Herbert I. Margolis Memorial Lecture

Technologies and Your Practice

Tufts University Dental School
Dept. of Orthodontics
November 5th, 2005

Dr. John Grubb and Mr. Steven McEvoy, MME Consulting
Advances in Orthognathic Surgery, Technology, and Changes With the American Board of Orthodontics

1. Technology in Today’s Orthodontic Environment
2. The American Board of Orthodontics (Technological) Advances
3. Common Principles of Esthetics
4. Distraction Osteogenesis:
   a. Symphyseal Distraction
   b. Cleft Palate Distraction
5. Mandibular Constriction (midline surgery)
6. Open Bite Surgery corrected with mandibular surgery
7. Resorbable Fixation
8. Platelet Rich Plasma (PRP)
9. Human Bone Morphogenetic Protein (rhBMP-2)
Who is Steve McEvoy?

- Mechanical Engineer – TMJ Modeling
- Design Engineer for AxialTome, Denar and others
- Involved in Dental X-Ray labs on the West coast and in Canada
- Work with Drs. Briss and Grubb at the ABO
- Technology consultant servicing the Dental Marketplace
MME Consulting, Inc.

• Working Nationally for:
  – Orthodontists
  – Oral Surgeons
  – Dental X-ray Labs
  – Perio/Endo/Pedo
  – General Dentists

• “Technology Planning and Integration for Dental Specialists”
This Morning’s Outline

- Imaging Modalities – The Past, Present and Future
  - Photographic
  - X-Ray
- Technologies in a Modern Practice – “The #1 with Coke”
Photography

• Past
  – Clearly established standards
    • 35mm SLR Camera
    • 105mm Macro Lens
    • Ring Flash
    • KodaChrome 35mm Color Slide Film
Photography – Past

- Drawbacks
  - Rather Complicated
  - Heavy
  - Time Lag
  - Development Process
  - External Service Involved
Photography

- Transition to Digital done with flat bed scanner
- Still the old method, just using prints rather than slides
- Scanning the prints into computer using a flat bed scanner
- Even Slower and more cumbersome
- Enabled us to start using software to sort, manipulate and store images
Photography

• The Dawn of Direct Digital
  – 1994 Kodak and Nikon developed a 35mm SLR body with a 1.3 million pixel sensor, selling for $18,000
  – Used all the existing lenses, etc

• Blazed the trail for today's digital cameras
Photography - Present

• Plethora of Cameras
  – Consumer
  – Pro-sumer
  – Professional

• Prices range from $50 to $15,000
Photography – Present

- Many Advantages
  - Time Saving
    - Instant Gratification
  - Cost Saving
    - No external Service
    - No film consumables
  - Quality Improvements
    - On-screen review (instant retakes)
    - More advanced auto modes

- Still Disadvantages
  - Lighting, complexity and cost
Imaging Software

• With the advent of wide spread use of cameras, Ortho Software vendors stepped up and provided imaging applications

• Used to:
  – Acquire
  – Manipulate
  – Store
  – Print
Photography – Present

• The Best Orthodontic Camera System
  – Buy a ‘kit’ from an Ortho Market Supplier that knows the challenges
  – Suppliers Include
    • Washington Scientific Camera Company
    • PhotoMed International
    • Dolphin Imaging
    • ... others
Photography - Present

Kits Include:

- Camera
- Lense
- Ring Flash
- Media Card
- Batteries and Charger
- Case to hold all the bits
- Protocol to follow for Portraits and Intraorals
Photography – Present

- **Canon Digital Rebel Kit**
  - 8 million Pixel SLR
  - 60mm Macro
  - Kit runs about $2,000

- **Fuji S3 Kit**
  - 12 million Pixel
  - 60mm Macro
  - Kit runs about $3,000
Photography - Present

• Still there are challenges
  – User Ability
  – Weight
  – Lighting

• Two Dimensional Digital Photography is the current standard

• Digital is now Accepted by the ABO!
Photography – Future Stereo Photogrammetry (a.k.a. 3D Photography)
3D Photography

- What possible use would Ortho have for 3D Photography?
- A supplement of information to be used in creating a patient specific 3D model built from Best Source Imaging
- ..... More Later .....
3dMD Camera System

- Six Camera’s Synchronized
- All Tied to one acquisition PC
- Single File Dataset (5mb)
- Free Viewer
- Infinite Views from one image
- Integrates with Dolphin 3D
3DMD Camera System
Photography - Future

- Cost of the system ($35,000 today)
- Space
- Does 3D Matter?
- More to come.....
Adoption Rate
Photography Technology in Ortho

Prior to 1994 – Film SLRs
Late 1990’s – Labs go 2D Digital
2000 and on – 2D Digital is Standard
2005 – Labs adding 3D Digital
20? – 3D Digital a Standard
X-Ray Imaging
Past & Present

2 Dimensional Imaging
What are the Goals of Imaging?

To Show the Anatomic Truth

Have a True Perception of Reality

Aid in accurate diagnosis, treatment planning, growth & development and outcomes analysis
Existing Technology

Highlights - Lowlights
Current Orthodontic Imaging

Typical

- Lateral Cephalometric
  - Tracing
- PA Cephalometric
- Panoramic
- Full Mouth X-Ray
  - Anteriors, upper and lower
- Occlusals
- TMJ
- Photos
Panoramic Manufacturers

- Planmeca
- Sirona
- Intrumentarium
Orthodontic Imaging Goals

Dr. Grubb – Help Me Out Here!

- Biometrics
- Root Alignment
- TMJ Assessment
- Identify or Rule Out
  - Short Roots
  - Caries
  - Impactions
2D Radiographic Cephalometrics

Broadbent (USA) 1931
Horfrath (Germany) 1931
Radiographic Cephalometrics
Used Frontal & Lateral Cephs
& “The Orientator”
2 Dimensional

What You See is All You Get!
Is It Accurate?
Imaging Limitations

- Point of View
- What you See is ALL YOU GET!

Distances
Note the large differences between the 2D measurements and the 3D and physical measurements.

76 Measurements – Accuscape
Panoramic Quality
Panoramic Distortion
Panoramic TMJ Issues

Lateral Pole

Medial Pole
Panoramic Accuracy

Changes Perception of:
– Size
– Shape
– Location
2 Dimensional Imaging can be deceptive

- **Photographs**
  - Perspective projection
  - Perceived changes in anatomy or in measurements due to different camera locations

- **Pan**
  - Distortion buccal/lingual
  - Poor root alignment evaluation

- **Ceph**
  - Perspective Projection
  - Geometric errors of projection
  - Linear measurements
  - Angular measurements

- **2D integration of images**
  - Different perspective geometry
  - Accuracy ???
  - Anatomic Truth
Digital X-ray Imaging

- Like with Photography, scanners began the transition
- Phosphor Scanners emerged getting rid of the wet process
- Software applications began to add tools like Ceph tracings
- Process was still cumbersome
- Waiting for Direct Digital.....
Direct Digital X-Ray

- Replace the film cassette and darkroom with digital sensor and a computer
- Promise of saving time, reducing dose and improving quality
- Instant Gratification
X-Ray Past – The Film & Screen

1. Scintillator Screen
2. Film
CCD/ CMOS

1. Scintillator
2. CCD Array
2D Digital Imaging Attributes

1. Size (mm or microns)
2. Location (x,y coordinate)
3. Value (intensity – bits)
And the costs....

- Panoramic/film
- Digident/indirect
- Denoptix/indirect
- ScanX/indirect
- Digora/indirect
- Gendex
- Trophy/direct
- Instrumentarium/direct
- Planmeca/direct
- Sirona/direct

12.5 K
18 K
20 K
22 K
28 K
43 K
50 K
72 K
72 K
72 K
3D X-Ray Imaging

“Cone Beam CT” is the name of the game
It’s a Value Proposition

Imaging Study
  – Quality and Significance of Imaging Study
    • Did you get the answer from the imaging session?
  – Dose
  – Cost
The Value Proposition of CBCT

- Eliminate Conventional images
- Reduce Dose to patient
- Decrease Cost?
- Produce true size, distortion and magnification free images

CBCT Can:
- Recreate:
  - Lateral Ceph
  - Tracing
  - PA Ceph
  - Panoramic
  - TMJ
- Create new views of:
  - Airway
  - Localization of Impacted teeth
  - 3D
Effective Dose Estimates (Health Physics Society)

Varies by equipment, film, digital, etc.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Dose (uSV)</th>
<th>Dose (mrem)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitewings</td>
<td>2-3</td>
<td>.2-.3</td>
</tr>
<tr>
<td>TMJ tomography</td>
<td>2-5</td>
<td>.2-.5</td>
</tr>
<tr>
<td>Panoramic</td>
<td>6-11</td>
<td>.6-1.1</td>
</tr>
<tr>
<td>Periapical</td>
<td>10-15</td>
<td>1.5</td>
</tr>
<tr>
<td>FMX</td>
<td>100-150</td>
<td>15</td>
</tr>
<tr>
<td>Laternal Ceph</td>
<td>17</td>
<td>1.7</td>
</tr>
<tr>
<td>Frontal Ceph</td>
<td>17</td>
<td>1.7</td>
</tr>
<tr>
<td>SMV</td>
<td>17</td>
<td>1.7</td>
</tr>
<tr>
<td>Conebeam CT</td>
<td>34 – 100</td>
<td>3.4-10</td>
</tr>
<tr>
<td>Mandible CT</td>
<td>50-700</td>
<td>15-70</td>
</tr>
<tr>
<td>PA &amp; Lat chest</td>
<td>170</td>
<td>17</td>
</tr>
<tr>
<td>Back ground</td>
<td>3,600</td>
<td>360</td>
</tr>
</tbody>
</table>

Ortho Series = 68 uSV - 233 uSV
Cone Beam Users

- Orthodontists
- Implants
- Maxillofacial surgeons
- Prosthodontists
- Medical
- Others…
Orthodontics

- Create “Typical” images out of Volume
  - Lateral Ceph
    - With tracing
  - PA Ceph
  - Panoramic
- These can be true size, or magnified to mimic 2D Ortho Images
- Create other helpful Images
  - Cross sections
  - 3D
Sensing Technology

- Film/Screen
- CCD/CMOS/PSP
- Image Intensifiers
- Flat Panel

Pan/ Ceph

CBCT
i-CAT CBCT Flat Panel Sensor

1. CsI Scintillator
2. Photo-sensor Array
CBCT Process

- Single Revolution (usually)
- 10 to 40 seconds
- 360 2D Ceph Images
- Volume is reconstructed using magic math
- Visualized on Computer
Voxel Volume
Voxel Volume Geometry

Medical CT = Anisotropic

Conebeam CT = Isotropic

$X = Y < Z$

$Z = \text{Slice Pitch}$

$X = Y = Z$

$0.25 \times 0.25 \times 1 \text{ mm}$

$0.2-0.4 \text{ mm}^3$
Cone Beam CT

Who are the manufacturers?

– i-Cat (Imaging Sciences)
– NewTom 3G (Aperio Services)
– CBMercuray (Hitachi Medical)
i-CAT Cone Beam 3-D

3-D volumetric images
True anatomic measurements
12 bit Gray Scale
Pan-sized footprint
Fast Scan Time
Low Radiation
Higher resolution for all views
(\textit{amorphous silicon flat panel image sensor})
TRADE NAME AND APPLICATIONS

The DENTAL VOLUMETRIC TOMOGRAPH named NewTom allows to carry out exams by tridimensional reconstruction of the maxillary area that gives the doctor a series of sections of the examined area on any desired plane.
Hitachi...
Units Installed

- Hitachi  <10 in 2 yr
- NewTom  <50 in 4 yr
- i-CAT  >200 in 2 yr
...and now the Costs!

- Hitachi $330,000
- NewTom $300,000
- i-CAT $180,000
So, how does it perform?
Tracing Overlay

Black = CBCT Ceph
Green = Ortho Ceph
### Tracing Values

#### CBCT Ceph (i-CAT)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
<th>Norm</th>
<th>Std Dev</th>
<th>Dev Norm</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA (°)</td>
<td>82.5</td>
<td>82.0</td>
<td>3.5</td>
<td>0.1</td>
</tr>
<tr>
<td>SNB (°)</td>
<td>82.4</td>
<td>80.9</td>
<td>3.4</td>
<td>0.5</td>
</tr>
<tr>
<td>ANB (°)</td>
<td>0.0</td>
<td>1.6</td>
<td>1.5</td>
<td>-1.1 *</td>
</tr>
<tr>
<td>Occ Plane to SN (°)</td>
<td>9.7</td>
<td>14.4</td>
<td>2.5</td>
<td>-1.9 *</td>
</tr>
<tr>
<td>Pog - NB (mm)</td>
<td>2.3</td>
<td>2.4</td>
<td>1.7</td>
<td>-0.0</td>
</tr>
<tr>
<td>MP - SN (°)</td>
<td>23.2</td>
<td>33.0</td>
<td>6.0</td>
<td>-1.5 *</td>
</tr>
<tr>
<td>FMA (MP-FH) (°)</td>
<td>21.0</td>
<td>23.9</td>
<td>4.5</td>
<td>-0.5</td>
</tr>
</tbody>
</table>

**Interincisal Angle** (UL-L1) (°)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
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</tr>
</thead>
<tbody>
<tr>
<td>UL - SN (°)</td>
<td>121.6</td>
<td>102.6</td>
<td>5.5</td>
<td>3.4 ***</td>
</tr>
<tr>
<td>UL - NA (mm)</td>
<td>5.7</td>
<td>4.3</td>
<td>2.7</td>
<td>0.5</td>
</tr>
<tr>
<td>UL - KA (mm)</td>
<td>39.1</td>
<td>22.6</td>
<td>5.7</td>
<td>2.9 **</td>
</tr>
<tr>
<td>Li - NB (mm)</td>
<td>2.1</td>
<td>4.0</td>
<td>1.8</td>
<td>-1.1 *</td>
</tr>
<tr>
<td>L1 - NB (°)</td>
<td>15.8</td>
<td>25.3</td>
<td>6.0</td>
<td>-1.5 *</td>
</tr>
<tr>
<td>FMA (Li-FH) (°)</td>
<td>68.8</td>
<td>64.8</td>
<td>8.5</td>
<td>0.5</td>
</tr>
<tr>
<td>IMPA (Li-NP) (°)</td>
<td>90.2</td>
<td>95.0</td>
<td>7.0</td>
<td>-0.7</td>
</tr>
</tbody>
</table>

**Lower Lip to E-Plane** (mm)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
<th>Norm</th>
<th>Std Dev</th>
<th>Dev Norm</th>
</tr>
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<tr>
<td>Lower Lip to E-Plane (mm)</td>
<td>0.0</td>
<td>-2.0</td>
<td>2.0</td>
<td>1.0 *</td>
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<tr>
<td>Upper Lip to E-Plane (mm)</td>
<td>-2.7</td>
<td>-6.0</td>
<td>2.0</td>
<td>1.6 *</td>
</tr>
<tr>
<td>Soft Tissue Convexity (°)</td>
<td>131.6</td>
<td>132.4</td>
<td>4.0</td>
<td>-0.2</td>
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</tbody>
</table>

#### Digital Ceph (Planmeca)

<table>
<thead>
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<tr>
<td>SNA (°)</td>
<td>80.1</td>
<td>82.0</td>
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<td>-0.5</td>
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<tr>
<td>SNB (°)</td>
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<td>80.9</td>
<td>3.4</td>
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<tr>
<td>ANB (°)</td>
<td>0.4</td>
<td>1.6</td>
<td>1.5</td>
<td>-0.8</td>
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<tr>
<td>Occ Plane to SN (°)</td>
<td>11.0</td>
<td>14.4</td>
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<td>-1.4 *</td>
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<tr>
<td>Pog - NB (mm)</td>
<td>2.7</td>
<td>2.4</td>
<td>1.7</td>
<td>0.2</td>
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<tr>
<td>MP - SN (°)</td>
<td>26.1</td>
<td>33.0</td>
<td>6.0</td>
<td>-1.1 *</td>
</tr>
<tr>
<td>FMA (MP-FH) (°)</td>
<td>22.1</td>
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<tr>
<td>UL - SN (°)</td>
<td>121.2</td>
<td>102.6</td>
<td>5.5</td>
<td>3.3 ***</td>
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<tr>
<td>UL - NA (mm)</td>
<td>7.2</td>
<td>4.3</td>
<td>2.7</td>
<td>1.1 *</td>
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<tr>
<td>UL - KA (mm)</td>
<td>41.1</td>
<td>22.8</td>
<td>5.7</td>
<td>3.2 ***</td>
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<tr>
<td>Li - NB (mm)</td>
<td>3.0</td>
<td>4.0</td>
<td>1.8</td>
<td>-0.5</td>
</tr>
<tr>
<td>L1 - NB (°)</td>
<td>18.3</td>
<td>23.3</td>
<td>6.0</td>
<td>-1.2 *</td>
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<td>FMA (Li-FH) (°)</td>
<td>65.4</td>
<td>64.8</td>
<td>8.5</td>
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<td>IMPA (Li-NP) (°)</td>
<td>92.5</td>
<td>95.0</td>
<td>7.0</td>
<td>-0.4</td>
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**Lower Lip to E-Plane** (mm)

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<tbody>
<tr>
<td>Lower Lip to E-Plane (mm)</td>
<td>-4.7</td>
<td>-2.0</td>
<td>2.0</td>
<td>-1.3 *</td>
</tr>
<tr>
<td>Upper Lip to E-Plane (mm)</td>
<td>-8.1</td>
<td>-6.0</td>
<td>2.0</td>
<td>-1.0 *</td>
</tr>
<tr>
<td>Soft Tissue Convexity (°)</td>
<td>131.6</td>
<td>132.4</td>
<td>4.0</td>
<td>-0.2</td>
</tr>
</tbody>
</table>
Case Example
Cephs, Tracings and more ...
Panoramic
TMJ and Airway
Adoption Rates
Digital X-Ray in Orthodontics

- Prior to 1990 – Film Based
- Starting mid 1990’s – Scanning
- Late 1990’s – Phosphor Plate Scanning
- 2000 – 2D Direct Digitals emerge
- 2002 – 3D Direct Digitals emerge
- 2006 – 2D Direct is standard for new and remodels
- 20?? – 3D Direct becomes the standard

Today - Still a mix of all
3D may be closer than you think

Dolphin 3D

– Developed to support the emerging demand for an Ortho tools for 3D datasets
– Need for a Research tool
– Development started in March 2005
– Pre-Released in Summer 2005
Dolphin 3D

- Build Patient Specific Model
  - CBCT
  - 3D Photography
- Use for Treatment and analysis
Integration of 3DMD with i-CAT CBCT scan

Dolphin 3D Live

Anatomically accurate 3D dynamic model
- Facial Soft tissue
- Skeleton / bone
- Teeth
  - no impressions ?
    - Intra-oral scanning
    - Conebeam CT
- Muscles ?
- Function ?
Is this Technology in your Practice?
Share my experience…

• You’re in for a mix of “JD Powers Survey” meets “Family Feud”
Reference Design

‘Number One with Coke’
- 12+ Computers
  - 6 Front Office
  - 6 Clinical
  - + Consults, Records, etc
- Dedicated Server
- Digital X-Ray
- Digital Photography
- Internet and Wireless Access
- Remote access from home
The myth of the $500 PC

AS SEEN ON TV!
Click here (or scroll) for Offer details.

Featured Products

**Dimension 2400**
- Pentium® 4 Processor at 2.66GHz with 533MHz front side bus
- Microsoft® Windows® XP Home Edition
- 128MB Shared DDR SDRAM at 333MHz (Performs at 266MHz for 400FSB systems)

- Featured at
  - $599
  - **$499**
  - After $100 Mail-In Rebate

**Inspiron 1100**
- Celeron® Processor, 2.4GHz, 14.1 inch XGA
- Microsoft® Windows® XP Home Edition
- 256MB Shared DDR, 266MHz, 2 Dimms, PC2100 SDRAM

- Featured at
  - $799
  - **$749**
  - $50 Special Offer
The Myth of the $500 PC Revealed

- Configured as a loss leader
- It will run, but there are many items that are compromised to make the price point
- Needs to be configured as a business PC
- Upgrading later a bad strategy
## What’s Wrong with a $500 PC

<table>
<thead>
<tr>
<th>Feature</th>
<th>As Configured</th>
<th>Desired</th>
<th>$$ to Fix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case</td>
<td>Low-end, tinny and noisy</td>
<td>Quiet</td>
<td>Change Model</td>
</tr>
<tr>
<td>Memory</td>
<td>128 megs</td>
<td>512 megs preferred</td>
<td>$150</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows XP Home</td>
<td>Windows XP Professional</td>
<td>$70</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>Slow 5200rpm</td>
<td>7200rpm is normal</td>
<td>$10</td>
</tr>
<tr>
<td>Productivity Software</td>
<td>Corel WordPerfect!</td>
<td>Microsoft Office</td>
<td>$139 to $349</td>
</tr>
<tr>
<td>Crapware</td>
<td>Plenty</td>
<td>None</td>
<td>Change Model</td>
</tr>
<tr>
<td>Floppy Drive</td>
<td>None</td>
<td>1.44MB 3.5”</td>
<td>$20</td>
</tr>
<tr>
<td>Support</td>
<td>1 year limited</td>
<td>3 year NBD Onsite</td>
<td>$139</td>
</tr>
<tr>
<td>Network Card</td>
<td>10/100 Mbps</td>
<td>10/100/1000 Mbps</td>
<td>$40</td>
</tr>
</tbody>
</table>
The *Real* Price of a Business PC

Trying for Apples to Apples (well, almost)

- The Dell Dimension $500 PC
  - $1187
  - Still has wrong case, loaded with crapware

- A Dell Optiplex GX620
  - $1170
  - Just the way we wanted it
Realistic Budgeting

• Everyone has an opinion
• What does a number one with Coke cost?
• Don’t be caught fooling yourself that there is a cheaper way
• Buy a Honda Accord, not a Yugo, it’s cheaper in the long run
• Survey Says: Buy Dell business lines
What is Thin Client Computing?

- (thin klī´&nt) A computing device designed to be especially simple and small so that the bulk of the data processing occurs on the terminal server.
- A thin client is usually a network computer without a hard disk drive, whereas a fat client includes a disk drive.
- Thin Clients may or may not have a Windows Operating System.
- Minimizing maintenance
Thin Client Computers

WinTerm SX0

- Dimensions: 6.94w x 4.75d x 1.38h
- Weight: 6 lbs
- Cost: $285 to $500
Terminal Server

- To support thin clients, you must have a Terminal Server
- Terminal Server does all the thinking
- ‘Bill’ is still gonna get ya
- Built into Microsoft Server, just need to enable
Thin Client Advantages

- Easier to physically install
- Centralized Applications
- Potentially Lower Initial Cost
- Potentially Lower Total Cost
- Potentially Less Maintenance
- Potentially Better Performance (for older Fat clients now running thin)
Thin Client Disadvantages

• All the Potentially’s
• Needs a smarter Bear to support
• A lot of your eggs in one basket
• Limitations.....
Thin Client Limitations

• Applications requiring high performance video suffer
  – Orthomation and iACT
  – OrthoCAD
  – Invisalign
  – Any Movie like application...
Thin Client Limitations

• Not all applications can run on a terminal server
• Difficult or impossible to connect peripherals locally:
  – Scanners/Card Readers/Printers
  – Basically, anything other than the monitor, keyboard and mouse
Thin Client Equation

- Upfront Savings per thin client: $700
- Upfront Additional Costs for Terminal Server: $4000
- Approximately 6-7 Thin Clients may make it less expensive than all Fat Clients.
- Survey Says: Consider on a case by case basis and use where it makes financial/strategic sense. Really vet the limitations.
Communications

- Communications between PCs, Printers and Server runs over the network cabling system
- CAT5, CAT5e, CAT6 cable
- Hubs and Switches, different speeds
- Network Cards, different speeds
- Wireless Networking
Communications
Wired Network Speeds

- Early 1990’s - CAT3 or CAT5 – 10Mbps
- Late 1990’s – CAT5 or CAT5e – 100Mbps
- Early 2000’s – CAT5, 5e, 6 – 1000Mbps
- Late 2000’s – CAT5, 5e – 10G or 10,000Mbps
- Today, we plan for a mix of 100 and 1000Mbps (gigabit) on CAT5e
- Still pass on CAT6
Communications
Wireless Networking

- Ahhh, wireless. Utopia for the cabling impaired.
- Not a fad, its here to stay
- Built-in to many new devices
- Hot spots are everywhere, and your office too!
- Not ready for business prime time
Communications

Wireless Standards

- **802.11b** - 11 Mbps - 150 feet
- **802.11a** - 54 Mbps - 50 feet
- **802.11g** - 54 Mbps - 150 feet
- .b and .g use 2.4GHz
- .a uses 5 GHz
- ‘Betamax’ vs. ‘VHS’
- We hedge and buy a/b/g WAPs, and rely on .g
Communications
What is Wireless Good for?

• NOT for use with primary business PCs
• Tablets
• Doctors Laptop
• Maybe for thin clients if all else fails
• Waiting Room ‘Hot Spot’
  – Put up a small sign
  – Inexpensive
  – Sexy
• Survey Says: Start using it, just in the right capacity
Communications

What should you do?

- Wired, not wireless except as noted
- CAT5 cabling is fine
- Use a Gigabit switch
- Equip your systems with Gigabit
Practice Management Software

- Deeply personal religious decision
- No Clear obvious choice
- Highly Competitive market
- Must be carefully evaluated and considered
Many Players

- PracticeWorks
  - Orthotrac Classic (Unix)
  - Orthotrac Office
- Ortho2
  - OneTouch (DOS)
  - Viewpoint
- Dolphin
  - Dolphin Management
- IMS
  - IMS for Orthodontics
- Oasys
- New Horizons
- Others....
To Change or Not ...

- Is there really a need?
- Orthotrac Classic and Dolphin Imaging works really well together
- There **Must** be a really compelling reason to change
- It’s gonna hurt!
Survey Says:

• Ortho2 Viewpoint and Dolphin Management are most popular
• Neither is complete utopia
• Share the same requirements:
  – Network
  – Printers
  – Servers
• Both excellent for Thin Computing
Image Management

• Used to acquire, manipulate, store and retrieve patient records

• Should be able to:
  – Integrate with PM application
  – Networkable to multiple stations
  – Connect to all your peripherals like camera, scanner and Pano
Players

- Dolphin Imaging
- Vistadent
- PracticeWorks Imaging
- Ortho2 Viewpoint (built in)
- Oasys (built in)
- ...others....
Survey Says:

Dolphin Imaging

– Its in about 70% of the offices
– Dynamic Company
– Not the cheapest, but worth it
– Excellent Integrations
– Excellent Peripheral support
– Excellent Thin Client Support
Digital X-Ray

The Ideal System is:
- Direct Digital
- Dual Sensor
- Ethernet Connected
- Twain Driver
- Smooth Workflow
- Affordable
Consider

- Planmeca Promax
- GE Healthcare/Instrumentarium
- Sirona
- They all cost about $72K (ugh!)

- Survey Say: Planmeca Promax
  - Looks, Quality, Reputation, what's coming.....
Digital Photography

• Redux

• Survey Says:
  – Canon Digital Rebel Ortho Kit from Dolphin
  – San Disk USB 2.0 Media Reader
  – Dolphin Backlight Box
  – Epson Expression 1680 Pro Scanner (if you care)
Patient Flow

- Taco Bell Drive Thru
- Elements
  - Practice Management Application
  - Reception PC
  - Sign-In PC
  - On-Deck PC
Fingerprint Scanner

- Latest innovation for HIPAA compliance at Sign-In PC
  - Dolphin Management
  - Ortho2 Viewpoint
- Captured at Reception PC
- One Touch Use at Sign-In PC
- Fingerprints are not stored
- Not Thin Client Compatible (yet)
On-Deck Displays

- Shows the status of patient moving through the system
  - Often a separate screen in PM app
  - Often a PC is dedicated to run it
  - Dolphin has embedded GPS, and offers a large format optimized lites application
- Most adopting large 32” LCDs
Survey Says:

• Assuming Ortho2 or Dolphin
• Fat Client Sign-In with Fingerprint Scanner
• Fat Client Reception with Fingerprint Scanner
• Fat or Thin Client running a 32” LCD Display
Patient Call Systems

- Automated calling system that off loads the appointment reminder calls
- Plays pre-recorded messages to tomorrow's patients at a preset time of day
- Sucks the data out of your PM app
- Can be a bit tricky to get setup initially
- Usually a PC onsite, but internet based options available now
Players

- Televox HouseCalls
- Tel-A-Patient PowerCalls
- Ortho2 Viewpoint (built in)
- ...others?

Survey Says: Televox HouseCalls PC
- Works with almost everyone
- Works great once its setup
Patient Info Online

- Extends your practice website to include a login for your patients
- They get access to:
  - Review Appointments, email reminders
  - View Photos
  - Financial History
  - Make Payments Online
CURRENT PAYMENT INFORMATION

Jason

Most recent payment: $ 58.50 Credit Card Transaction 313080 on January 18, 2005.

Next contract payment: $ 58.50 due November 7, 2005. To pay by credit card, click here.

Remaining Balances:

Total: $ 1373.35. This takes into account all personal payments and insurance payments received to date

Steven: $ 906.25.

Aetna: $ 467.10.

We bill your insurance company as a courtesy to you. Please remember that you are responsible for any amount not covered by your insurance. Please notify us of any changes in your benefits.
Patient Info Online

- Usually requires a Fat or Thin Client in the waiting room as an “Email Collector” to get them signed up
- Online Payment requires some additional setup
- They usually combine the service with developing and hosting a website for you
- Closely consider all the technical process before buying
Players

- Ortho Sesame
- Televox T.link
- Ortho2 Viewpoint iSiS

Survey Says: Ortho Sesame, but consider others
Lobby Plasma

- Everyone wants one!
- TV/DVD
- Practice Promotion
- Study Club Meeting
Patient Education

- Software used to explain treatment options, conditions
- Since its movie based, not for thin clients
- Usually just in the consultation rooms
- Require a good PC, DVD helps
Players

• iACT
• Orthomation
• ... others

• Survey Says: Either, they are both a bit tricky, but work well
Aligners

• Invisalign and the emergence of OrthoClear
• Works well with most PCs, not as great on thin clients, but works
• Invisalign can integrate with Dolphin Imaging
• Survey Says: Everyone does a little invisalign
Electronic Models

- Promises of:
  - Eliminate plaster
  - Model Storage
- Send them impression, get back electronic dataset through the Internet automatically
- Requires a good PC for good performance, but can run on thin clients
Players

• Cadent OrthoCAD
  – ABO tools
  – Dolphin Imaging Integration

• GeoDigm e-Model
  – Working on ABO

• Survey Says: OrthoCAD if this suits you
Tablet Computing

Motion Computing
JD Powers Survey
Total Ortho Package

- Dolphin Management or Ortho2 Viewpoint
- Dolphin Imaging Premium
- Planmeca Promax with Twain and Ethernet
- Canon Digital Rebel Camera Kit
- Dolphin Backlight Box
- Fingerprint Sign-In
- Clinical Ondeck screen 32” LCD
- 42” Lobby Plasma doing Practice Promo/Study Club Duty
- CAT5e network cabling
- 802.11g Wireless Networking Internet Hotspot
- HouseCalls
- Oasys or Tlink
- IACT or Orthomation for Patient Education
- Invisalign
- OrthoCAD for Digital Models
- Quickbooks for Payroll, managing the business
JD Powers Survey
Total Ortho Package cont.

• Dell Business Line Equipment
  – Poweredge Servers
  – Optiplex PCs
  – Latitude Laptops
  – Powerconnect Gigabit Switches
• HP Laser Printers
• Dymo Label Printers
• HP or Canon Photo Inkjets
• All Ethernet connected printers
• Microsoft XP Professional Edition (no Home Edition)
• Microsoft Small Business Server 2003 Premium Editions
• Microsoft Office 2003 Word, Excel, Outlook and Powerpoint as needed
• DSL Internet Connection with Static IP
• Linksys/Cisco VPN Router-Firewall
• MME for Installation and Support Services :-)
Summary

- 3D Photography
- Cone Beam CT
- Dolphin 3D

- Consider technology choices
- Look to your peers experiences
- Consider getting help
One Source of Help ....

- Training Sessions from The DDI Education Center
  – www.DDIU.com
Thank You!

steve@mmeconsulting.com

Presentation Online at
www.mmeconsulting.com/talks
Why connect your Practice to the Internet?
Good Things on the Internet

The “Internet”

Your Connection

Your PC

Dolphin Imaging & Management Solutions
Dolphin Records On the Web
Good Things on the Internet
Cone Beam CT Data on the Web
Many Good Things
Bad Things Galore

Hackers

SPAM

Spyware
Getting Connected

• DSL
• Cable Modem
• Wireless
• Fiber Optic
• Old Fashioned Dial-Up Modem
Survey – Windows Versions

- Windows 95/98/Me?
- Windows 2000?
- Windows XP?
- XP Service Pack 2 Installed?
Windows XP SP2

- How long did it take to download?
- Can be as much as 266MB
- 20 – 30 minutes or more by DSL, hours by dial-up modem
How long can a naked PC survive directly connected to the Internet?

- Connected directly by DSL, Cable, Wireless or Modem
- No Windows XP SP2
- Not even logged in, just on
- Months? Weeks? Days?
Internet Survival Time

Less than 20 minutes!

Source: Internet Storm Center SANS Institute isc.sans.org
And you thought that was bad...

- No built in defense for Pre-XP Operating Systems
- Connecting a non-XP SP2 laptop wirelessly at a public Internet Hot-Spot is all it takes
Insights into the mind of a Computer Guy ....

“We’ve determined the cause of your computers problem is the dreaded I-D-10-T error”

I-D-10-T = IDIOT
So what do you do?
Simple steps towards Internet Security

Words of Caution: Tightening Security can be inconvenient. It can break stuff, so be prepared.
Internet Security: Step 1

Use Passwords

Make sure that all user accounts that can log into a computer, including the local Administrator account, have a password. Anything is better than blank, and HIPAA requires it.

If you have a dedicated server at the office implement ‘Domain’ Security.
Internet Security : Step 1

Choose a Good Password

A good password is a non-dictionary word, contains at least one number and a case change. Ideally it would be 7 characters or more. CowBoy9 is a good password, you child’s name is not.
Internet Security: Step 2

Get Microsoft’s Critical Updates

Windows operating systems have programming bugs that may make it possible for others to take over your computer or to launch viruses. Critical updates and service packs help fix these bugs. If your computer tells you that there are critical updates available for your computer, you should install them.
Internet Security: Step 2

Windows Updates are available in Internet Explorer under the Tools Menu
Which Updates to Install?

- Criticals - Always
- Windows XP – If needed
- Driver Updates – with Caution
Internet Security: Step 2

Turn on Automatic Updates

Let the system update itself automatically
Insights into the mind of a Computer Guy ....

"Do you mean the letter zero or the number?"
Microsoft has included a personal firewall in Windows XP (Home and Pro). It was OFF by default with the original version of XP and in SP1. Downloading and Installing SP2 will enable it and Automatic Updates. Microsoft is finally getting serious about security.
Internet Security: Step 3

Check to see if the Windows Firewall is enabled
Internet Security: Step 3

Make sure Windows Firewall is enabled
Internet Security: Step 3

Enable the Exceptions you need.

You need to consider:
- Remote Access
- Security Keys
- SQL Settings
- This is not a trivial issue
- Consult your software vendors for specifics
Insights into the mind of a Computer Guy ....

The different classes of technology:

Hardware
Software
Skinware

a.k.a. Wetware, Meatware, Liveware
Use AntiVirus Software

Antivirus software should be installed on EVERY PC, not just ones considered likely to get a virus. A virus that gets into a network can move quickly to any other PC on the network if unprotected.
Internet Security: Step 4

Update your AntiVirus Software DAILY!

Configure the antivirus software to automatically update itself everyday. This is usually not the default setting. If you aren't doing this, you have no protection against a virus that was released yesterday if the last time you updated was a week ago.
Internet Security: Step 4

Updating your AntiVirus Software Daily
Internet Security: Step 4

Symantec AntiVirus™ Corporate Edition

A great choice for Office or home, about $34 per PC

A good choice for home, about $44 per PC
Insights into the mind of a Computer Guy ....

After a thorough evaluation we have determined that the
“Problem Exists Between Keyboard And Chair”
Internet Security: Step 5

Use a Firewall

If you connect to the Internet, you need a firewall. If it’s for a business, get a hardware firewall. A hardware firewall is also an ideal choice for home. If you use dial-up Internet access, a software firewall (such as XP SP2) would be a good choice.
Internet Security: Step 5

Practice Safe Surfing – Use a Firewall
Internet Security: Step 5

A basic hardware firewall costs only $40

A hardware firewall with VPN and wireless connectivity costs $180
Spam

Spam is defined by Webster's as:

“Unsolicited e-mail, often of a commercial nature, sent indiscriminately to multiple mailing lists, individuals, or newsgroups; junk e-mail”
Internet Security: Step 6

Spam Facts:

- It’s Really Annoying
- 85% of email traffic flowing on the Internet is SPAM
- It’s illegal in many states
- Often leads to Spyware
- It’s a fact of Internet Life
Internet Security: Step 6

Stopping SPAM

Our best chances at reducing SPAM come from:

• Not giving out your email address to strangers
• Never ‘unsubscribe’
• Using SPAM filtering software to sort it out for you
Insights into the mind of a Computer Guy ....

People pay us to tell them to reboot their computers
Internet Security: Step 7

Spyware

- New beast in town
- Utilizes and controls your computer without your knowledge, acquiring information about you, etc.
- A.k.a. AdWare
Spyware Infested PC
Spyware Infested PC
Spyware Infested PC
Internet Security: Step 7

Spyware Symptoms

- Uncontrolled Popups
- Computer is slowing down
- You can hear the hard drive always working, even while idle
Internet Security: Step 7
Spyware

What to do about it:

• Anti-Spyware and Adware Software
  – No clear best of class
    • AdAware
    • PestPatrol
    • Microsoft Malicious Software Detection Tool
    • Symantec Antivirus Corporate

• Install a Popup blocker

• Prevention is best
Internet Security: Step 7

Spyware

Be Spyware aware

• Don’t be suckered by popups, close using the X or Alt-F4
• Free software really isn’t free
• Use Business PCs for Business Purposes