Teleradiology in cross-border Healthcare

24 October 2016
Brussels, Belgium

Prof. Dr. Peter Mildenberger
Mainz/DE

Chair, ESR Subcommittee on Professional Issues and Economics in Radiology
Radiologist at University Medical Center Mainz (Germany) including Section Chair of Imaging Informatics

Chair of ESR Subcommitee on „Professional Issues and Economics in Radiology“ (PIER)

User Cochair in IHE – Europe (Integrating the Healthcare Enterprise)

Several other commitments
e.g. DICOM Standards Committee

No disclosures in regards of topics or examples in this presentation
FACTS AND FIGURES ABOUT THE ESR & ECR

66,175 individual members from 155 countries
- 45 European national member societies
- 16 European subspecialty and allied sciences member societies
- 44 non-European national member societies

MAIN ACTIVITIES OF THE ESR: Education and Training, Research, European and International Affairs, EuroSafe Imaging, European Congress of Radiology...

THE EUROPEAN CONGRESS OF RADIOLOGY

25,998 PARTICIPANTS FROM 133 COUNTRIES

8,275 INDUSTRY REPRESENTATIVES
11,796 PROFESSIONAL DELEGATES
5,927 ECR ONLINE VIEWERS
300 EXHIBITORS (26,000m²)
WHY TELERADIOLOGY?

- Geographically understaffed regions
- Access to experts, enabling subspecialisation
- Behaviour of radiologists ("Work-Life-Balance")
- Night-services (out-of-office-hours)
- Shortage of radiologists
RADIOLOGICAL WORKFLOW
AND ASSOCIATED STEPS

- Justification
  - Clinical conditions & questions, history & former exams, patient information & consent
- Protocol Definition
  - Select appropriate method, no. of phases, dose level etc.
- Imaging Procedure
  - Almost performed by technicians, but placement of protection material, device status (incl. replacement) etc. to be checked
- Image Interpretation
  - Primary reporting or consultation, reporting standards, clearness etc.
- Presentation and discussion with referrers
  - Regular meetings with referrers, presentation of findings, recommendations, interpretation in context with other results etc.
- Quality assurance
  - Peer review, analytics, dose optimisation etc.
TELERADIOLOGY IN EUROPE

- 3 models:
  - hospital employees working off-site shifts
  - commercial companies providing the whole service
  - Expert consultation (2\textsuperscript{nd} Opinion)
- Technology no barrier anymore
- Little international variation in image interpretation
- ESR standardised curriculum for training and lifelong learning
- European Diploma in Radiology as uniform test of competence
- Concerns on justification, accreditation, patient involvement...
TR CROSS-BORDER CASE STUDIES

Leading European TR- and Telepatholgy-Provider

2002 founded by Swedish physicians

2016
- 192 Radiologists
- 7 Pathologists
- 100 additional staff

Off-hours service from Australia

3:00 - 13:00

Courtesy: Alexander Boehmcker, CEO TMC
Distribution of cases in 2015: n=420,000

By section
- On Call; 22%
- MSK 30%
- Body 19%
- Neuro 29%

By modality
- CT/MR 70%
- CR/US/DX; 20%
- Mammo; 6%
- Patho; 2%
- CDxN; 2%

By countries
- UK; 49%
- SWE; 30%
- NO; 12%
- DK; 9%

Discrepancy rates over all, ~10% going through peer review

<table>
<thead>
<tr>
<th>ALL COMPANY</th>
<th>Total 14</th>
<th>Total 15</th>
<th>Jan</th>
<th>Feb</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Avg. 16</th>
<th>KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 5</td>
<td>88.6%</td>
<td>86.3%</td>
<td>80.3%</td>
<td>83.0%</td>
<td>83.5%</td>
<td>83.8%</td>
<td>83.3%</td>
<td>83.9%</td>
<td>82.2%</td>
<td>77.1%</td>
<td>82.5%</td>
<td>80%</td>
</tr>
<tr>
<td>Level 4</td>
<td>8.6%</td>
<td>10.3%</td>
<td>15.6%</td>
<td>12.7%</td>
<td>11.6%</td>
<td>12.5%</td>
<td>12.3%</td>
<td>12.3%</td>
<td>13.4%</td>
<td>17.3%</td>
<td>13.2%</td>
<td>15%</td>
</tr>
<tr>
<td>Level 3</td>
<td>2.7%</td>
<td>3.3%</td>
<td>3.8%</td>
<td>3.9%</td>
<td>4.4%</td>
<td>3.3%</td>
<td>3.9%</td>
<td>3.4%</td>
<td>3.6%</td>
<td>5.2%</td>
<td>3.9%</td>
<td>4%</td>
</tr>
<tr>
<td>Level 2</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.2%</td>
<td>0.4%</td>
<td>0.4%</td>
<td>0.4%</td>
<td>0.4%</td>
<td>0.3%</td>
<td>0.7%</td>
<td>0.3%</td>
<td>0.4%</td>
<td>1%</td>
</tr>
<tr>
<td>Level 1</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.06%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Courtesy: Alexander Boehmcker, CEO TMC
Client identifies his/her health problem and chooses from a shortlist of pre-filtered specialists.

Client provides symptoms' details and medical documentation (MRI, CT, x-ray, etc.), asks questions.

Client gets medical advice from the specialist, within maximum 5 working days.

PROVIDING PATIENTS WITH EASY ACCESS TO THE WORLD'S TOP MEDICAL SPECIALISTS
ESR PUBLICATIONS ON TELERADIOLOGY

• 2006: Teleradiology in the European Union White Paper

• 2014: ESR white paper on teleradiology
  • an update from the teleradiology subgroup

• 2016: ESR teleradiology survey
  • 2 surveys: - national radiology societies in Europe
    • practising radiologist ESR members
ESR PUBLICATIONS ON TELERADIOLOGY

• 2014: ESR white paper on teleradiology: an update from the teleradiology subgroup

• Teleradiology services are increasingly integrated in the workflow of radiology departments

• Technological possibilities open the way for cross-border healthcare services including teleradiology

• Teleradiology should be part of the spectrum of radiology services, not a separate tradable commodity

• The same quality standards should apply to images and reporting

• Patients need to be fully informed when teleradiology is used
Can patients refuse that their images are "outsourced" for teleradiology?

- 58.5%: No, they don't know that their images are being outsourced
- 21.4%: Yes they are able to refuse it and to chose another solution
- 10.4%: Yes they are able to refuse it but then there's no alternative
- 9.7%: I don't know
AREAS FOR IMPROVEMENT in eHEALTH (SELECTION)

- Justification
- Radiation protection
- Reporting
- Documentation & Quality Assurance
- Communication & Access
Table 5.4. The Top 20 total frequencies of x-ray procedures per 1000 of population for all countries and for the main groups (plain radiography, fluoroscopy, computed tomography and interventional radiology). LV: no Top 20 data provided. Plain radiography of the Top 20 method does not include dental procedures.

<table>
<thead>
<tr>
<th>Country</th>
<th>Plain radiography</th>
<th>Fluoroscopy</th>
<th>Computed tomography</th>
<th>Interventional radiology</th>
<th>TOP 20 total frequency per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>514,9</td>
<td>22,8</td>
<td>63,4</td>
<td>0,4</td>
<td>602</td>
</tr>
<tr>
<td>BE</td>
<td>487,6</td>
<td>15,9</td>
<td>164,3</td>
<td>11,5</td>
<td>679</td>
</tr>
<tr>
<td>BG</td>
<td>248,7</td>
<td>15,5</td>
<td>33,3</td>
<td>0,8</td>
<td>298</td>
</tr>
<tr>
<td>CH</td>
<td>445,2</td>
<td>7,8</td>
<td>88,5</td>
<td>2,4</td>
<td>544</td>
</tr>
<tr>
<td>CY</td>
<td>323,7</td>
<td>10,8</td>
<td>95,6</td>
<td>1,9</td>
<td>432</td>
</tr>
<tr>
<td>CZ</td>
<td>617,1</td>
<td>13,1</td>
<td>87,4</td>
<td>5,2</td>
<td>723</td>
</tr>
<tr>
<td>DE</td>
<td>357,5</td>
<td>28,4</td>
<td>104,9</td>
<td>2,8</td>
<td>494</td>
</tr>
<tr>
<td>DK</td>
<td>274,2</td>
<td>3,7</td>
<td>76,5</td>
<td>1,6</td>
<td>356</td>
</tr>
<tr>
<td>EE</td>
<td>359,1</td>
<td>11,1</td>
<td>143,2</td>
<td>1,4</td>
<td>515</td>
</tr>
<tr>
<td>EL</td>
<td>466,9</td>
<td>21,3</td>
<td>93,8</td>
<td>1,7</td>
<td>584</td>
</tr>
<tr>
<td>ES</td>
<td>637,1</td>
<td>12,1</td>
<td>88,8</td>
<td>1,3</td>
<td>739</td>
</tr>
<tr>
<td>FI</td>
<td>367,7</td>
<td>5,0</td>
<td>58,4</td>
<td>1,4</td>
<td>432</td>
</tr>
<tr>
<td>FR</td>
<td>452,9</td>
<td>9,7</td>
<td>108,9</td>
<td>2,0</td>
<td>573</td>
</tr>
<tr>
<td>HR</td>
<td>311,1</td>
<td>22,9</td>
<td>43,2</td>
<td>2,2</td>
<td>379</td>
</tr>
<tr>
<td>HU</td>
<td>750,7</td>
<td>27,3</td>
<td>97,5</td>
<td>1,9</td>
<td>877</td>
</tr>
<tr>
<td>IE</td>
<td>540,7</td>
<td>9,9</td>
<td>59,2</td>
<td>4,0</td>
<td>614</td>
</tr>
<tr>
<td>IS</td>
<td>340,9</td>
<td>11,9</td>
<td>140,4</td>
<td>2,4</td>
<td>496</td>
</tr>
<tr>
<td>IT</td>
<td>459,0</td>
<td>15,4</td>
<td>116,2</td>
<td>2,5</td>
<td>593</td>
</tr>
<tr>
<td>LT</td>
<td>650,5</td>
<td>34,7</td>
<td>51,2</td>
<td>1,4</td>
<td>738</td>
</tr>
<tr>
<td>LU</td>
<td>406,1</td>
<td>10,3</td>
<td>167,3</td>
<td>0,9</td>
<td>584</td>
</tr>
</tbody>
</table>
TELERADIOLOGY REFERRALS

- Quality of imaging referrals key to appropriate imaging
- In teleradiology, communication between referrers and radiologists can be challenge
- ESR advocates decision support for imaging referrals to improve appropriateness – ESR iGuide
- Access to referral guidelines within electronic workflows:
  - supports referrer in selecting appropriate procedure
  - provides clear indications for teleradiologists
- Clinical Decision Support (CDS) facilitates application of evidence-based standards and more consistent clinical practice
- National or even local specific adoption possible
  - e.g. limited MR capacity
RADIATION PROTECTION

• Indicating and selecting the appropriate imaging is very relevant in respect of radiation protection
• esp. CT-exams are increasing globally
• Medical exposures similar to / outweigh natural radiation already
• Careful planning of imaging protocols relevant
• Benchmarking limited by different coding systems
• Imaging quality and radiation protection optimized with “up-to-date” equipment (ESR publication on Renewal of Equipment, 2014)
REPORTING

- Reporting almost widely different by institution, personal behaviours, access to history & former imaging studies
- Language issues
  - Patient don’t understand reports well, increased when in other languages
- “Suboptimal” or defensive reporting could lead to additional, probably risky follow-up examinations
- Radiological societies and Standardisation / Profiling bodies (DICOM / IHE) are working on “Structured Reporting” globally
- “Structured Reporting” (IHE MRRT profile) enables categorisation, coding, improved clearness, data-mining, well accepted by referrers
  - Basic tools are available
  - Common understanding of coding suboptimal
  - Structured and coded reports could reduce language barriers
• Personal relationship between radiologists and patient and/or referrers improves interpretation (wording, recommendations etc.)
• Radiology is a key player in “Multidisciplinary Team Meetings”
  • -> special challenges for cross-border teleradiology
  • eHealth and videoconferencing could be helpful
• Access to patient history and former imaging studies mandatory
• Documentation of radiation exposure and findings part of the reporting (EU legislation on Basic Safety Standards 2013)
• Dose reports could be used (anonymously) for benchmarking and quality assurance / improvement (IHE REM profiles)
• Standardisation on eHealth infrastructure throughout Europe
• Patient access to their informations should be guaranteed
<table>
<thead>
<tr>
<th>Country</th>
<th>Profiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>XCA, PDQV3, XDS, ATNA, CT, PIXV3, PDQV3, PDQ, XUA, XDS-I</td>
</tr>
<tr>
<td><strong>CDA R2 based Profiles</strong></td>
<td>XD-Lab, XDS-MS, XDS-SD</td>
</tr>
<tr>
<td>Austria regions</td>
<td>XDS, ATNA, CT, PIXV3, PDQV3, PDQ, XUA, XDS-I, XD-Lab, XDS-MS, DSUB</td>
</tr>
<tr>
<td>US States (Vermont, New York, Texas, Pennsylvania, etc.)</td>
<td>XCA, XCPD, XDS, ATNA, CT, PIXV3, XUA, BPPC, DSUB.</td>
</tr>
<tr>
<td><strong>CDA R2 based Profiles</strong></td>
<td>XDS-XPHR (C-CDA), XDS-SD</td>
</tr>
<tr>
<td>Nagoya City</td>
<td>XDS, XDS-I, PIX, ATNA, XDS-SD, CT</td>
</tr>
<tr>
<td>Dutch regions</td>
<td>XDS, XDS-I, PIX, CT, ATNA, XDS-SD, XD-LAB</td>
</tr>
<tr>
<td>European Cross-Border (epSOS now moving to CEF/DSI)</td>
<td>XCA, XCPD, CT, ATNA, XUA</td>
</tr>
<tr>
<td><strong>CDA R2 based Profiles</strong></td>
<td>XDS-XPHR, XDS-SD, PRE, DIS</td>
</tr>
<tr>
<td>US ehealth Exchange (Sequoia &amp; Care Equality)</td>
<td>XCA, XCPD, CT, ATNA, XUA, XDR</td>
</tr>
<tr>
<td><strong>CDA R2 based Profiles</strong></td>
<td>XDS-XPHR, XDS-SD, PRE, DIS</td>
</tr>
<tr>
<td>US CommonWell</td>
<td>XCA, PDQV3, CT, ATNA, XUA</td>
</tr>
<tr>
<td><strong>CDA R2 based Profiles</strong></td>
<td>US C-CDA R1.1 and R2.1 (based on XDS-XPHR).</td>
</tr>
<tr>
<td>France</td>
<td>XDS, XDS-I, PIX, ATNA, XDS-SD, XD-LAB</td>
</tr>
<tr>
<td>Italian Regions</td>
<td>XDS, PIX, CT, ATNA, XDS-SD, XD-LAB, XDS-I, XDW, DSUB</td>
</tr>
<tr>
<td>Denmark Regions Denmark (PHR)</td>
<td>XDS, XDS-I, PDQ, CT, ATNA, XDS-SD, XD-LAB, XDW, PHMR</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>XDS, XDS-I.b, XCA, XUA, PIX, PAM, PDQ, XCPD, CT, NAV, ATNA, DSUB</td>
</tr>
<tr>
<td>German Regions</td>
<td>XDS, XDS-I, PIX, PDQ, HPD, CT, ATNA, XUA, BPPC, APPC/XACML, XCA, XCPD</td>
</tr>
<tr>
<td>German Case-related electronic patient record (EFA)</td>
<td>XDS, XCA, CT, ATNA, XUA</td>
</tr>
<tr>
<td>Switzerland Regions Switzerland</td>
<td>XDS, XDS-I.b., , XUA, PIX, PDQ</td>
</tr>
<tr>
<td><strong>CDA R2 based Profiles</strong></td>
<td>XDS-XPHR, XDS-SD, XD-Lab</td>
</tr>
<tr>
<td>Slovenia</td>
<td>XDS, PIX, PDQ, CT, ATNA, XUA, BPPC</td>
</tr>
<tr>
<td>Finland</td>
<td>XDS, XDS-I, ATNA, CT</td>
</tr>
<tr>
<td>US Interop Standards Advisory</td>
<td>XDS, HPD, RFD, XCA, XCPD, PIX, PDQ, PIXV3, PDQV3, DEC, DSUB</td>
</tr>
<tr>
<td>US National Record Location Service (Surescript)</td>
<td>XCA, XCPD, CT, ATNA, XUA,</td>
</tr>
<tr>
<td><strong>CDA R2 based Profiles</strong></td>
<td>US C-CDA R1.1 and R2.1 (based on XDS-XPHR).</td>
</tr>
<tr>
<td>Uruguay</td>
<td>XDS</td>
</tr>
<tr>
<td>South Africa</td>
<td>PIX, PDQ, PAM, RID, HPD, MHD, XDS, XDS-SD, XDM, BPPC, XDS-MS, PRE, DIS, PADV, XD-Lab, APS, LDS, XDS-I, ATNA, CT</td>
</tr>
<tr>
<td>Japan</td>
<td>XCA, XDS, PIXV3, ATNA, CT</td>
</tr>
<tr>
<td><strong>CDA R2 based Profiles</strong></td>
<td></td>
</tr>
</tbody>
</table>
ESR POSITION & SUMMARY

• Definition of teleradiology as a medical act
• EU-wide accreditation criteria needed
• Application of international quality standards with Audits
• Full information of patients and informed consent in teleradiology
• Radiological imaging is not “reporting only” – workflows more complex
• Several fields for improvement (coding, reporting, dose registers...)
• Interoperability with optimised IT-Infrastructure relevant for eHealth
  • Inclusion of IHE profiles on Reporting (MRRT) and Radiation dose Exposure Monitoring (REM)
• Provision of teleradiology in the best interest of patients, not as a solution for the shortage of radiologists or cost-cutting measure

→ Always put the patient’s needs and quality of care first!