Collaborative Consultation Relevant to the Laryngeal Diseases: A Case Study using CoMed

Mee Young Sung
University of Inchon
South Korea

http://marvel.inchon.ac.kr/~mysung
mysung@lion.inchon.ac.kr
Collaborative Consultation

- Overview of CoMed
- A Case Study
- Conclusions
CoMed:
A Web-based Real-time Collaborative Medicine System
Multimedia and Laryngology

- Data on laryngeal patients can be multiform
  - the doctor's textual memo of the patients
  - the numeric data from the result for the analysis, for example, blood analysis
  - the image data for the radiological examination
  - the sound data from the stethoscope
  - the audio data for the voice sound
  - the motion picture of the walking test
  - the facial expression
  - the video data for the movement of the vocal folds, etc.
What we can do with CoMed

**Database**
- Access multimedia medical DB by 5 user levels
- Register patient records
- Search patient records
- Convert search results into the Excel files

**Collaboration**
- Web browser sharing
- Using whiteboard
- Chatting
- Teleconferencing
- Using multi-agent system for conference calling
Functional Structure

- Login
- User Registration
- Main
  - Register Patients
  - Search Patients
  - User Management
  - Web sharing
  - White board
  - Tele-conferencing
  - Web board
  - Registered Result
  - Search Result
  - Add Users
  - User Info.
  - Delete User
  - Collaboration
  - Collaboration
  - Collaboration
  - Q & A
  - Delete Patient
  - Result in detail
  - Result
  - Info. in detail
  - Update
  - Update

MD Anderson Grand Rounds
Login

- Five login levels
  - Administrator
  - Senior Doctor
  - Junior Doctor (Resident)
  - Nurse/Paramedic
  - Patient/Guest
Data Registry [1]

### Patient ID

<table>
<thead>
<tr>
<th>Field</th>
<th>Required</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Yes</td>
<td>Enter name</td>
</tr>
<tr>
<td>Sex and Age</td>
<td>Yes</td>
<td>Select male or female</td>
</tr>
<tr>
<td>Chart No.</td>
<td>Yes</td>
<td>Enter chart number</td>
</tr>
<tr>
<td>Resident Registration Number</td>
<td>Yes</td>
<td>Enter registration number</td>
</tr>
<tr>
<td>Address</td>
<td>No</td>
<td>Enter address</td>
</tr>
<tr>
<td>Phone Number</td>
<td>No</td>
<td>Enter phone number</td>
</tr>
<tr>
<td>Permanent Domicile</td>
<td>No</td>
<td>Enter permanent domicile</td>
</tr>
<tr>
<td>Occupation (in detail)</td>
<td>No</td>
<td>Enter occupation</td>
</tr>
<tr>
<td>Smoking: pack/day x years, quit at</td>
<td>No</td>
<td>Enter smoking details</td>
</tr>
<tr>
<td>Alcohol: 0, Never, 1, Occasional, 2, Moderate, 3, Heavy</td>
<td>No</td>
<td>Enter alcohol consumption</td>
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* is mandatory
### Data Registry [2]

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<th>Disease</th>
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<tr>
<td><strong>Side:</strong></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>Rt, Lt, Both, Midline,</td>
<td></td>
<td></td>
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<tr>
<td><strong>Clinical Stage (AJCC):</strong></td>
<td>T</td>
<td>N</td>
<td>M</td>
<td></td>
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<td></td>
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<tr>
<td><strong>Pathologic Stage:</strong></td>
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<td>N</td>
<td>M</td>
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<tr>
<td><strong>Pathology:</strong></td>
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<tr>
<td><strong>Dis Meta (if any):</strong></td>
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<td></td>
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<tr>
<td><strong>Double Prim (if any):</strong></td>
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<tr>
<td><strong>Comment for Disease:</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Picture:</strong></td>
<td></td>
<td>Upload</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Move:</strong></td>
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<td>Upload</td>
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</tr>
<tr>
<td><strong>Sound:</strong></td>
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<td>Upload</td>
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## Neck

<table>
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<tr>
<th>L/N Level</th>
<th>Right Neck</th>
<th>Left Neck</th>
<th>Right Neck</th>
<th>Left Neck</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Clinically (+) L/N</td>
<td>Removed L/N</td>
<td>Clinically (+) L/N</td>
<td>Removed L/N</td>
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<tr>
<td>Submental</td>
<td>Ia</td>
<td>Ia</td>
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<td>Submand.</td>
<td>Ia</td>
<td>Ia</td>
<td>Ia</td>
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<tr>
<td>Upper Jug.</td>
<td>II</td>
<td>II</td>
<td>II</td>
<td>II</td>
</tr>
<tr>
<td>Mid Jug.</td>
<td>III</td>
<td>III</td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td>Lower Jug.</td>
<td>IV</td>
<td>IV</td>
<td>IV</td>
<td>IV</td>
</tr>
<tr>
<td>Posterior</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
</tr>
<tr>
<td>etc.</td>
<td>VI</td>
<td>VI</td>
<td>VI</td>
<td>VI</td>
</tr>
<tr>
<td>Removed Struture</td>
<td>SCM □</td>
<td>GAN □</td>
<td>IJV □</td>
<td>CA □</td>
</tr>
<tr>
<td>Other comment</td>
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## Data Registry [4]

### Tx and F/U

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<tr>
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<th>Event Code</th>
<th>Description</th>
<th>Response</th>
<th>Tumor Status</th>
<th>Patient Status</th>
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</tbody>
</table>
Data Registry [5]

Tx Summary & Fill_Up Information

<table>
<thead>
<tr>
<th>Fill_Up Dr.</th>
<th>Fill_Up Date</th>
<th>Password</th>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>
## Data Search

### Search Result

Select Record = 5  
Page Count = 1

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Gender</th>
<th>Age</th>
<th>Chart No.</th>
<th>Resident Registration Number</th>
<th>Telephone</th>
<th>Site</th>
<th>Fill-Up Dr.</th>
<th>Select</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>유석철</td>
<td>Man</td>
<td>58</td>
<td>1384119-9</td>
<td>530201-1267311</td>
<td>064)746-7047</td>
<td>LXG</td>
<td>성명훈</td>
<td>☑️</td>
</tr>
<tr>
<td>52</td>
<td>정준채</td>
<td>Man</td>
<td>26</td>
<td>1384120-9</td>
<td>750606-1631720</td>
<td>02-939-2355</td>
<td>NPP</td>
<td>김동영</td>
<td>☑️</td>
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<tr>
<td>53</td>
<td>전현주</td>
<td>Man</td>
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<td>1384125-9</td>
<td>750417-1394334</td>
<td>02-234-5384</td>
<td>NPI</td>
<td>성명훈</td>
<td>☑️</td>
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<tr>
<td>54</td>
<td>이성제</td>
<td>Man</td>
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<td>1384145-9</td>
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<td>OCH</td>
<td>성명훈</td>
<td>☑️</td>
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<tr>
<td>55</td>
<td>장진희</td>
<td>Man</td>
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<td>1384145-9</td>
<td>760902-1483294</td>
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<td>OCH</td>
<td>김동영</td>
<td>☑️</td>
</tr>
</tbody>
</table>

Convert the selected patient(s) into an Excel file
Web Browser Sharing

- Existing web browser
- URL synchronization
- HTML with Java scripts and Java applet
- Synchronous and efficient collaboration
Whiteboard & Chatting

- Sharing all images, drawings or pen-based inputs
- Sharing web pages
- Sharing MS Office documents
- Supporting personal pointers
- Storing and retrieving contents of whiteboard
- Supporting group & one-to-one chatting
Teleconferencing

- Audio conferencing
- Video conferencing
- A control mechanism for maintaining the voice data to be unbroken
  - Variable sized audio buffers
  - Variable number of audio buffers
Multi-agent System

- Propose the most promising dates for the conference

- Agents
  - Facilitator Agent
  - Scheduler Agent
  - Negotiator Agent
  - Group Information Manager Agent
  - Personal Information Manager Agent
  - Interface Agent

- Communication among agents using KQML (Knowledge Query and Manipulation Language)

- Forward Chaining and Back Propagation Network
S. C. Yoo (M/58)

- Chief complaint: voice change (onset: 1999. 0.)
- Systemic review: fatigue in phonation (+)
  dyspnea (-), dysphagia (-)
  cough / sputum (- / -)

- Past medical history: -
- Social history:
  - occupation: volleyball manager
  - smoking: 30 pack-year
  - voice abuse (+)
Case Study using CoMed

- Collaboration between
  - Seoul National University Hospital, Seoul
  - Cheju Provincial Medical Center, Cheju island

- Laryngeal cancer patient
  - S. C. Yoo (M/58)
S. C. Yoo (M/58) [1]

- Chief complaint:
  - Voice change for several months

- Social history
  - Occupation: ex-volleyball manager of national team
  - Smoking: 30 pack-year
  - Voice abuse (+)
S. C. Yoo (M/58) [2]

- 1999.8.9. P/E at SNUH
  - Videostroboscopy finding:
    - Rt. vocal fold hyperkeratotic mass

- 1999.8.10. 1st Laryngeal microsurgery with laser
  - Permanent biopsy: Laryngeal cancer
    (squamous cell carcinoma)

- Follow-up with CoMed

MD Anderson Grand Rounds
S. C. Yoo (M/58)  [3]

  - Videostroboscopy finding:
    - Rt. vocal fold hyperkeratotic lesion

- 1999.10.19. 2nd LMS, SNUH
  - Frozen biopsy: no malignancy
  - Permanent biopsy: keratosis with severe dysplasia

- Further Follow-up with CoMed

- 2000.6.2. Last OPD F/U
  - Videostroboscopy finding: No Evidence of Disease
Current Application of CoMed

- Collaborative consultation on laryngeal diseases
  - Remote community doctor’s consultation
  - Post-treatment follow-up
- Data acquisition
  - Multimedia medical data from multiple sites
- CoMed can be utilized for
  - Solo research
  - Collaborative consultations among medical specialists
  - Telemedicine with participation from patients and medical specialists
Conclusions

- Using CoMed
  - Synchronous & Asynchronous Collaboration
  - Medical Database → Statistical Conclusions

- CoMed can be
  - Be available anytime, anywhere on the Internet
  - Be extensible in using the object database $O_2$ and CORBA
  - Supports some useful facilities for collaboration
  - Minimize efforts while conference calling
Future Work

- More clinical experience to validate the effectiveness of CoMed for collaborative consultation
- Confidentiality of patient’s personal clinical information