The role of telemedicine in the organisation of blood transfusion service in Slovenia

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Marko Breskvar
Irena Bricl
The aim of the presentation

To present:

- The telemedicine system in transfusion service
- The reorganisation of blood transfusion service in Slovenia
- The development and implementation of the telemedicine system in Slovenia
- The effects and benefits of using telemedicine in blood transfusion service in Slovenia

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Abbreviations

**TM system** = Telemedicine system

**BTS** = Blood transfusion service in Slovenia

**BTC** = Blood Transfusion Centre of Slovenia, the main national blood establishment in Ljubljana

**CTM** = Centre for transfusion medicine (Maribor, Celje)

**CTS** = Centre for transfusion service, i.e. remote unit of blood establishment
Introduction of the BTS in Slovenia

- 2 million inhabitants

- Blood transfusion service of Slovenia consists of 3 main blood establishments:
  - Blood Transfusion Centre of Slovenia with its 6 remote units (CTSs) at other locations
  - Centre for Transfusion Medicine Maribor with its 2 remote CTSs
  - Centre for Transfusion Medicine Celje

- Transfusion numbers for 2012:
  - 62,000 blood donors (10% new donors)
  - 97,000 blood collections (45% mobile session)
  - 200,000 prepared components
  - Issued components:
    - 89,000 RBCs
    - 11,400 Platelets (8,000 BC + 3,400 apheresis)
    - 31,000 FFP
Telemedicine is the delivery of healthcare services with the help of Information and Communication Technologies (ICT) in a situation where the actors are not at the same location.

- Acceptance of the request
- Audit of the request
- Transfusion lab tests performance
- Preparation of telemedicine session
- Remote interpretation and validation of the results
- Electronic signature
- Allocation and delivery of blood components
The basic concept of telemedicine activity =
Open session → Question → Answer

<table>
<thead>
<tr>
<th>LABORATORY TECHNICIAN</th>
<th>Acceptance of a request for blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>in remote CTS without MD</td>
<td>Transfusion lab tests performance</td>
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<tr>
<td></td>
<td>Preparing telemedicine session</td>
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<tr>
<td></td>
<td>Sending question to a teleconsultant on duty</td>
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</table>

<table>
<thead>
<tr>
<th>TELECONSULTANT</th>
<th>Interpretation of laboratory results from gel cards</th>
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<tbody>
<tr>
<td>Transfusion medicine specialist</td>
<td>Discussion on the case, optional order of additional tests</td>
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<tr>
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<td>Electronic signature</td>
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<tr>
<td></td>
<td>Sending back the session with results</td>
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</table>

<table>
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<tr>
<th>LABORATORY TECHNICIAN</th>
<th>Export of the results to transfusion IT system Datec</th>
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<tr>
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<td>Confirmation of the results in transfusion IS Datec</td>
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<td>Printing of the results</td>
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<td>Delivery of blood components</td>
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Digital data acquisition for remote reading

**Scanned documents**
Request, panel list, ...

**Laboratory tests**
Pretransfusion, prenatal tests: AB0-RhD, Ab screening, XM...

**Data from host transfusion IS**
Patient history, laboratory tests history
Donors data: AB0-RhD, ICT, ...

**Telephone consulting**
Patient data from hospital
Professional discussion

**Transfusion medicine specialist**

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Timeline of telemedicine and reorganisation of BTS

Telemedicine System

Stage 1
- start of the project
- introduction of TM1 in all transfusion centres

Stage 2
- start of the new TM2 system development

Stage 3
- implementation of the TM2 system


Reorganisation

- remote units (CTSs) of the Ljubljana establishment
- remote units (CTSs) of the Maribor establishment

CTS Novo mesto
CTS Trbovlje
CTS Slovenj Gradec
CTS Izola
CTS Jesenice
CTS Murska Sobota
CTS Nova Gorica
CTS Ptuj

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Actual organisation of BTS in Slovenia

- Centre for transfusion service Slovenj Gradec
- Centre for transfusion service Izola
- Centre for transfusion service Jesenice
- Centre for transfusion service Trbovlje
- Centre for transfusion service Novo mesto
- Centre for transfusion service Nova Gorica
- Centre for transfusion service Ptuj
- Centre for transfusion service Murska Sobota
- General hospital Celje
- Centre for transfusion medicine Celje
- University clinical Center Mb
- Centre for transfusion medicine Maribor
- Hospital Blood Bank Brežice
Collected units in Slovenian BTS

Collected units in 2012

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>No of collected units/ year</th>
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<td>CTS Trbovlje</td>
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<td>CTS Slovenj Gradec</td>
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<td>5.600</td>
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<td>CTS Jesenice</td>
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<tr>
<td>CTS Nova Gorica</td>
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<tr>
<td>LJUBLJANA</td>
<td>65.700</td>
</tr>
<tr>
<td>CTM Maribor</td>
<td>13.300</td>
</tr>
<tr>
<td>CTS Ptuj</td>
<td>4.000</td>
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<tr>
<td>CTS Murska Sobota</td>
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<tr>
<td>MARIBOR</td>
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<tr>
<td>CTM Celje</td>
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<tr>
<td>CELJE</td>
<td>9.900</td>
</tr>
<tr>
<td>SLOVENIA</td>
<td>97.300</td>
</tr>
</tbody>
</table>
Pretransfusion testing before reorganisation

- Performed at 14 locations:
  - 1 BTS of Slovenia
  - 10 transfusion departments at regional hospitals
  - 3 laboratories at (maternity) hospitals

- Results were interpreted and validated by a transfusion medicine specialist or by trained clinicians from hospitals

- Clinicians were trained in two weeks’ course to release negative and expected results

- In cases with positive or unexpected results, lack of experience could cause delayed transfusions, because the samples were sent to the BTC of Slovenia or CTM Maribor

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The idea for the development of TM system

- Remote interpretation of pretransfusion tests by a TM specialist:
  - for professional discussion between two TM specialists in solving special cases
  - to advise clinicians on duty who are involved in interpretation and validation of pretransfusion testing for their patients
  - to reduce sending blood samples to Reference laboratory by selection of cases
  - to speed up the blood components release
The development and implementation of TM1

Stage 1

- TM1 system was developed in cooperation of experts from BTC of Slovenia and University of Ljubljana, Faculty of Electrical Engineering.

- In 2005, a pilot application of TM1 system was developed as laboratory system for a range of 100 cases per year.

- A device for imaging laboratory gel cards (gelscope) was developed.

- By 2008, it was implemented in all CTs.
Teleconsultations between 2005–2008

Stage 1

Ljubljana

Jesenice

Nova Gorica

Izola

Trbovlje

Celje

Novo Mesto

Maribor

Ptuj

Murska Sobota

Hungary

Austria

Croatia

Italy

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Problems after the reorganisation of BTS

- The organisation of work at the remote CTDs became a responsibility of BTC of Slovenia and CTM Maribor.

- Clinicians from hospitals did not participate in the transfusion service any more (exception emergency cases).

- The Competent authority demanded equal service 24/365.

- 9 remoted locations = 9 transfusion medicine specialists needed 24/365, but only few were available.

TM system offered a solution to pretransfusion testing

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After 2008, the purpose of TM1 system has been extended from consultation in special cases to routine pretransfusion testing in day time.

The number of TM sessions increased substantially.

Since 2009, its use has been extended until the evening.

Since July 2011, two teleconsultants in Slovenia have been on duty 24/7/365.
TM sessions after reorganisation of BTS

Stage 2

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The frequency of TM sessions

Number of TM sessions

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References for TM1


Development of the new TM2 system

Reasons:

- TM1 system has not been designed for up to 20,000 cases a year
- Upgrade of existing (laboratory) platform was no longer possible
- A new professional TM system with redundancy was needed
- New professional requirements
- A need to increase safety
Development and implementation of the new TM2 system

Stage 3

- End of 2011 – Public tender for the development of new TM2 system
- Tender was awarded to the Slovenian IT company XLAB Ltd.
- During 2012, TM2 system was developed in cooperation with experts from BTC of Slovenia
- End of 2012 – testings, validation and training of consultants and laboratory technicians
- February 2013 – Launch of the TM2 system in all CTs

- TM2 system has new professional functionalities
- Maintenance & support 24/7
- CE certification in process

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## Improvements in the new TM2 system

<table>
<thead>
<tr>
<th>FUNCTIONALITIES</th>
<th>TM1</th>
<th>TM2</th>
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</thead>
<tbody>
<tr>
<td>Checking of historic AB0</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Types of sessions</td>
<td>Consultation</td>
<td>Datec session</td>
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<td>Status of the session</td>
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<td>State of urgency</td>
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<td>Yes</td>
</tr>
<tr>
<td>Choosing among prepared results</td>
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</tr>
<tr>
<td>Consecutive adding of tests within one session</td>
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# Connection of TM system with host transfusion IS DATEC

<table>
<thead>
<tr>
<th>DATA EXCHANGE (TM vs DATEC)</th>
<th>TM1</th>
<th>TM2</th>
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</thead>
<tbody>
<tr>
<td>Import from host transfusion IS DATEC</td>
<td>• Patient data &lt;br&gt; • Patient AB0 &lt;br&gt; • Sample ID &lt;br&gt; • Medical remarks &lt;br&gt; • Laboratory results history &lt;br&gt; • Issued units</td>
<td>• Patient data &lt;br&gt; • Patient AB0 &lt;br&gt; • Patient K &lt;br&gt; • Orientation AB0 &lt;br&gt; • Sample ID &lt;br&gt; • Medical remarks &lt;br&gt; • Laboratory results history &lt;br&gt; • Issued units &lt;br&gt; • Comments</td>
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<td>No</td>
<td>• Test results &lt;br&gt; • Comments on report &lt;br&gt; • Electronic signature</td>
</tr>
<tr>
<td>Communication protocol</td>
<td>Unsecure (ftp)</td>
<td>Secure (ssh)</td>
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</tbody>
</table>

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Technician prepares the TM session
Inserting gel card into haemoscope
The session arrives to consultant
Request
TM session

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Patient history

**Zgodovina pacienta:**

### 3rd Abbott Diagnostics Global Transfusion Symposium

#### Zdravniški komentarji

<table>
<thead>
<tr>
<th>KOMENTAR</th>
<th>KONEC KOMENTARJEV</th>
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#### Zgodovina pacienta

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<th>DATUM IN URÁ</th>
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<th>ZVID</th>
<th>ZDRAVNIK</th>
<th>KLINIKA</th>
<th>ŠIFRA</th>
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<td>TKTM</td>
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#### Izvid nadomešča izvodi z St. Z0023491 (pogosto začetni podatki)

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#### Anamneza za pacienta

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Enlarged image of gel card
Enlarged image of columns
Screening cells
Electronic signature

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Statistics of TM sessions between 2005-2012

Number of TM sessions

Prediction for 2013: 18,520 [2-10: 13,890]
Statistics of TM2 sessions in 2013

Peaks: 1833/month, 123/day

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### TM2 sessions in 2013

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>TM2 sessions 2-10 2013</th>
<th>Prediction Year 2013</th>
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<tr>
<td>BTC of Slovenia</td>
<td>60</td>
<td>80</td>
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<td>CTS Novo mesto</td>
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<td>CTS Trbovlje</td>
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<td>CTS Jesenice</td>
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<tr>
<td>SLOVENIA</td>
<td>13.890</td>
<td>18.520</td>
</tr>
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</table>

**Prediction Year 2013:** 18.520
Benefits of the new TM2 system

- The TM consultant has access to all available patient data
- IT controls built in the TM2 system improve the safety (checking of historic BG...)
- Electronic export of results from TM2 system to transfusion IS Datec reduces errors
- Redundance and traceability are provided
- The process is faster because less work is needed
- User-friendly for technicians and consultants
Impact of TM on BTS in Slovenia

- Equal quality / interpretation of the IH results
  - Due to the TM system, pretransfusion testing in Slovenia is supervised 24/365 by transfusion medicine specialists only (previously partial coverage)

- Lower costs
  - Reduction in the number of transfusion medicine specialists in CTDs:
    - In 2000: 13 full time + 1 part time job
    - In 2013: 5 full time + 4 part time job
  - Allocation of some transfusion medicine specialists to the BTC of Slovenia and CTM Maribor
Impact of TM on BTS in Slovenia

- Quicker responding time in complex cases
  - More cases are solved on site
    - Laboratories are equipped with panel cells and reagents
  - Fewer samples are transported to the Reference laboratory

- Rationalisation of activities
  - One consultant in the Ljubljana region is responsible for 6 CTSs + 1BB, another one in the Maribor region for CTM Maribor + 2 CTSs 24/365
  - Since the consultant can work from any location, all transfusion medicine specialists can be engaged
Impact of TM on BTS in Slovenia

- Standardisation of testing procedures
  - The use of the TM system required the standardisation of testing procedures

- So far, the TM system has been the only transfusion IS that connects all CTs in one TM region
  - It enables the checking of patients' data from other CTs
Conclusions

- TM enables remote interpretation of pretransfusion testing
- TM provides the same quality / interpretation of pretransfusion testing in all BTS sites
- TM helped in the reorganisation of national BTS
- TM is the key element of BTS in Slovenia today
- TM enables further rationalisation in the organisation of national BTS
Thanks to

Prim. Irena Bricl, MD
Invitation

Telemedicine system TM2 will be presented by our partner XLAB at

MEDICA 2013
World Forum for Medicine

International Trade Fair
November 20-23, 2013
Düsseldorf, Germany