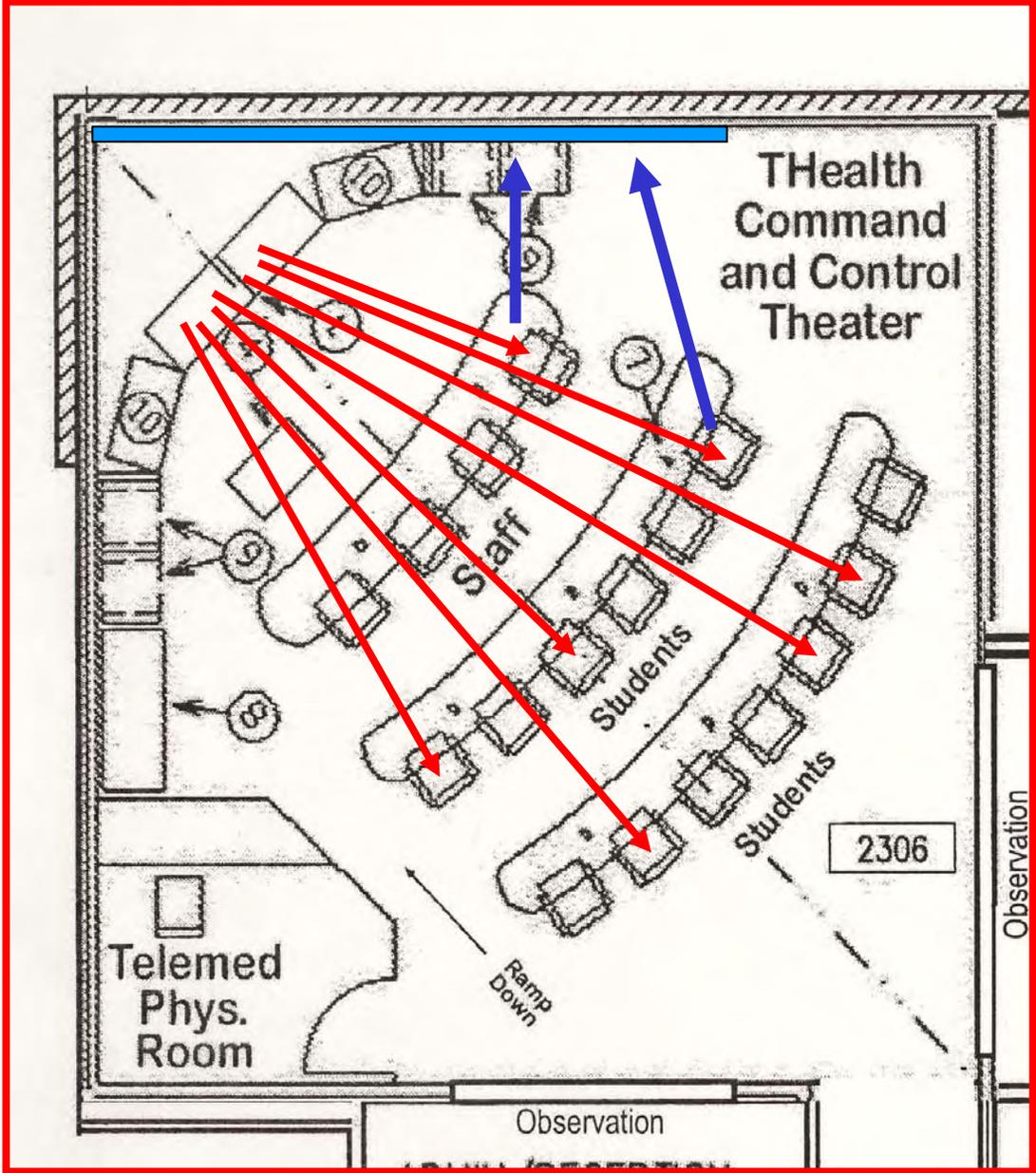
**ARIZONA  
TELEMEDICINE  
PROGRAM**



# T-Health Command and Control Amphitheater



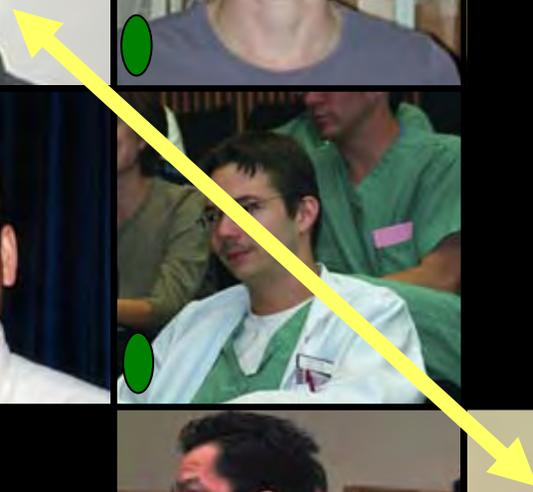




Group #1  
medical students



Group #2  
nursing students

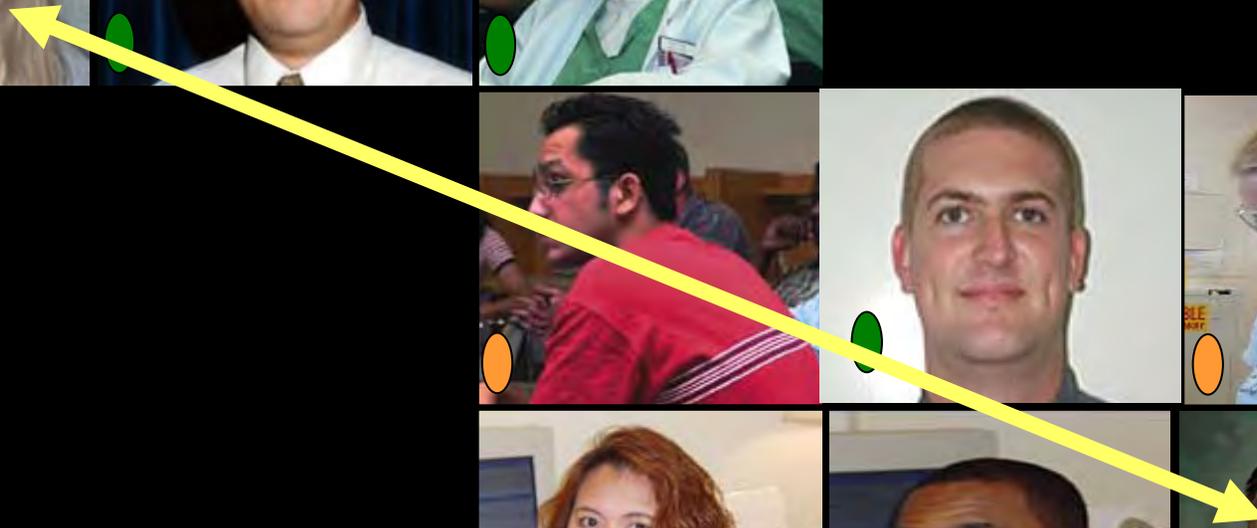




Group #3



Group #4





Group #5



Group #6



# State-wide concurrent activities monitored at the Arizona Telemedicine Program

**Nogales**



**Tucson**



**Tuba City**



**Whiteriver**



**Nogales**



**Tucson**



**Tuba City**



**Whiteriver**



# Diabetes Education Program

**Nogales**



**Tucson**



**Tuba City**



**Whiteriver**





**Nogales**



**Tucson**



**Tuba City**



**Whiteriver**



**Nogales**



**Tucson**



**Tuba City**



**Whiteriver**





**Nogales**



**Tucson**



**Tuba City**



**Whiteriver**



**Nogales**



**Tucson**



**Tuba City**



**Whiteriver**



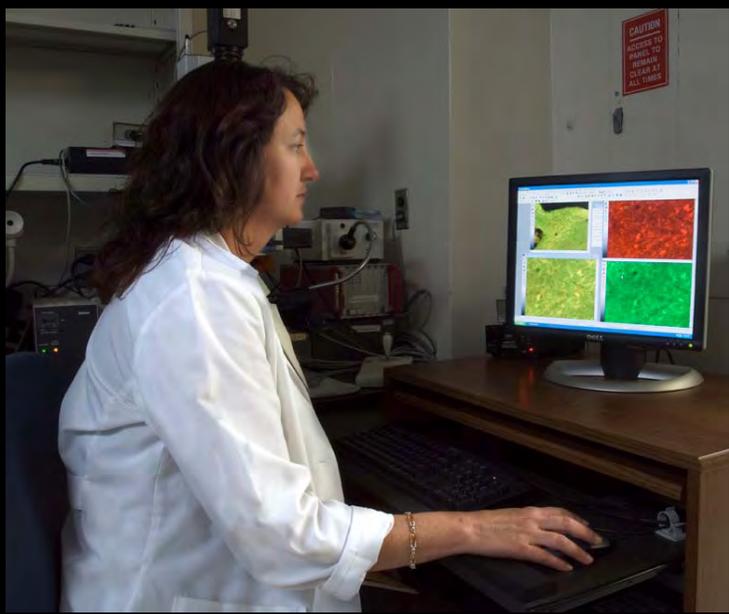


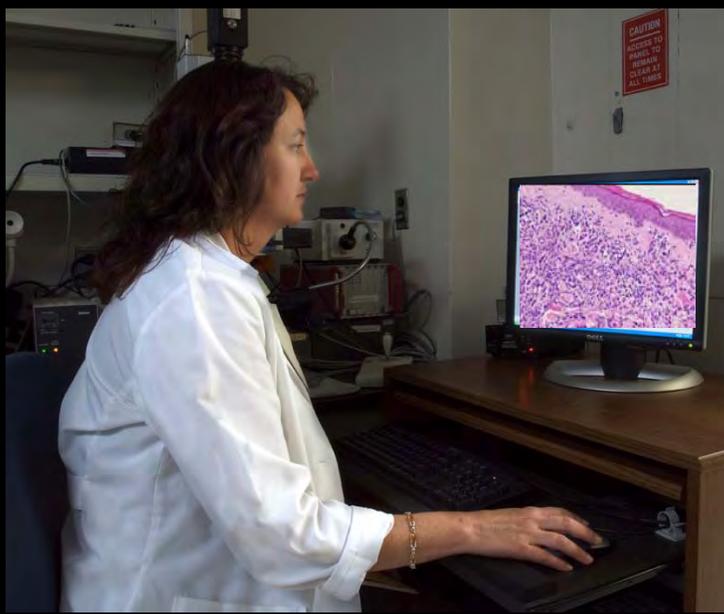
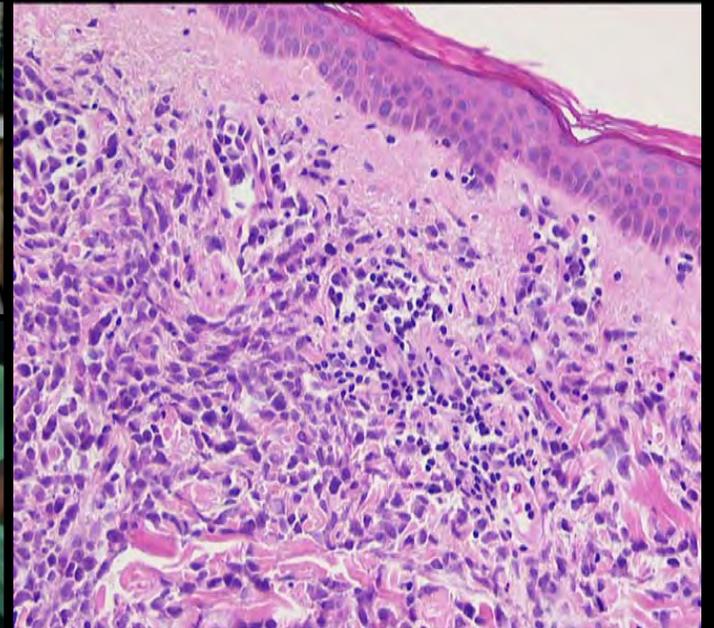


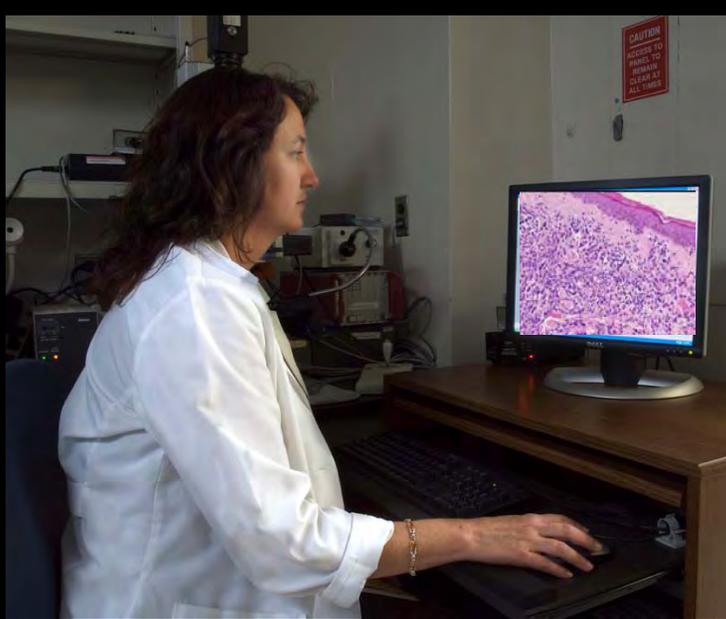
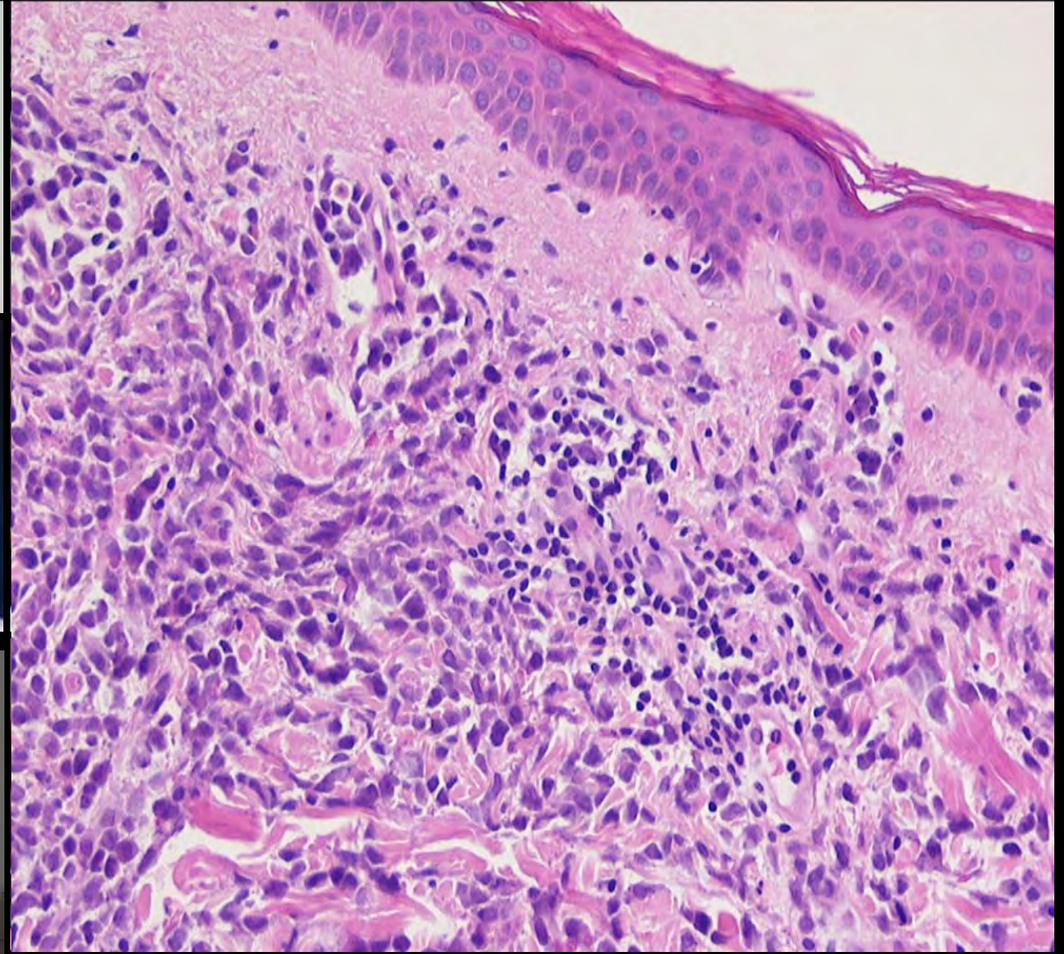










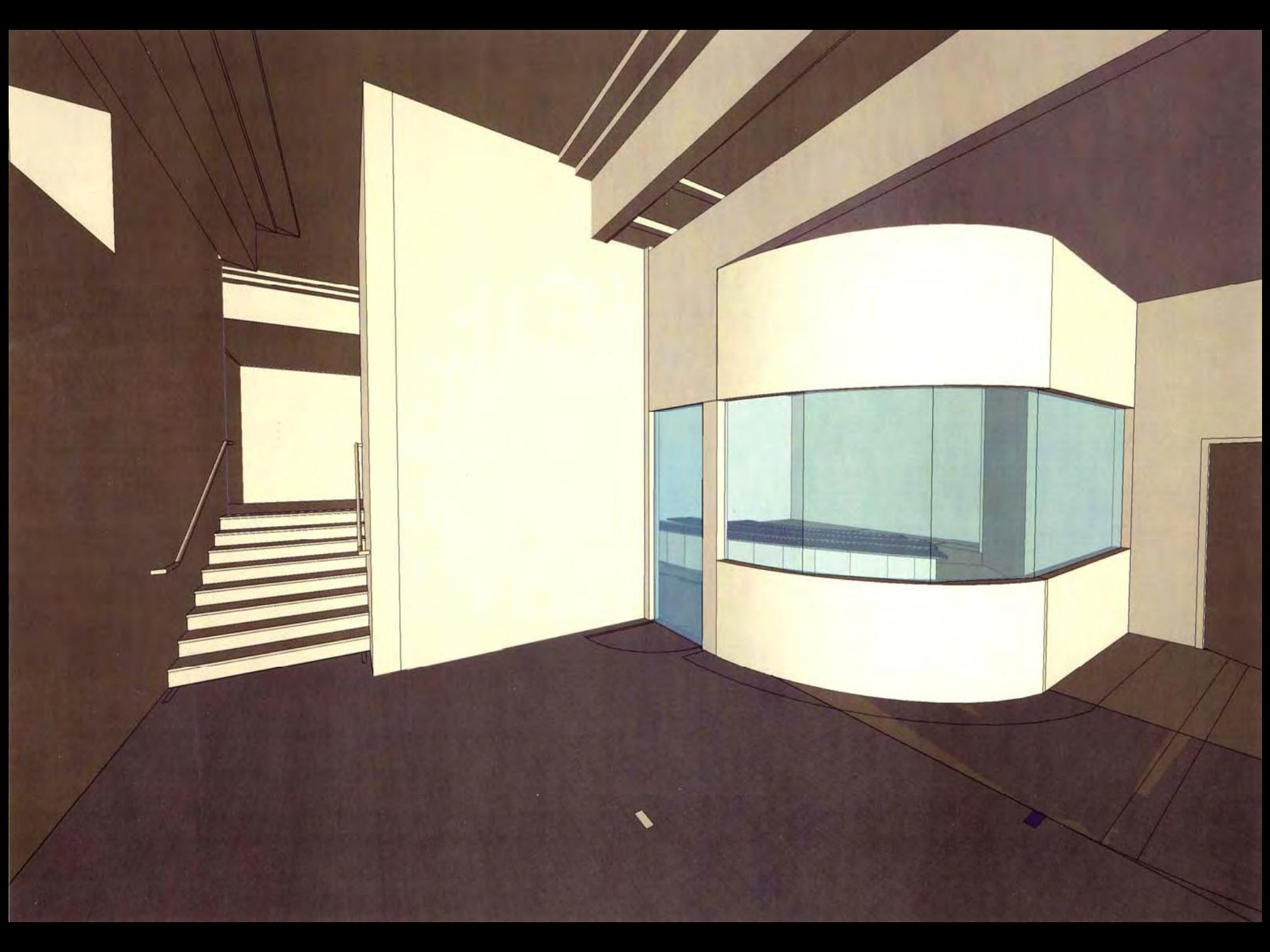


**Arizona Telemedicine Program**  
*Interprofessional Learning Center*



Phoenix, Arizona







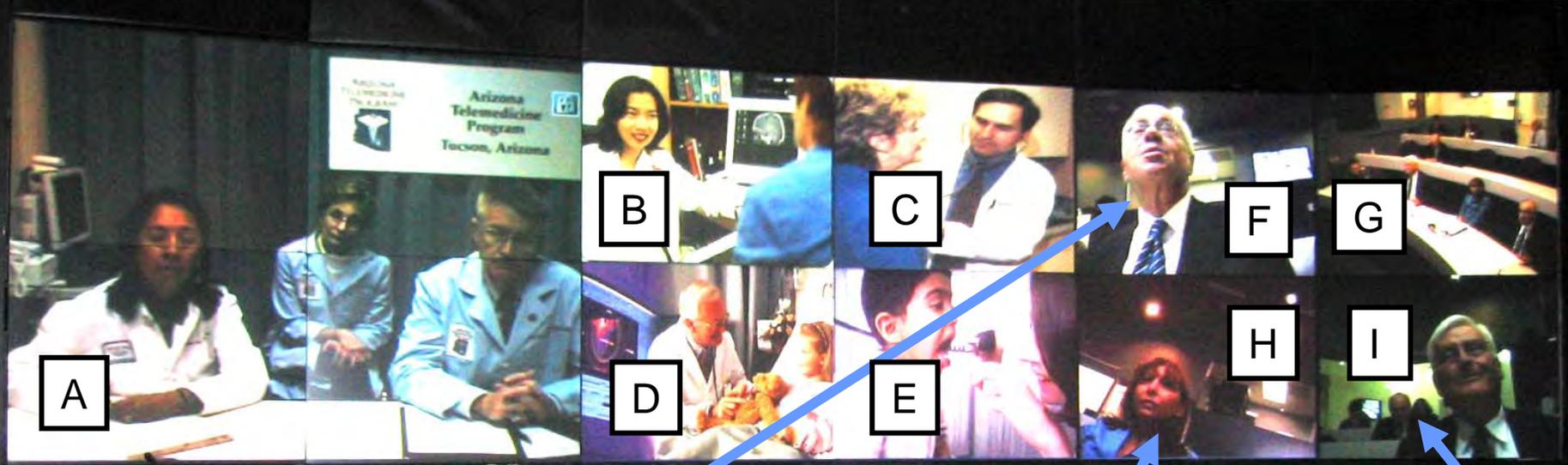
2306  
2315

Private Studio





T-Health Amphitheater



A

B

C

F

G

D

E

H

I

100+ Video Feeds

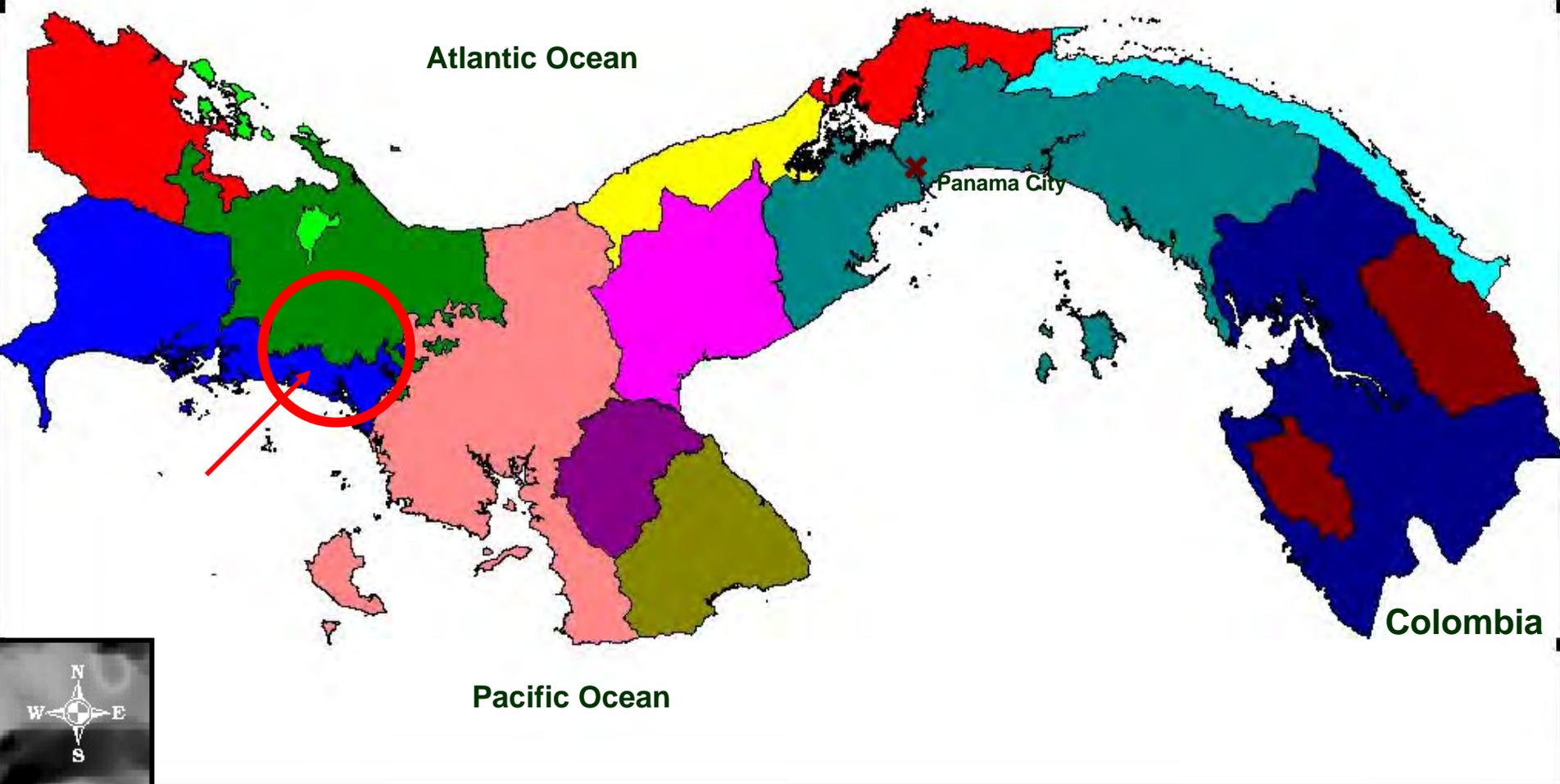
# Video Input Device Testing Program



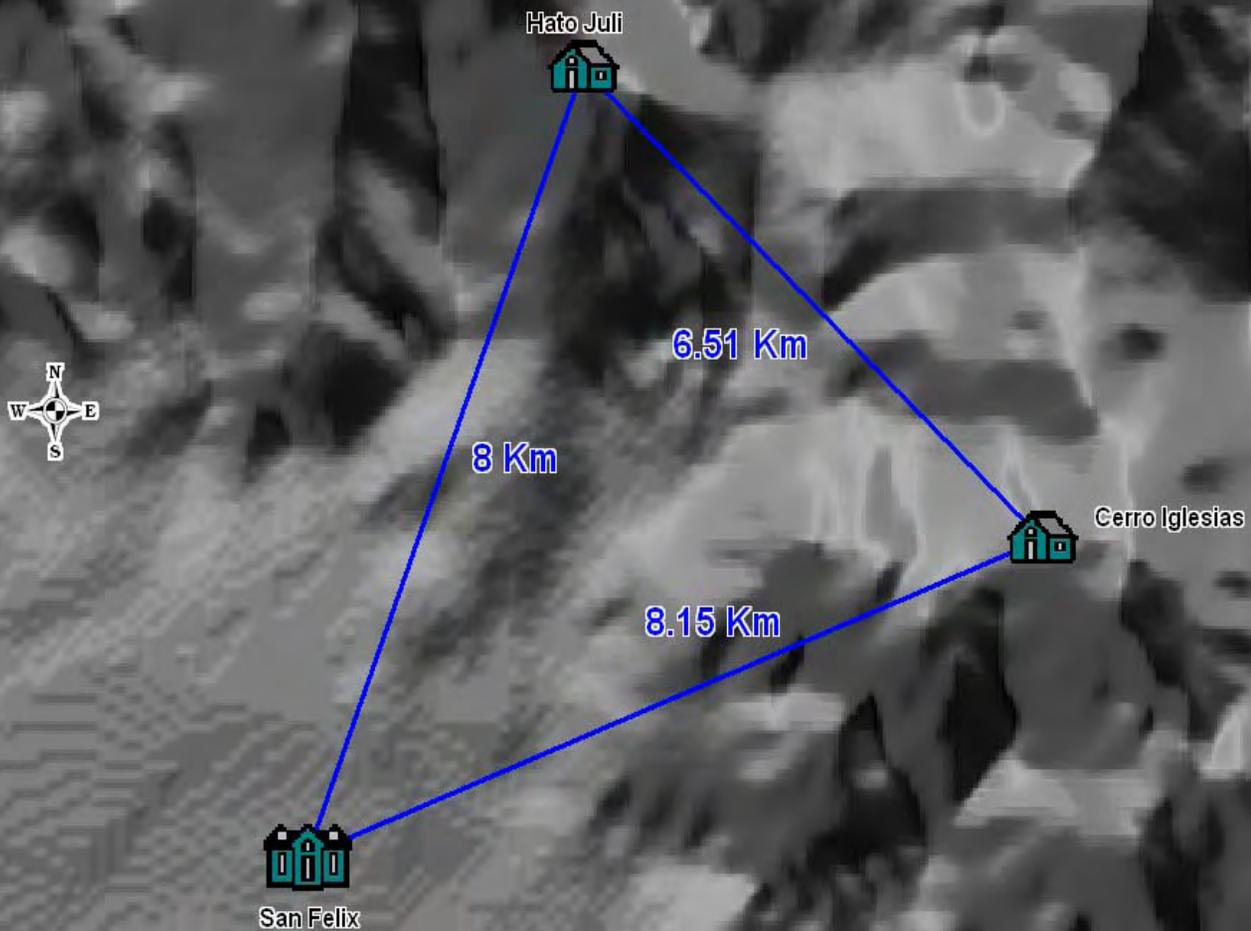
US Department of Defense Initiatives

# Rural Telemedicine

## U.S. Army/Arizona Telemedicine Program



# TELEMEDICINE SITES IN NGOBE BUGLE AREAS





# REMOTE SITES

## Puesto de Salud de Cerro Iglesias:

- Located 8.15 Kms from consulting site.
- No doctor nor nurse .
- The attention is offered by nurses assistants or health assistants (all of them are part of the indian community).
- Services as electricity or phone are not available.
- Population: aprox. 3,364





**Cerro Iglesias**



**San Felix Rural Hospital**



ARIZONA  
TELEMEDICINE  
PROGRAM



Program Description

Publications

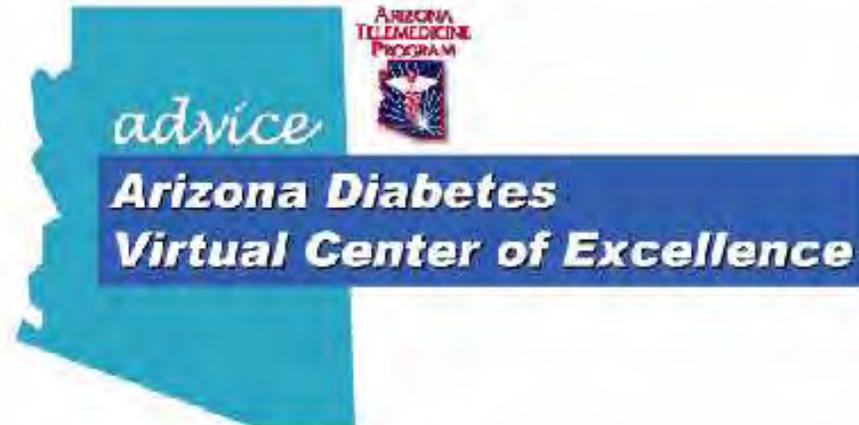
Affiliated Programs

Related Web Resources

Arizona Health Sciences Center

The University of Arizona

HOME



The Arizona Diabetes Virtual Center of Excellence (ADVICE) is a comprehensive program for diabetes prevention, assessment, and management utilizing the Arizona Telemedicine Program Network.

ADVICE is partially supported by the Office for the Advancement of Telehealth (OAT), Department of Health and Human Services, Health Resources and Services Administration (HRSA).

[Arizona Diabetes Roundtable](#) 

[| Description](#) | [Goals](#) | [Web Links](#) |



# Involving Students from University of Arizona Colleges of Medicine, Nursing, Pharmacy, Public Health



**Rural Physician: Douglas**



**College of Medicine Rural  
Preceptor Trainers: Tucson**

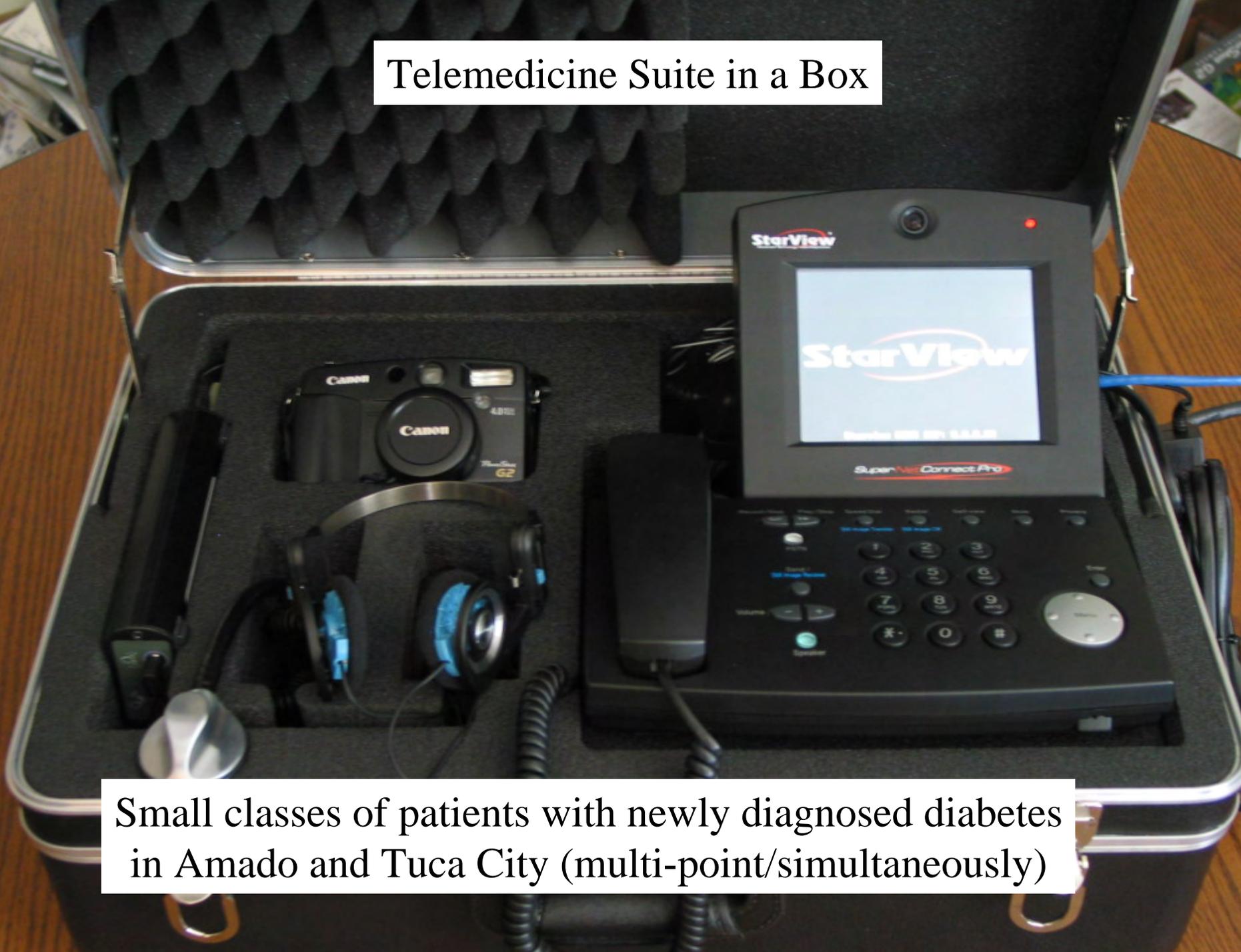
# Diabetes Case Conferences via Telemedicine



**Mariposa Community Health Center  
Nogales, AZ**

**St. Elizabeth of Hungary Clinic  
Tucson, AZ**

## Telemedicine Suite in a Box



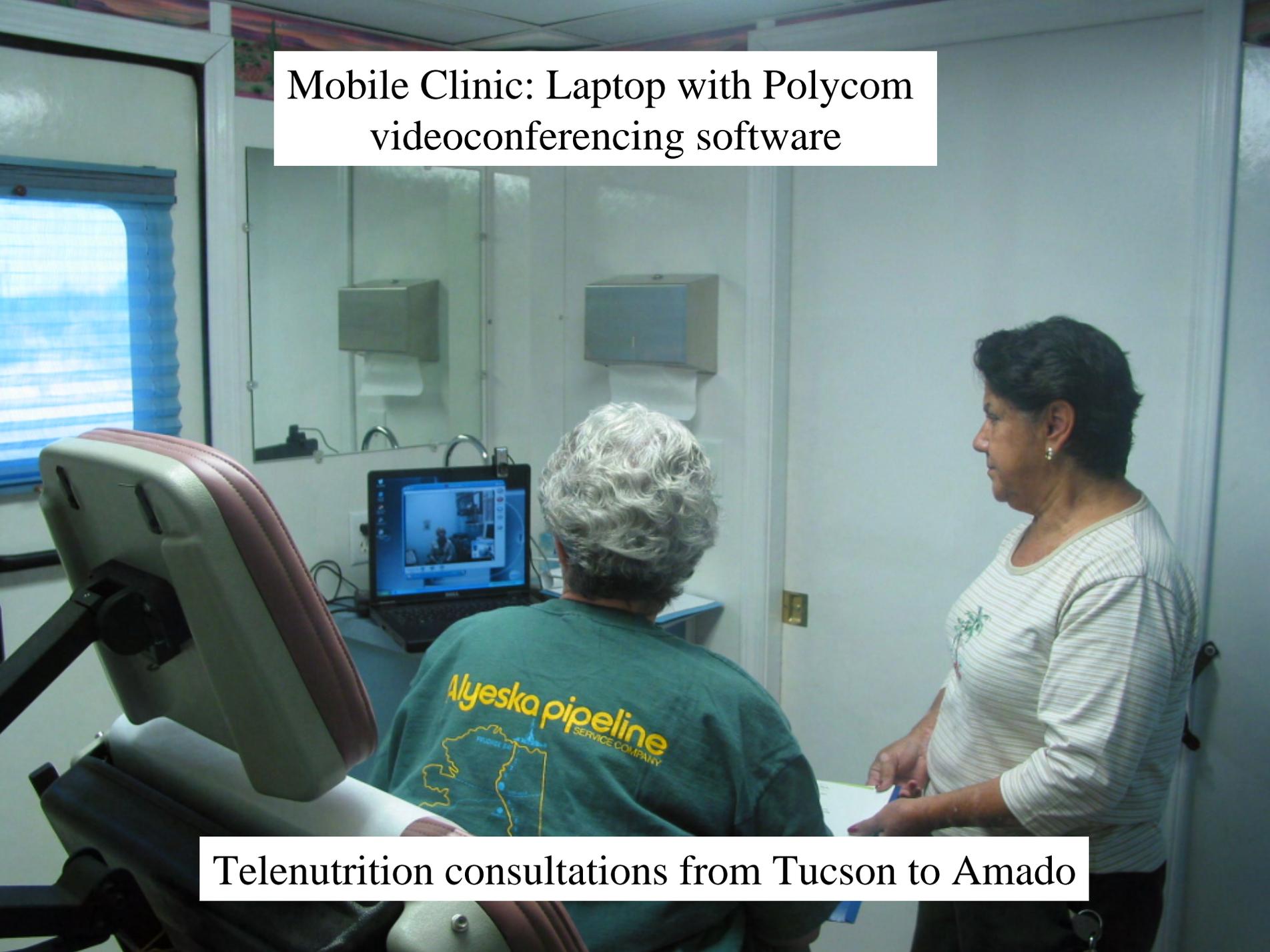
Small classes of patients with newly diagnosed diabetes in Amado and Tuca City (multi-point/simultaneously)

Laptop/e webcam/Second Opinion EHR



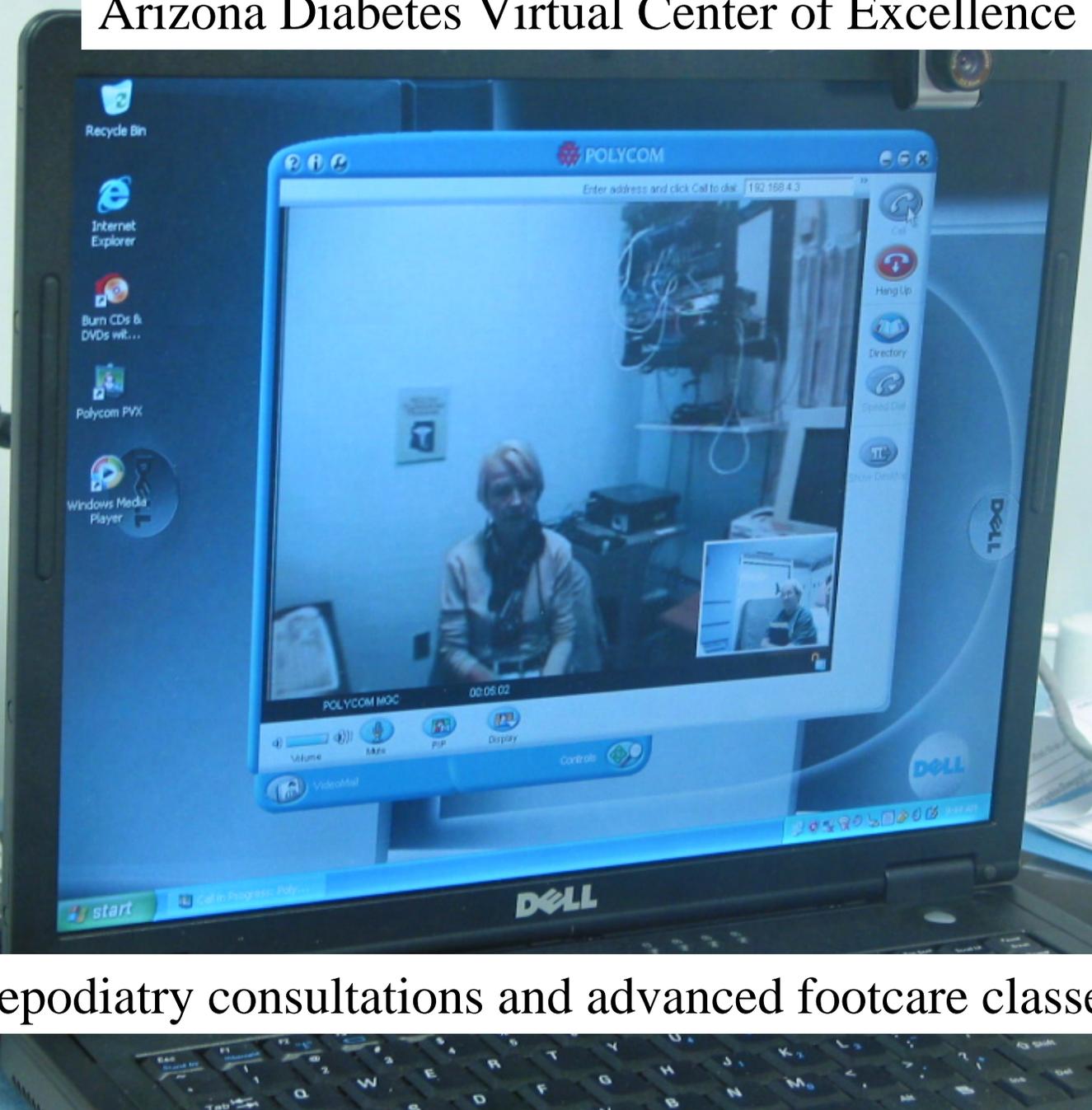
Telenutrition consultations from Tucson to Amado

Mobile Clinic: Laptop with Polycom  
videoconferencing software



Telenutrition consultations from Tucson to Amado

# Arizona Diabetes Virtual Center of Excellence



Telepodiatry consultations and advanced footcare classes

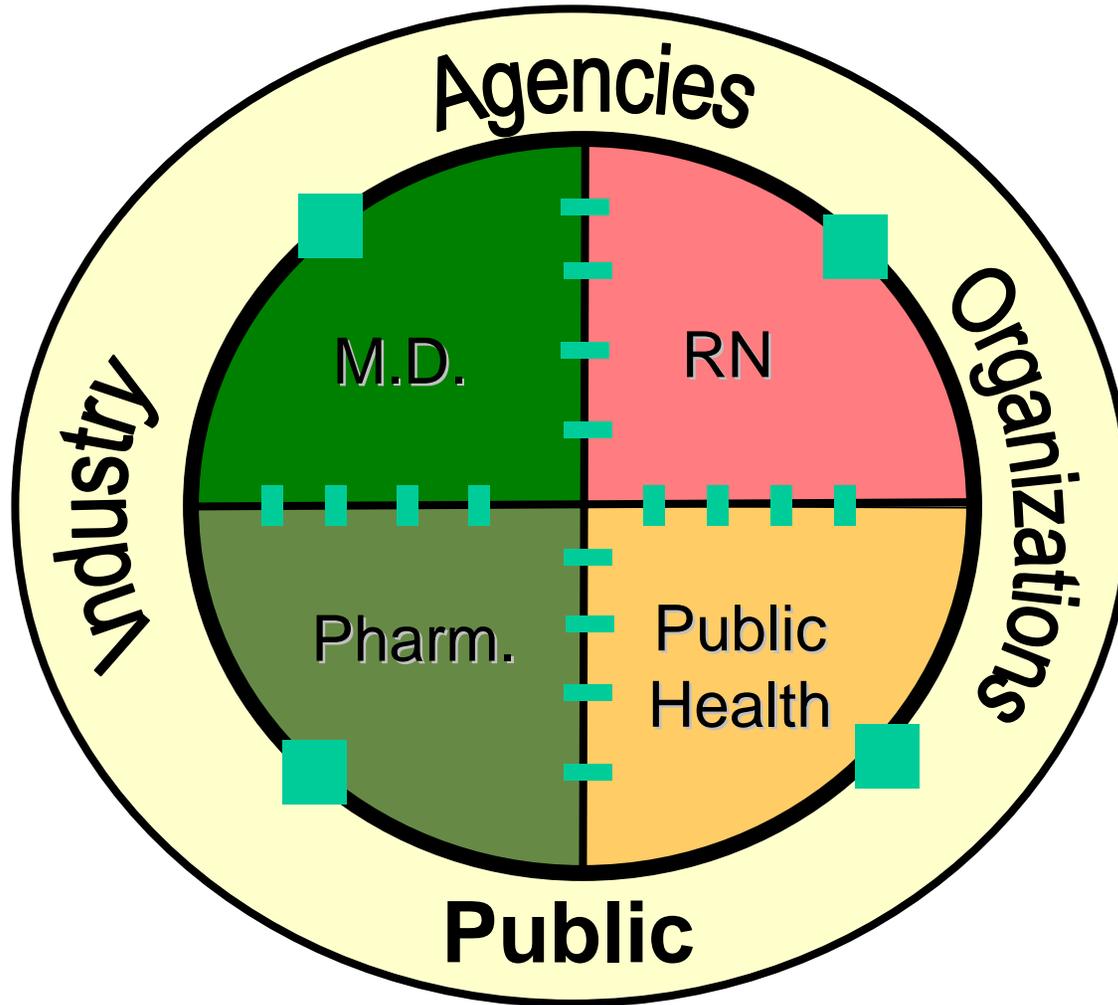
ATP Director's Office – AHSL Tucson, Arizona



Video Input Device Trials

# “Institute of Medicine-Plus”

*An Arizona Experimental Curriculum  
in Multidisciplinary Education*



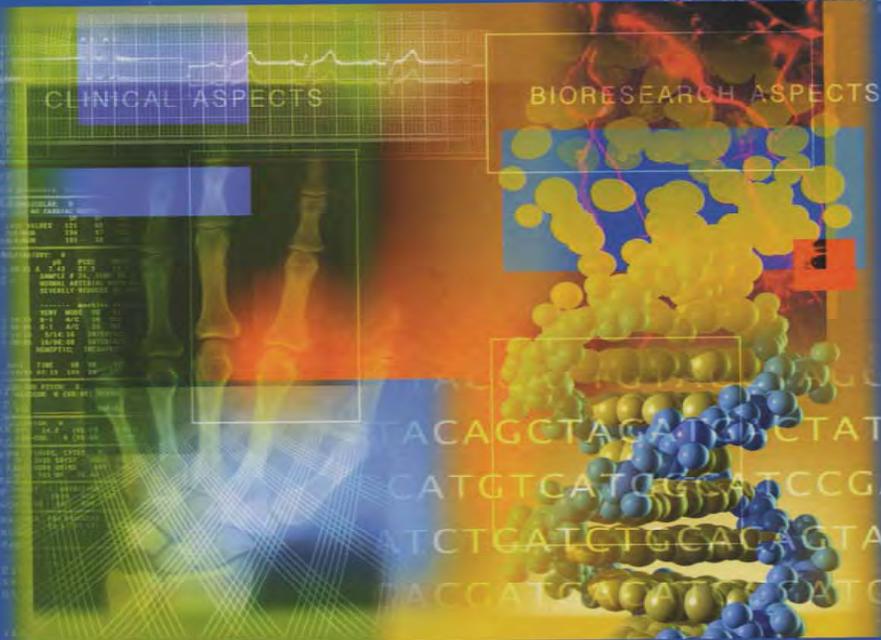


Arizona Telemedicine Program – T-Health Institute

**Edward H. Shortliffe** *Editor*  
**James J. Cimino** *Associate Editor*

# Biomedical Informatics

Computer Applications in Health Care  
and Biomedicine



Third Edition



Ted Shortliffe, M.D., Ph.D.



Robert Greenes, M.D., Ph.D.



Vimla Patel, Ph.D.



October 3, 2007  
T-Health Amphitheater  
Phoenix, Arizona

Personal Series

T150



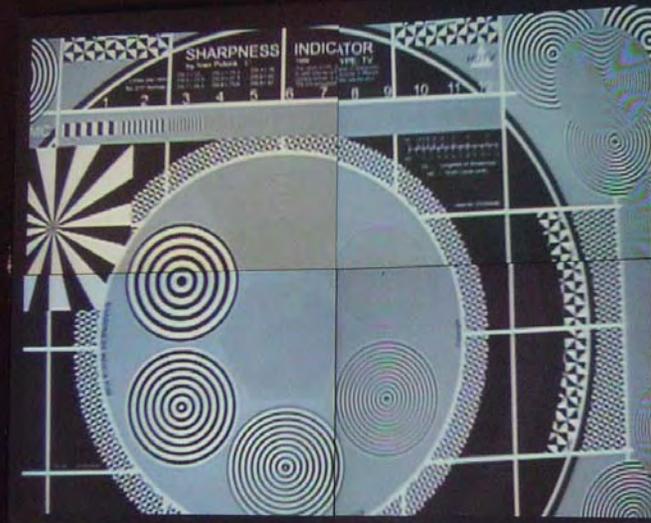
TANDBERG

October 3, 2007  
T-Health Amphitheater  
Phoenix, Arizona



October 3, 2007  
T-Health Amphitheater  
Phoenix, Arizona

Arizona Telemedicine Program – Executive Committee Meeting  
*Video Conferencing between Phoenix and Tucson*



October 3, 2007  
T-Health Amphitheater  
Phoenix, Arizona

Arizona Telemedicine Program  
*Telemedicine Training Course*



October 10, 2007  
Auditorium Building  
Phoenix, Arizona

Arizona Telemedicine Program  
*Telemedicine Training Course*



October 10, 2007  
Auditorium Building  
Phoenix, Arizona

# Arizona Telemedicine Program *Telemedicine Training Course*

## Program Initiation

- ❑ The Arizona Telemedicine Program (ATP) started in July 1996
- ❑ Decision package from the Arizona State Legislature
- ❑ \$1.2 million per year

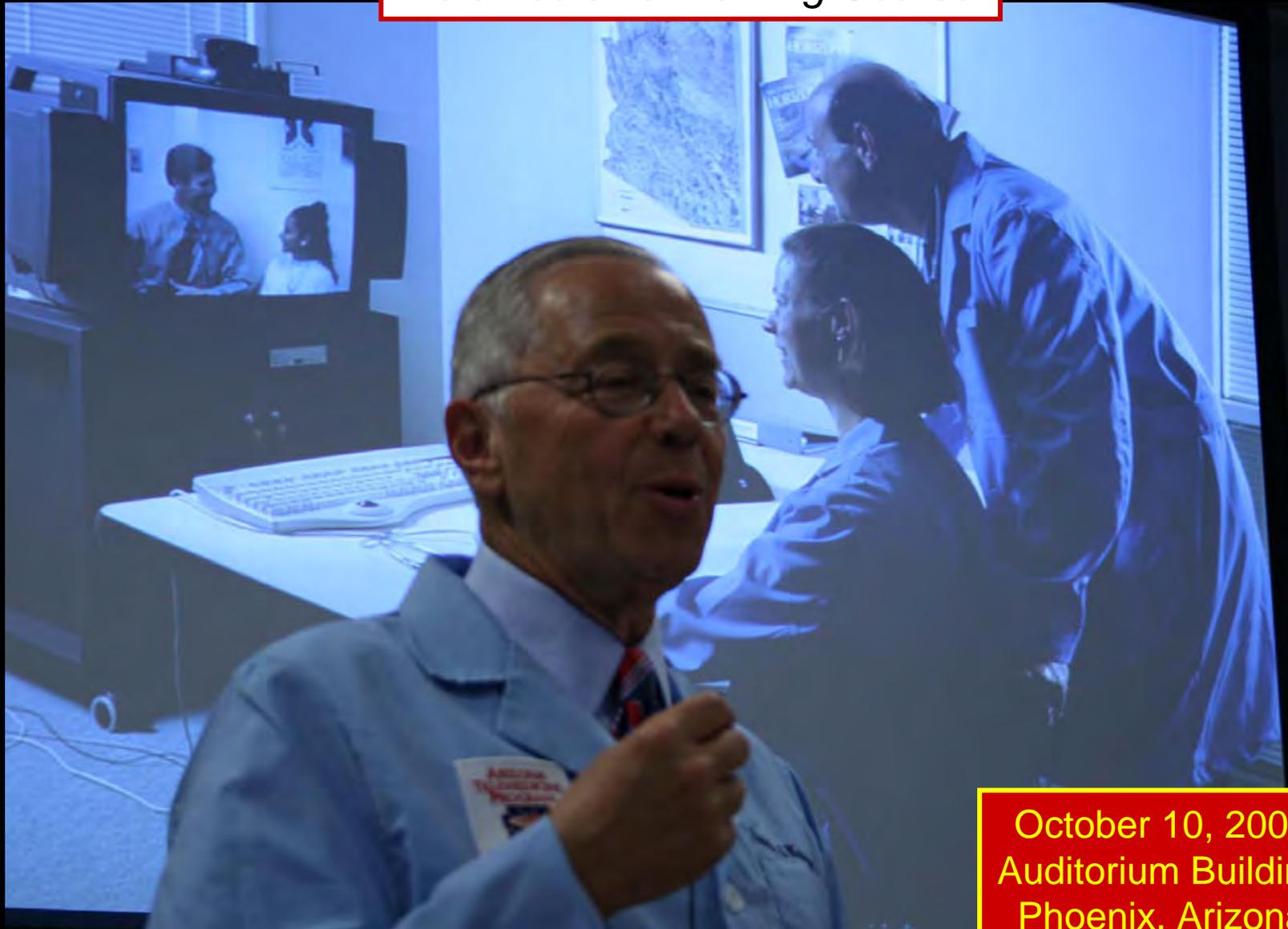
October 10, 2007  
Auditorium Building  
Phoenix, Arizona

Arizona Telemedicine Program  
*Telemedicine Training Course*



October 10, 2007  
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Phoenix, Arizona

Arizona Telemedicine Program  
*Telemedicine Training Course*



October 10, 2007  
Auditorium Building  
Phoenix, Arizona

# Arizona Telemedicine Program *Telemedicine Training Course*



## What makes a good teleconsultation?

- Complete data
  - Avoid the incomplete consult!
- Diagnostic images
- Steps in review:
  - Site Coordinator
  - Medical Director
  - Specialist

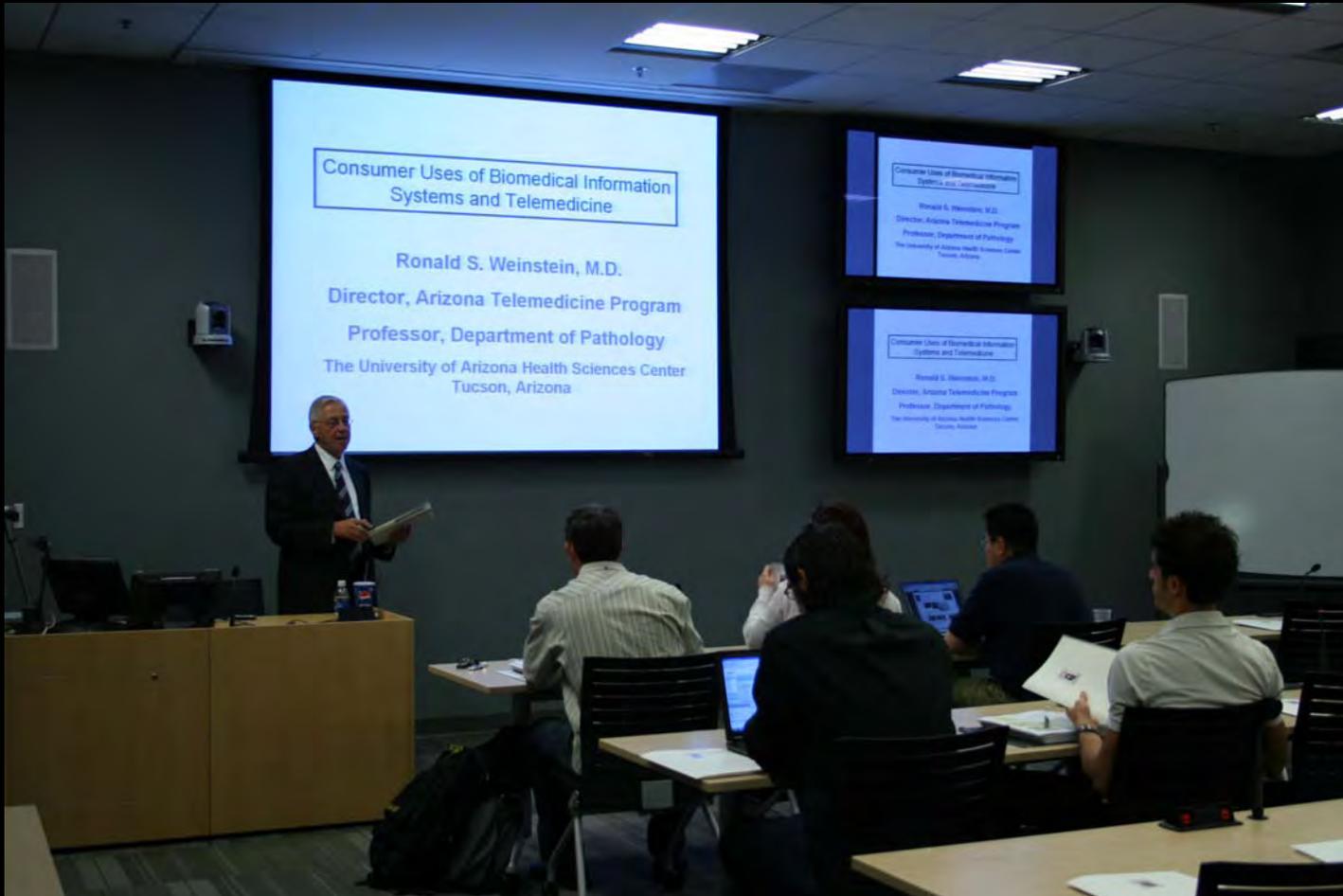
October 10, 2007  
Auditorium Building  
Phoenix, Arizona

# Biomedical Informatics Course - ASU COM-Phoenix Campus



October 15, 2007  
Auditorium Building  
Phoenix, Arizona

# Biomedical Informatics Course - ASU COM-Phoenix Campus



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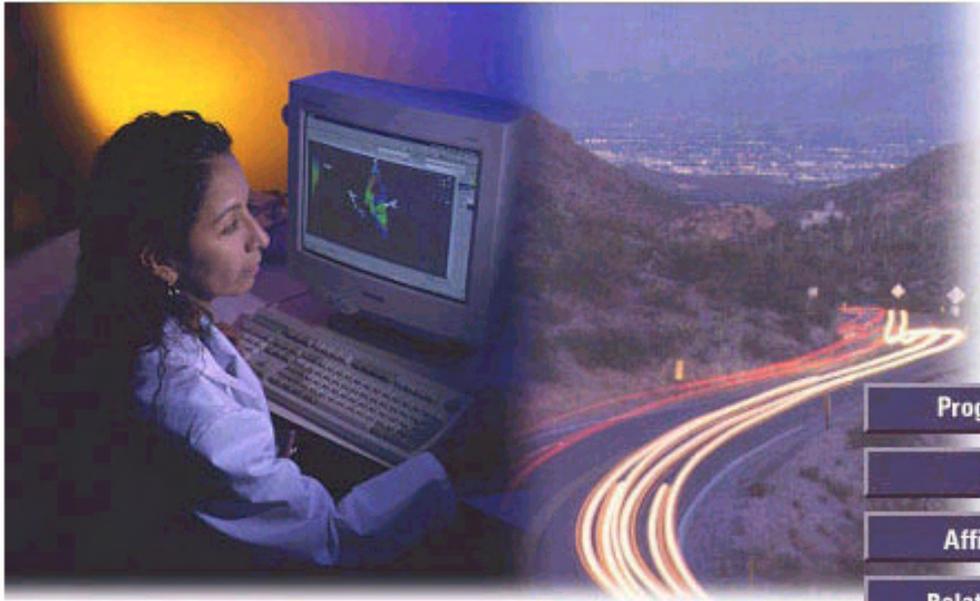
# Biomedical Informatics Course - ASU

## COM-Phoenix Campus



October 15, 2007  
Auditorium Building  
Phoenix, Arizona

# www.telemedicine.arizona.edu



## ARIZONA TELEMEDICINE PROGRAM



Program Description

Publications

Affiliated Programs

Related Web Resources

Arizona Health Sciences Center

The University of Arizona

National Awards:



TeleCon

collaborate  
Conference & Expo



Health Management  
Technology



*4th Annual*

National Corrections Telemedicine Conference

Tucson, Arizona

November 23-26, 2002

[www.nctc2002.com](http://www.nctc2002.com)

Thank you.

[ronaldw@u.arizona.edu](mailto:ronaldw@u.arizona.edu)