





# Telehealth/telemedicine services to remotely support patients at home

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## MKS Ltd., Ljubljana profile

- □ R&D micro SME (1990) service integrators & enablers
- Active nationally and internationally
- EU projects
  - NITICS (AAL), ACESO (AAL), Telescope EAHC (Partner)
  - United4Health ICT PSP (Subcontractor)
  - REHA2030 (SI-AT Interreg)
  - EASY-IMP (Personal engagement)
  - 18 unsuccessful applications
- □ National project: Telerehabilitation, Telecare, Obstetrics
- Set-up&run: telemedicine centre CEZAR (2014 GH SG), telecare centre (1991 Ljubljana, 1997 Celje)
- Contribution to the national strategies and legislation (active ageing, long-term care, telehealth, telecare)
- Collaboration with national academic institutions

## Purpose of the lecture

- To get in touch with a telemedicine service for persons with long-term disease
- To have hands-on experience with a telemedicine service (heart failure)
- To be able to **distinguish** among healthcare services when talking about digital health
- To focus on the telemedicine service for supporting persons with heart failure

## Content

- Examples of telehealth (TH)
- Challenges for EU countries
- Telemedicine, telehealth definitions and scope
- Models of telehealth services
- Examples of home telemedicine
  - TM services in GH Slovenj Gradec (**Demo**)
  - TM in the COVID-19 period
- Challenges, obstacles and enablers for services
- Future of home telehealth services

## Telehealth?

#### Healthcare services at a distance: A reality?

#### Yes! Your own experiences:

- Phone call to your personal GP for an advice, medications,...
- Mum's health advice by phone
- Educational programmes/emissions on TV and radio (TV Health channels vs sport channels?)
- Mobile gadgets, apps,....
- Bringing information, suggestions, advices for health or changes in lifestyle

#### Apple iHealth, Google Fit, Prestigio Healthcare... Technology platforms for healthier living style



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# Healthy lifestyle – monitoring of physical activity – FitBit

1004 & 1001	Image: Stars     1     10       Stars     7     200       Image: Stars     1     10       Image: Stars<	Day       Week       Month       Year       Image: Mon, Oct 1         Activity       Image: Activity       Image: Activity       Image: Activity         Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity         Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity         Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity       Image: Activity
	Day Week Month Year Sleep	10,000 steps       25 floors       25         Want to challenge yourself to be more active?       Start a free week trial of the Fibit trainer now!         Calories Burned       Steps       Floors         Time Active       Time Active         Time active (excluding sleep)       Sedentary            • fairly active • fairly active

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# Mobile apps related to health & wellbeing



Apple Health app

https://support.apple.com/enus/HT203037

#### Roche-AccuCheck

https://www.accu-chek.com/datamanagement/connect-app Santigo mobile app

https://www.health-insight.de/

m.taidoc.tdlink.bg&hl=en

## Medication dispensers



### Telerehabilitation at home – REHA2030 robotic post-stroke exerciser



# Telerehabilitation at home – arm excercising



## **EU HEALTH CHALLENGES**

# Chronic diseases – A challenge for today not tomorrow!



Source: British Medical Journal, 26 October 2002

# Multimorbidity – arising challenge with aging of the EU population



### Public expences for healthcare



### Public expences for long-term care



Figure 9: Age profiles for public expenditure on long-term care<sup>39</sup>

# Why changes in healthcare service delivery system are urgently needed?

- Cannot deliver healthcare services within the established frameworks (models, people, costs) in the desired quantity at the requested quality
- Sustainability of the health and social care systems under threat
  - Very high expectations for modern services: excellent diagnostics (e.g. NMR,CT,3D US,...), better medication, no waiting lists,...
  - Increasing labour costs
  - Increasing costs for equipment, medication...
  - Limited financial and human resources

# **European Commission** response to the challenges - principles

- New models and approaches for better healthcare performance
- Promising opportunities brought by ICT (Information and Communication Technologies)
- ICT based services ("Move information not the patient!")
- Patient empowerment
- Inclusion of informal carers (social networks: relatives, friends, neighbours, charities, volunteers...)

# **EU Commission's** recommendations to "Change the focus From –To"



### **European Society for Cardiology** recommendations 2021

Home telemonitoring recommended

Level of recommendation: Class IIb, level B

- Expected impact: reduced risk of repeated cardio-vascular episode and consequently re-hospitalisation
- Advantages:
  - Immediate response to the worsening of health conditions
  - Reduced number of regular visits
  - Reduced costs for patients' transportation to the specialist
  - Patient empowerment at self-treatment
- Huge potential for TM services to improve patient cooperation in the treatment
- Improved patient's adherence to the treatment

## DEFINITIONS

### Definition of Telehealth&Telemedicine

#### Telemedicine

Telemedicine is the provision of **healthcare services** through the use of ICT in situations where the health professional and the patient (or two health professionals) are not at the same location at the same time (time and location separation)

(Source: European Commission)

#### Telehealth

The means by which technologies and related services concerned with **health and wellbeing** are accessed by or provided at a distance for people and/or their carers (at home or in the wider community) in order to facilitate their empowerment, assessment or the provision of care and/or support

(Source: Telescope EU project)

### Telemedicine vs. Telehealth

#### Telemedicine

- Services for illness
- Clinician and nurse led
- Institutional context
- Focus on patients
- **Control**, monitoring of patient
- `Treatment' may promote dependency
- Rooted in 'traditional' way
- Focused market

#### Telehealth

- Services for well-being
- Service or user led
- Home or community context
- Focus on people
- Self-management
- 'Empowerment' can support independence
- Supporting 'new ways'
- Wider and growing market

Source: Adapted from Fisk M. Global Telehealth 2012, Perth, Australia

### Scope of Telehealth&Telemedicine



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Adapted from Fisk M., Med-e-Tel, 2012

### Where to introduce telehealth services?

- Home environment
- Work places
- Recreation facilities
- Nursing homes & homes for elderly people
- Healthcare centres
- Ambulance
- Hospitals
- Remote areas (rural areas, oil rigs,...)
- Prison settings
- Space programmes etc.

## TH services **primary** users

- Healthy people maintaining their health (athletes, fitness users, joggers, pregnant women...)
- Persons in acute phase of illness
- Persons waiting for a surgery and postoperative
- Persons with long-term conditions
  - cardio vascular diseases (hypertension, ventricular arrhythmia, heart failure, vascular diseases...)
  - diabetes type I and II
  - **pulmonological and allergy** problems (COPD, asthma, tuberculosis, allergy, cysticfibrosis...)
  - skeleton injuries
  - dementia, Alzheimer, Parkinson disease
  - psychiatric problems
    - palliative care ....

### Secondary and tertiary users of TH

#### Secondary or indirect users of services

- health/social care professionals
- informal carers (relatives, social network, volunteers, charities...)

#### Tertiary users (stakeholders)

- health insurance agencies
- municipalities
- □ healthcare politics, HC planners

## **TELEHEALTH MODELS**

### B2B and B2P telehealth service models

# Telehealth services

# Participate only service providers

e.g. GP 🗇 specialist

(B2B model)

# Participate service providers and users

e.g. patient ⇔ healthcare worker

(B2P model)

## Telehealth service B2B model



### Examples of B2B model services

- Teleradiology
- Telepsychiatry
- Telestroke
- Teleconsultations
- Teledermatology
- Telesurgery
- Telerehabilitation
- □ Telenursing
- Second opinion, etc.

#### Example of B2B telehealth in Slovenia: Teleconsultations in transfusion medicine



## Telehealth service B2P model



### Examples of **B2P model** services

#### Telemonitoring of vital signs (health parameters)

- Psychiatric support
- Teleconsultations and counselling -Communicating health condition or well-being
- □ **Virtual visits** at home (Healthcare workers)
- □ Support for **medication** at a distance
- Telerehabilitation
- **Triage** prior a visit to a healthcare institution
- Personalised education and/or coaching for healthy life and patients for a sustainable life with the illness
- 🗆 etc.

# Global adoption of telehealth by service type



## HOME TELEHEALTH SERVICES

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### Vital signs monitored by TH services

- blood pressure (systolic / diastolic)
- heart rate
- $\Box$  blood oxygen saturation (SpO<sub>2</sub>)
- blood glucose
- body weight
- body temperature
- pulmunar capacity
- $\Box$  level of CO<sub>2</sub> in exhaled air
- EKG
- □ feelings, emotions assessment
- opinions.....

## Vital sign monitors

- blood pressure meter
- weight scale
- blood glucose monitoring systems - glucometer
- pulse oxymeter (SPO2)
- spirometer PEF/FEW (PEF - Peak Expiratory Flow)
- dermascope
- otoscope
- ECG/cardiac monitor
- pedometer

- pacemaker monitor
- medication dispensers
- medical alert devices
- personal Help devices
- activity monitors
- arrhythmia monitor
- blood anti-coagulation level tester

etc.

## Telehealth infrastructure

- Peripheral equipment vital sign monitors
- Gateways (communicators smart-phones & tablets + SW apps)
- Mobile/phone line networks
- □ SW Telehealth portal app/database
- Back-office system infrastructure

# Expected benefits for the primary users of remote services

#### How telemedicine will increase my quality of life?

- **Timely intervention** if something goes wrong
- **Reassurance**: "Somebody cares for me!"
- Decreased number of (un)necessary visits in healthcare institutions (Move information not a patient!)
- Evidence based health related decisions (based on continuous measurement results)
- Professional support/coaching in endeavours for recuperation and/or healthy living
- Staying at home

#### Better quality of life

# Expected benefits for the secondary users

#### Healthcare discipline

- Therapeutic effects
- Quality of care
- On-time interventions
- Coordination of care greater efficiency
- Reduced burden of healthcare staff e.g. decreased needs for periodic check-ups
- Shorter or eliminated waitings at outpatient clinics

#### **Informal carers**

- Released burden peace of mind due to the permanent monitoring of the cared person
- Called when needed

# Expected benefits for the tertiary users

- Better accessibility of healthcare services regardless of the distance from healthcare institutions
- Equal accessibility of healthcare services
- Better healthcare planning
- Sustainable healthcare system economic effects
- Satisfied citizens
- etc.

### TELEMEDICINE SUPPORT TO PATIENTS WITH HEART FAILURE AT THE GENERAL HOSPITAL OF SLOVENJ GRADEC (SLO)

#### Telemedicine service model (B2P)



### Telemonitoring of vital signs in Heart Failure patients at GH SG (Slovenia)





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## HF Patient's results

Date	Pulse	Blood pressure	SPO	Weight		,Comment/Report
05.08.2014	<b>*</b> 83	143/97	96	(08:04)	87.3	Ured
04.08.2014 💻	♥100	145/103	93	(06:48)	88.4	Cardiologist's
03.08.2014 -	₹85	123/83	91	(07:16)	90.7	intervention
02.08.2014	\$\$87	135/90	92	(07:21)	88.0	intervention
01.08.2014	₹80	123/81	93	(07:48)	88.1	
31.07.2014	₹132	(07:44)         135/97           (07:32)         117/92           (05:59)         130/97	91	(05:53)	87.4	<b>Comment</b> radi povišane srčne frekvence, pokazan izvid oz meritve dr. Maroltu, ki naroči Lanitop 1tab dva dni, nato 1/2 tabletke na dan.
30.07.2014	♥95	141/100	93	(07:08)	88.2	Telefonsko sporočeno gospodu, ki se
29.07.2014	♥140	117/93	93	(06:36)	87.4	pocuti dobro.
28.07.2014 -	♥131	117/88	92	(06:10)	87.2	
27.07.2014 -	₹87	122/91	93	(07:56)	88.1	
26.07.2014	\$82	130/92	96	(07:40)	88.4	
25.07.2014	93	122/87	94	(08:15)	88.2	
24.07.2014 -	49	85/64	95	(08:05)	87.6	
23.07.2014	₹84	127/82	97	(07:42)	87.5	
22.07.2014 -	₹81	116/77	94	(08:14)	87.3	
19.07.2014 💻	♥95	144/103	93	(07:57)	89.2	
18.07.2014	♥94	124/93	96	(08:23)	88.6	

## HF Patient's daily TM results



## HF Patient's daily TM results



### Impact of TM support on LVEF in HF patients









# Histogram of hospital days for TM supported HF patients





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# Impact of TM monitoring on hospitalisations of HF patients



# Impact of TM monitoring on hospitalisation days in HF patients



#### CEZAR telehealth centre statistics

	DM2	
Item	patients	HF patients
No. of supported patients	480	430
Average patient's age	69	73
Telemetrically registered measurements	113.730	450.000
No. of the operator's phone calls to the patients	151	800
No of therapy changes suggested due to telemetrically received data	1.072	250







## Service characteristics

- The solution is mobile and does not require any patient's intervention when taking measurements using devices at home.
- Each patient cares only that his tablet is on and operational.
- All the patients and their carers receive an adequate training prior to inclusion.
- On-site technical support is provided
- Patients are called by the CEZAR staff if something goes wrong
- Patients are informed by phone and in written when they have to change their therapy
- Decision on "What to do?" when something goes wrong is on the medical staff.







## LIVE DEMONSTRATION

- Blood pressure & Heart rate
- Body weight
- SpO<sub>2</sub> Oxygen saturation in blood
- Temperature
- Physical activity

## The user's main display



#### The user's view – Blood pressure data



### The user's view – SpO2 data

			08:55		→
	Datum	Čas	Srčni utrip	Zasičenost s kisikom	
	28.09.2022	08:41	76 bpm	98 %	
	28.09.2022	08:32	78 bpm	97 %	
	19.09.2022	20:01	71 bpm	96 %	
14					
		•	•		

### Medical staff view – Blood pressure



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#### Medical staff view – Heart rate



### Medical staff view – Oxygen saturation



#### Medical staff view – Physical activity



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## SUPPORT TO COVID-19 PATIENTS AT HOME

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### TM support to patients with COVID-19

#### Inclusion criteria:

- infection established, symptoms confirmed, hospital treatment not required => treatment at home
- early discharge from a hospital

#### **Patient receives:**

- blood pressure meter
- pulse oximeter
- thermometer
- PC tablet with app
- 27 patients supported by TM (21.9.2022)







# CHANGES OF VITAL SIGNS DUE TO THE COVID INFECTION

#### EXPECTED

□ Drop in the oxygen saturation (SpO2)

Increased temperature

#### **REGISTERED – BUT NOT IN ALL PATIENTS**

Lower oxygen saturation (SpO2) at the start of telemonitoring

□ Slightly increased temperature (>37°C)

Increased heart rate

#### RECOVERY

□ 14 days period

□ Slow increase of the oxygen saturation (SpO2)

□ Slow decrease of the heart rate

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# COVID-19 case report – blood oxygen saturation (SpO<sub>2</sub>)



### LESSONS LEARNED IN THE COVID CHRISIS

#### NEEDS

- Increased needs for remote support to long-term patients as regular scheduled visits were cancelled
- Need for organisational changes to implement telehealth services
- Insurance organisations to establish reimbursement procedures

#### **CHANGES DUE TO COVID-19 IN SLOVENIA**

- Some TM services have been recognised as adequate to replace standard services (e.g. teleconsultations in psychiatry)
- □ Minimal reimbursement for telemonitoring of COVID-19
- □ No structural or organisational changes in HC organisations
- □ No systematic support to implement new TM services

## FUTURE OF HOME TELEHEALTH SERVICES

### Challenges for telehealth services

- □ **Trust** in telehealth services
- Acceptability among professionals, direct users and carers
- □ Scaling-up of use of telehealth services
- □ Technology **infrastructure** for telehealth
- □ Standards (quality, interoperability, security)
- **Ethical and legal** (liability) framework
- Service accreditation
- □ Licensure for telehealth professionals
- □ Financial **investments** in telehealth services
- **Reimbursement** of costs for telehealth service provision
- Evaluation of the support outcomes

# Requiements for introduction of telehealth/telemedicine services

- National strategies for the development and implementation are needed
- Awarness to be raised among all stakeholders, in particular among dicision-makers in healthcare planning and health insurance
- New organisational models (service provision)
- Integration of telehealth services into the existing pathways
- Education for new roles and posts in telehealth services requested (plans, change in curriculum, skills...)
- **Readiness** of healthcare professionals for changes

# Obstacles for telehealth implementation in Slovenia

System level	<ul> <li>No strategy</li> <li>No political will on the national and regional level</li> <li>Lack of cooperation among sectors</li> <li>Abscense of legal frameworks</li> </ul>
Economy	<ul> <li>No strategic investments in health and social care sector</li> <li>Key stakeholders on "stand-by" – no health insurance schemes prepared</li> <li>Waiting on investments from a private sector</li> </ul>
Psychological, social level	<ul> <li>Dependency on external help is neglected</li> <li>No decisions for the future (If it happens then I will)</li> <li>Ignorance among professionals</li> <li>Lack of information on the existing services</li> </ul>

# Barriers to telehealth implementation - globally



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# Stereotypical objections to the use of TM monitoring

#### TM monitoring equipment is expensive

- Reduced number of regular visits (travel, time, companions)
- □ Reduction of readmissions to the hospital (1 hospit.=1 year TM subscription)
- Improved level of healthcare

### Technological solutions are too demanding for patients to use

- More and more patient friendly technological solutions
- Customisation of the solution to the level of information literacy of the user
- □ Support to the users from informal carers

#### TM services are fine, but not essential

- Better disease management
- □ Timely and appropriate response of the medical staff
- □ Improved healthcare staff-patient collaboration for better health
- □ Greater mutual trust between the patient and the healthcare staff

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#### Stairway from idea to a TH service (1/2)



#### Stairway from idea to a TH service(2/2)



## Countries with government sponsored telehealth programmes - globally



#### Thank you for your attention!

