Slovenian national telemedicine system for remote interpretation of red cell laboratory testing

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Aim of the presentation

To present:

- The use of telemedicine (TM) in Slovenian blood transfusion service (BTS)
- TM system named TeleTransfusion
- Impact of TM on:
  - patient safety
  - organisation of work
  - BTS – hospitals relationships
Blood transfusion service in Slovenia

- 2 million inhabitants

- BTS network consists of 3 main blood establishments and 8 remote Transfusion centers (TCs) and one Blood bank (BB):
  1. Blood Transfusion Centre of Slovenia (BTCS) with 6 affiliated remote TCs and 1 BB
  2. Centre for Transfusion Medicine (CTM) Maribor with 2 affiliated remote TCs
  3. CTM Celje

- Main data for 2014:
  - 62,000 blood donors (11% new donors)
  - 93,000 blood collections (45% mobile session)
  - 185,000 prepared components
Telemedicine

**Telemedicine (TM)** 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.

- In Slovenia TM in transfusion medicine (**TeleTransfusion**) is used for centralised remote interpretation of pre-transfusion and prenatal tests in Transfusion centers (TCs), whenever transfusion medicine physician (TMP) is not on site.

- Timeline of TM use:
  - 2005-2008 used as expert opinion for special patients
  - after 2008 used also for routine cases
Slovenian BTS before 2008

In 11/14 transfusion sites PTT was interpreted by:
- TMP on-site during the day or TMP on standby and called in when needed
- trained physicians of other specialities during out-of-routine hours: afternoons, nights, weekends, holidays
Development of TM system: objectives

- to allow an expert opinion to TMPs on other locations when solving special cases
- to advise clinicians on duty involved in interpretation of PTT for their patients
- to reduce sending blood samples to the reference laboratory by selecting cases
- TM system jointly developed by experts from BTCS and University of Ljubljana, Faculty of Electrical Engineering\(^1\).

Reorganisation of BTS

- reorganisation of Slovenian BTS occurred between 2008 and 2013
- former Transfusion departments of regional hospitals gradually became remotely located Transfusion centers of BTCS Lj (7 TCs) and CTM Mb (2 TCs)
- organisation of work at the remotely located TCs became responsibility of BTCS and CTM Maribor
- treating physicians from hospitals did not participate in the transfusion service any more (except for emergency cases)
- shortage of TMPs for continuous (24/7) organisation of work at 9 remotely located TCs

TM was a solution for interpretation of red cell laboratory testing in remote TCs

Slovenian BTS in 2015

- **BTCS**: Blood Transfusion Centre of Slovenia
- **TC**-remotely located unit of BTCS
- **CTM Maribor/CTM Celje**
- **TC**-remotely located unit of CTM Maribor
- **BB**: Hospital blood bank

- **Hungary**
- **Croatia**
- **Italy**
- **Austria**

- **BTCS Ljubljana**
- **TC Trbovlje**
- **TC Novo mesto**
- **TC Ptuj**
- **CTM Celje**
- **TC Murska Sobota**
- **TC Nova Gorica**
- **TC Slovenj Gradec**
- **TC Jesenice**
- **TC Izola**
- **BB Brezice**

- **blood collection**: 9 sites
- **viral donor testing**: 2
- **IH donor testing**: 2
- **component production**: 3
- **pretransfusion testing**: 12 sites
- **NAT testing**: 1

• In 3 main Blood establishements TMP is on site 24/7
• In 9 TCs TM is used for remote interpretation of PTT, when TMP is not on site
TM used routinely after 2008

- After 2008 TM system use extended from expert opinion in complex cases to **routine PTT cases**

- Since July 2011 two TMPs work as teleconsultants on duty **24/7/365** for dislocated TCs in Slovenia:
  - one in the Ljubljana region and
  - one in the Maribor region

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**Number of TM sessions substantially increased**
Two TM regions after 2008

Teleconsultant
Telemedicine use

Reorganisation of BTS

- CTS Novo mesto
- CTS Trbovlje
- CTS Slovenj Gradec
- CTS Novo Gorica
- CTS Jesenice
- CTS Murska Sobota
- CTS Ptuj
- CTS Murska Sobota

No of TM sessions


TM for special cases

TM for routine cases

- Remote units (TCs) became part of the BTCS Ljubljana
- Remote units (TCs) became part of the CTM Maribor
Development of new version of TM system

- TM1 system not designed for up to 20,000 consultations a year
- Upgrade of existing (laboratory) platform no longer possible
- 2012: TM2 system developed by Slovenian IT company XLAB in cooperation with experts from BTCS
- Feb 2013 – Launch of the upgraded TM2 system

Procedures performed in transfusion laboratory before issuing blood components

LABORATORY TECHNICIAN
- Acceptance of a request for blood
- Transfusion lab tests performance
- Preparing TM session
- Sending question to a teleconsultant-TMP on duty

TMP
On site /on distant location
- Interpretation of laboratory results from gel cards
- Discussion on the case, optional order of additional tests
- Digital signature
- Sending back the session with results

LABORATORY TECHNICIAN
- Export of the results to transfusion IT system Datec
- Confirmation of the results in transfusion IS Datec
- Printing of the results with digital signature
- Delivery of blood components

When TMP is not on-site, TM is used
Patient data retrieval from various sources

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

**Images of laboratory tests**
Pre-transfusion and prenatal tests

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

**Bi-directional connection of TM system with host TIS DATEC**
Imported patient history:
previous IH results, commentaries, issued units

Transfusion medicine physician
Technician prepares the TM session

Capturing images of gel cards by haemoscope

Scanning bar-code of the RBC unit tube
The sessions arrive to teleconsultant

| Medical remarks | Request form |
In-built control of AB0 with historical AB0
Interpretation of results

magnified images of gel card and columns
Digital signature

Digital signature (hash extraction)
Number of TM sessions 2005-2014

Year


Number

Extended use of TM

No of cases

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<th>ON-SITE</th>
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Outcomes of TM

- Improved patient safety
- Improved organisation of work at remotely located TCs
- Satisfaction of TM users (consultants and technicians)
- Rationalisation of activities in Slovenian BTS
- Better transfusion service to clinicians without their involvement in PTT
- Cost savings\(^4\)

TM and patient safety

- PTT supervised by TMPs 24/7 nation-wide

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**Safer pre-transfusion practice for sensitised patients:**
from issuing XM-negative units to Ag-negative XM-negative units

- More equal transfusion service provided for all patients nation-wide
- Quicker response, especially in patients with unexpected antibodies
- More cases solved on site
- Fewer samples transported to the Reference laboratory
- Haemovigilance data between 2002-2014 are too limited to prove significant decrease in SARs due to haemolysis (0-2 cases per year)
Responding time to TM sessions: 86% < 1h
Rationalisation of activities

Four TMPs responsible for all TCs 24/7:

- **Teleconsultant in Ljubljana region** (for 6 TCs and 1BB)
- **Teleconsultant in Maribor region** (for CTM Mb and 2 TCs)
- TMD in BTCS Ljubljana
- TMD in CTM Celje

- Teleconsultant can work from any location: all TMPs can be engaged

- Reduction in the number of TMPs in TCs

- Allocation of some TMPs to the BTCS Lj and CTM Mb
Discussion

- A unique experience of using a national TM system for remote interpretation of RC tests, connecting BTS and hospitals nation-wide

- Comparable experiences from other countries: limited

- Patient safety improvement: likely, although Haemovigilance data are too limited to show a significant decrease in SARs

- Satisfaction surveys proved that technicians and teleconsultants highly appreciate using TM and TM system functionalities

Conclusions

- Effective use of national TM system in transfusion medicine expanding in the last decade
- TM enables continuous centralised remote interpretation of RC tests by TMPs
- 24/7 availability of TMP: safer blood supply for patients and timely response in every distant location
- Hospital physicians provided with improved transfusion service without their involvement in PTT
- TeleTransfusion was the first TM system in Slovenia that successfully operates routinely
Thank you for your attention!

Questions?