Disclosure Information

I hereby declare that I have had business or personal interests in the following industrial enterprises since 1 September 2016:

Name of the enterprise / Nature of the interest

<table>
<thead>
<tr>
<th>Enterprise</th>
<th>Interest</th>
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<td>Nothing to declare</td>
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FROM TELEPATHOLOGY TO
TELEMEDICINE AND BACK
Digital pathology in routine diagnostic pathology - Zagreb 25 years experience

Sven Seiwerth
Institute of Pathology UZSM;
Adil Dzubur
VAMSTEC
Zagreb, Croatia
HOW IT ALL STARTED

• 1989/1990 – SFORM
• 1993/1994 – PHAROS
• 1996/1997 - ISSA
FIRST STEPS IN TELEPATHOLOGY

PHAROS
Telemedical system - image and data transfer, whiteboard interactive communication, consultation chart
please give me this region with obj, 6.3

[sven]: "Patchwork" image of whole specimen - low magnification
[sven]: the longest sample diameter is 12 mm approx
[sven]: Basal cell carcinoma
obj. x25 please

[sven]: "Patchwork" image of whole specimen - low magnification
[sven]: the longest sample diameter is 12 mm approx
[sven]: Basal cell carcinoma
KEY PROBLEMS (1998/99)

- Large number of high quality images
  > 1,200 KB/image
  - 6 - 12 images/patient

- POTS
- Internet
- ISDN
- ATM
- Satellite

AVAILABILITY & FEASIBILITY
SYSTEM ELEMENTS

REQUIREMENTS

Fast
Reliable
Not expensive

MODE
Live/Still image
Interactive
Store and forward

SOCIO-ECONOMIC ENVIRONMENT
MORE VISUAL DATA

ISSA - IMAGE DATA-BANK

DIFFERENT SOURCES

EASY COMPARISON
STILL IMAGE STORE AND FORWARD

Very applicable

Interactive telemedicine is rarely used

Main reason:

experts requested for consultation are usually not available immediately
“CLASSICAL” STORE AND FORWARD
DYNAMIC STORE AND FORWARD
LIVE SEQUENCE TRANSFER TIME

- Transfer times for 15 MB sequence:
  - modem 33.6 kbs: 74 min
  - ISDN 128 kbs: 20 min
  - ADSL ~500 kbs: 5 min
Live Ultrasound Sequence

Live Diascopic Sequence
BENEFITS

- Low cost system, based on PC standards
- Conforms to all medical imaging standards
  - DICOM, FDA Approved
- Suitable also for developing countries
  - Low hardware and software costs
  - Low telecommunication charges
- Multimodality
  - Pathology, endoscopy, X-ray, CT, MRI, dermatology etc.
- Scalable
  - additional stations for growing user needs
National teleradiology network
1998.
33 CT i MRI
28 hospitals
19 cities

Referral center for teleradiology in neurosurgery
NRK-KBC Zagreb

> 400,000 km
of patient transportation was saved
Due to time consumption/costs in preparing teleconsultation and/or digitalizing slides for consultation vs sending slides/blocks

NO NATIONAL TELEPATHOLOGY CONSULTATION SERVICE

BUT TELE(NEURO)RADIOLOGY AND PARTS OF ISLAND TELEMEDICINE ARE WELL FUNCTIONING
UTMB, Galveston, Texas
Telepathology, Teleradiology,
Ship telemedicine
LATEST (since 2016)

- McMurdo, Palmer and Scott-Amundsen Antarctic Bases. UTMB, Galveston Texas rendering telemedical service. VAMSTEC - Issa/Pharos teleradiology
PACS-based organization of Pathology Institute.
Before integration:

INFORMATIC CHAOS
First step

- Quantitative pathology
- Radiology scanner

PATHOLOGISTS

RESIDENTS

TYPISTS

ISSA Web server
www.Telemed.mef.hr

ISSA server

Central UZSM Server Facility
University of Texas Medical Branch, Pathology

Location: Galveston, Texas
Install Date: July 2002
MOBILITY IN TELEPATHOLOGY/TELEMEDICINE
Project: mobile frozen-sections unit.

- Smaller hospitals-surgery requiring frozen sections is not performed on a daily basis.
- The telepathology system is not in full use, producing an unfavourable cost-benefit ratio.
- Fully equipped frozen-sections lab yields additional costs.
- Personnel cutting frozen sections only occasionally, produces suboptimal results.
INTEGRATING STRUCTURED REPORTING INTO PATIENT DATA MANAGEMENT SYSTEM
Integrating virtual slides into a PACS-based patient management system

PATHOLOGISTS AND RESIDENTS

Quantitative pathology
Radiology scanner

ISSA server

ISSA Web server
www.Telemed.mef.hr

Ethernet

Central UZSM Server Facility

SLIDE SCANNER (Hamamatsu)
HIIM (CBRI)
Management of virtual slides

• Huge amount of data
  – Storage („acute” and long time)
  – Manipulating
  – Integration in complex IS
• Different generation protocols and reading software
• No compatibility

Virtual slides are already integrated in a Digital Pathology System controled by a specialised software comparable to PACS.
Multilayer connection between PACS/PIS and the VS archive
Preparat predstavlja dio plućevine s znatno proširenim bronhom čiji lumen je ispunjen gustom, hiperviskoznom sluzi. Bronhalne žlijezde su proširene, a u sluzi se nalaze kozinofili, dok su u stijenci prisutni kozinofili i limfociti.
UNDER WAY

• Bar coding (so far only Clinical orders and wet storage). Scanning available.
  — Workflow tracking; Archiving
• Computer dictation (speech mike)
  — Voice recognition