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**NATO STANDARD**

**AMedP-5.3**

**Telemedicine for mission support**

Edition A Version 2

NOVEMBER 2023



**NORTH ATLANTIC TREATY ORGANIZATION**

**ALLIED JOINT PUBLICATION**

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**Telehealth** is the provision of all remote health services, including Telemedicine, Health Education and Preventive Care, using information and communication technology (ICT).

**Telemedicine** is the delivery and support of healthcare over a distance using information and communication technologies.

## Telemedicine Options



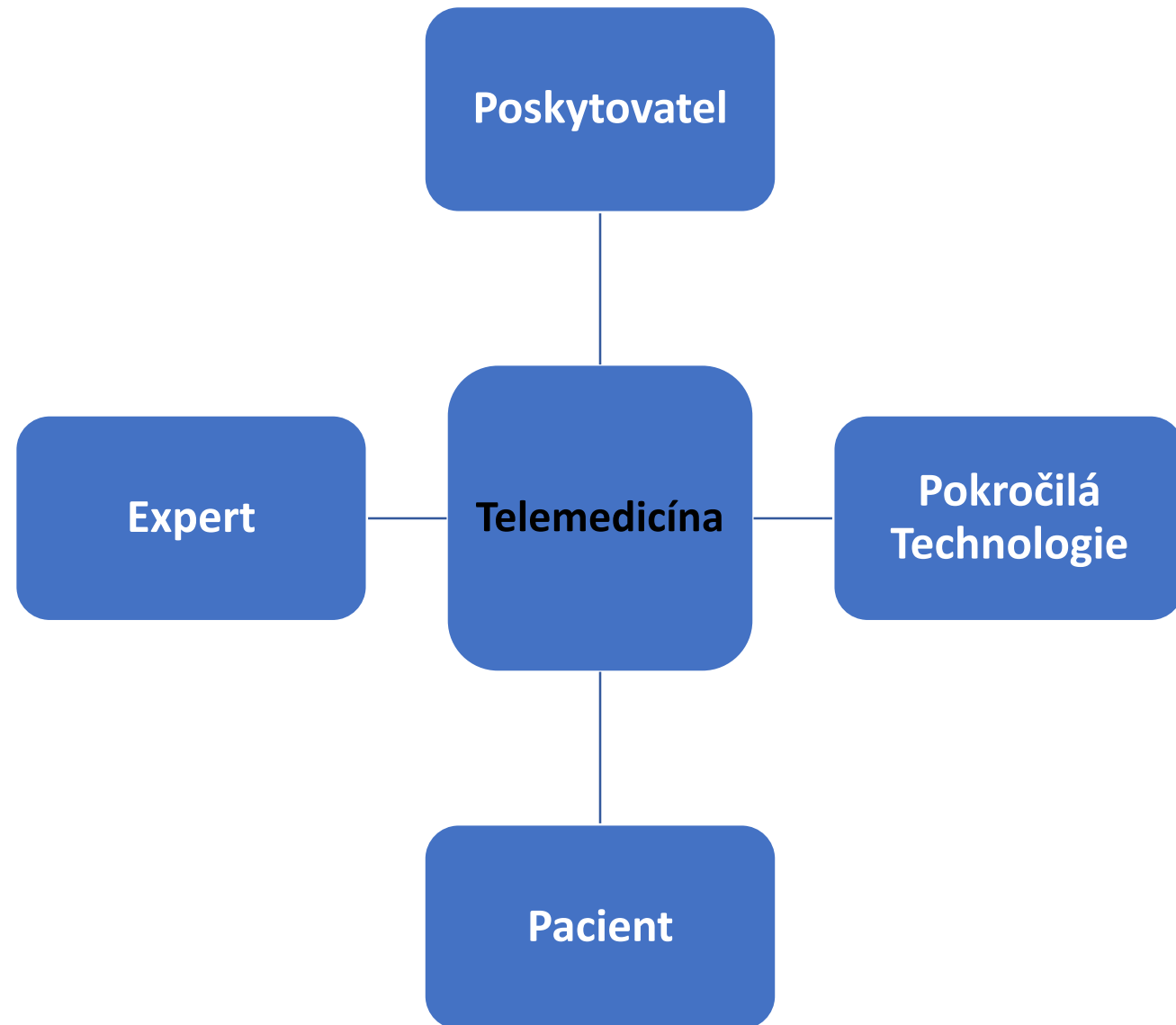
### Have a Clinical Question / e-Consultation?



*\*\*ADVISOR does not facilitate MEDEVAC or casualty movement.*



**Lifesaving direct patient care takes priority over calling for help!** *Never leave the casualty to get help if the casualty's condition may worsen while you are absent. Consider having a teammate "make the call" while the primary medical provider is delivering patient care.*



**POI**  
**CCP**

**FORWARD  
MEDEVAC**



**ROLE 1**



**TACEVAC**



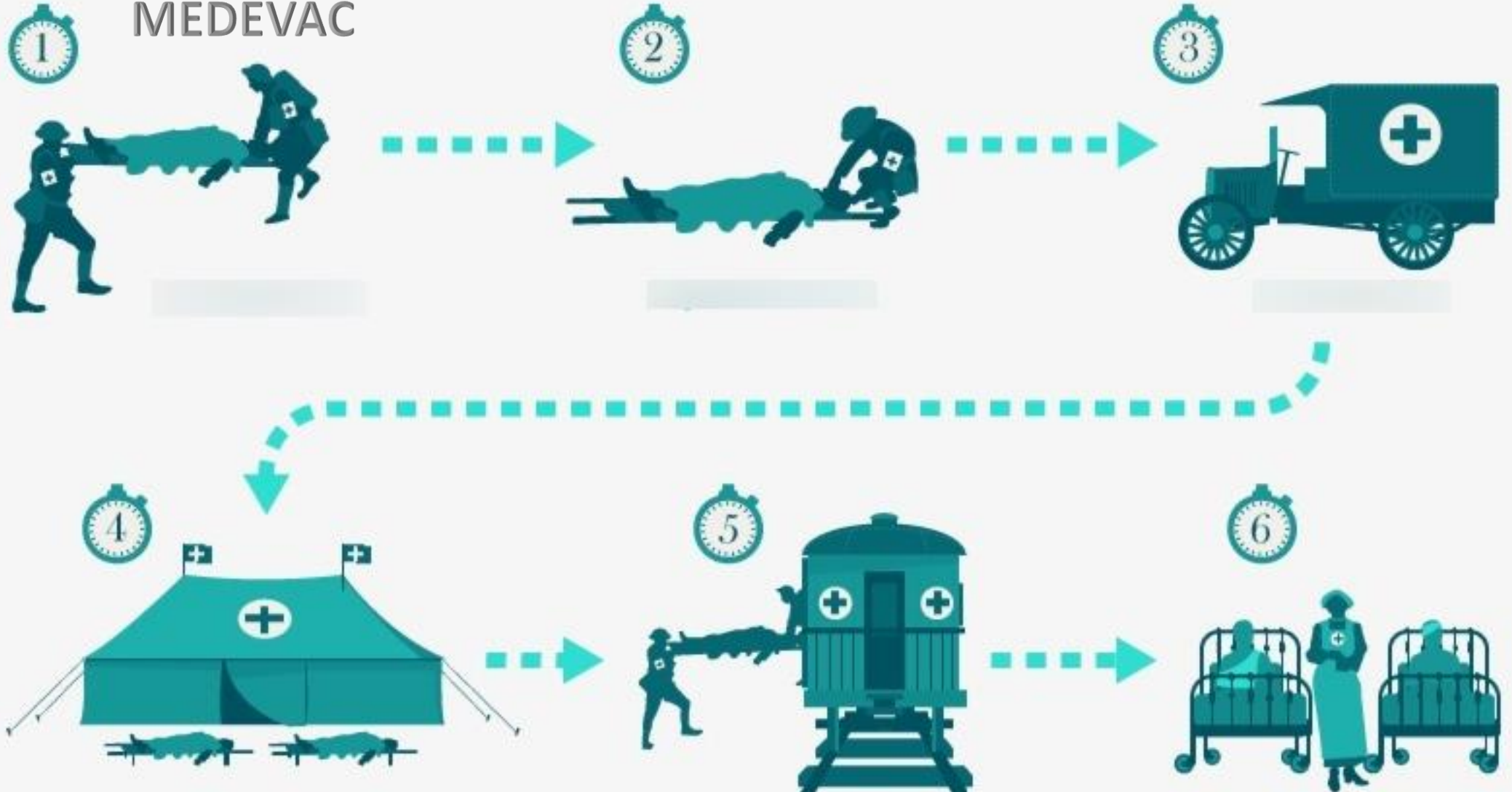
**ROLE 2/3**



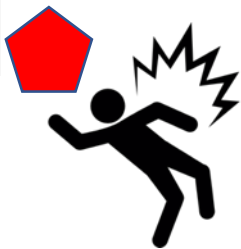
**STRATEVAC**



**ROLE 4**



Scene Monitoring  
Remote Biomonitoring  
Enemy Warning  
Chemical and Radiation Warning



HOT ZONE

# Návrh projektu POV ZÁCHRANA

Využití pokročilých technologií k záchraně raněných vojáků



ROLE 1



Casualty Evacuation

Autonomy Systems  
Artificial Intelligence

Augmented Reality  
Triage  
Telemedicine



Air Transport  
Blood and Medical Supply

ROLE 2



Virtual Reality  
TeleMentoring

Scene Monitoring  
Remote Biomonitoring

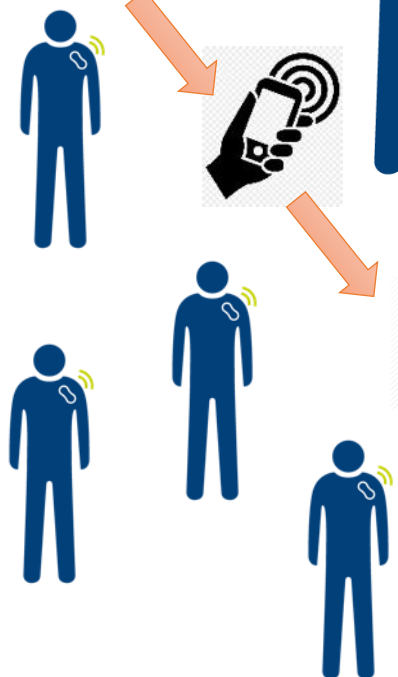


HOT ZONE

# Návrh projektu POV ZÁCHRANA

Využití pokročilých technologií k záchraně raněných vojáků

BioSensors  
NFC CHIP



## TRANSPORT RANĚNÉHO

ROLE 1



Autonomy Casualty Evacuation



Medical  
Evacuation

ROLE 2



Augmented Reality



Triage

Telemedicine

## TELEMENTORING



Virtual Reality

## MEDICAL DATA TRANSFER



BVIS ISVŘ



Elektronická  
zdravotní  
dokumentace

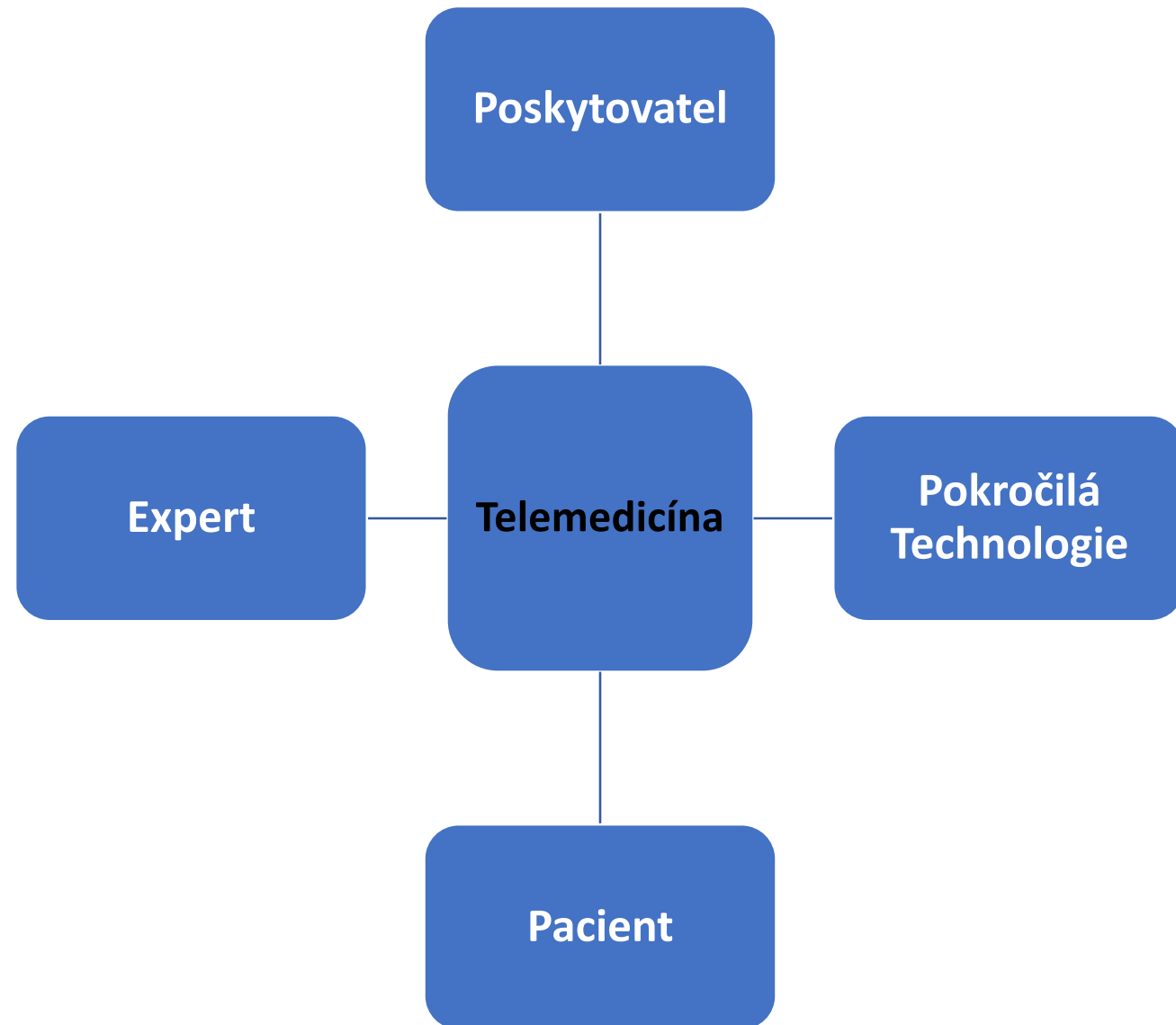
# Projekt DTA (Digital Triage Assistant)



Fakulta vojenského zdravotnictví  
ČVUT Praha  
John Hopkins University  
DefSec Innovation Hub  
NATO ACT

Vyškov, 2021





# Sensor Network Employing Consumer Wearables for COVID-19 Post-acute Phase Patient Care

Miroslav Bures, Katerina Neumannova, Pavel Blazek, Matej Klima, Hynek Schvach, Michal Kopecky, Jan Dygryn, Vladimir Koblizek

**Abstract**—A significant part of COVID-19 patients suffers from respiratory problems in the post-acute phase (2nd-3rd month) of the disease. Individual telerehabilitation and telecoaching render a viable and helpful option for treating these patients. To treat the patients individually, medical staff must have detailed knowledge about their physical activity and status. A sensor network from medical-grade devices can be created to collect these data, but the price and availability of these devices might limit the scalability of such a network to larger groups of patients. Hence, the employment of low-cost commercial fitness wearables is an option worth exploring. This paper presents a concept and technical infrastructure of such a telerehabilitation program that started in April 2021 in Czechia. A pilot controlled study with 14 COVID-19 patients indicates the potential of the concept to improve patients' states in terms of their physical activity, exercise tolerance, and inspiratory muscle strength. The paper combines technical and medical viewpoints on the problem. Besides the technical details of the solution, it focuses on the lessons learned helpful in employing this concept to treat COVID-19 post-acute phase patients.

**Index Terms**—COVID-19, Sensor Network, Personal Wearables, Internet of Things, Telerehabilitation, Telecoaching.

## I. INTRODUCTION

THE current two-year COVID-19 pandemic brings significant challenges to the global healthcare system. Apart from the considerable difficulties in managing COVID-19 acute phase [1], numerous COVID-19 patients with a heavy disease course require an adequate rehabilitation program in the post-acute phase. During such a rehabilitation program, knowledge about patients physical activity, quality of sleep and other vital function data is helpful for individual work with the patients. Also, collected information further allows for the optimization of treatment and rehabilitation procedures.

However, some patients have limited access to outpatient pulmonary rehabilitation program [2]. Therefore, telerehabilitation may be a suitable solution for these patients. Previous studies confirmed the positive effect of telerehabilitation and

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Manuscript received Date TBD; revised Date TBD.

telecoaching on reducing symptom severity, increased exercise capacity and physical activity, and improvement in health-related quality of life in patients with chronic obstructive pulmonary disease (COPD) and idiopathic pulmonary fibrosis [3]–[5]. On the contrary, there are only a few studies that evaluate the effect of telerehabilitation and telecoaching on functional status in patients with post-acute covid. However, the results of these studies [6]–[9] showed the positive effect of telerehabilitation in these patients as well. After undergoing COVID-19, patients often complain of fatigue, breathing difficulties, and muscle weakness [10]. Moreover, they have a negative perception that they are unable to be physically active as before the disease. Therefore, it is optimal if the patients can attend targeted and interactive programs focused on improving their physical activities level. One of these options could be telerehabilitation, including individualized telecoaching. For optimally guided telecoaching it is important to know the intensity and level of daily physical activity.

Sensor networks can be greatly helpful for this purpose; however, considering the number of affected patients, time to develop proprietary hardware for the case might be limited; development and production of specialized hardware might be limited from a cost viewpoint. Numerous commercial fitness applications accompany wearable consumer electronics; however, only a few allow for direct connection with medical staff to optimize rehabilitation procedures for individual patients.

The logical option worth exploring is to employ commercial wearables to collect the required patient data. Lower price and low hardware acquisition time represent substantial benefits compared to proprietary hardware development. In situations where the accuracy of the obtained data is acceptable for the discussed case, building the sensor network from commercial wearables renders

We follow (TEle)REhabilit is dedicated to heavy course patients continue an initial facpapist online with telecoaching throughout the physiotherapist that access to for many patients this treatment and transport



# TERKA 2

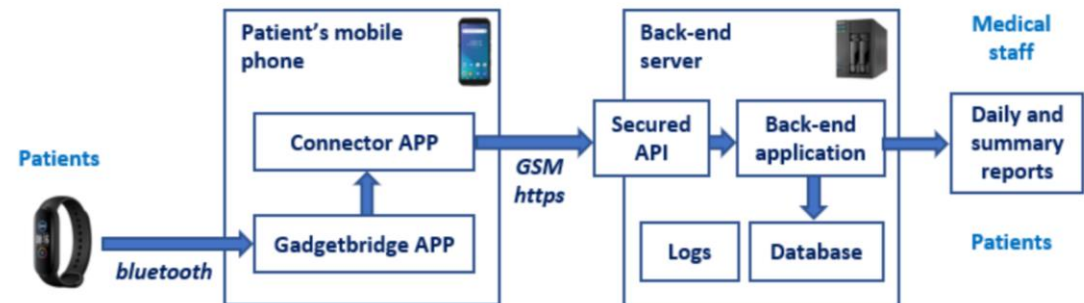
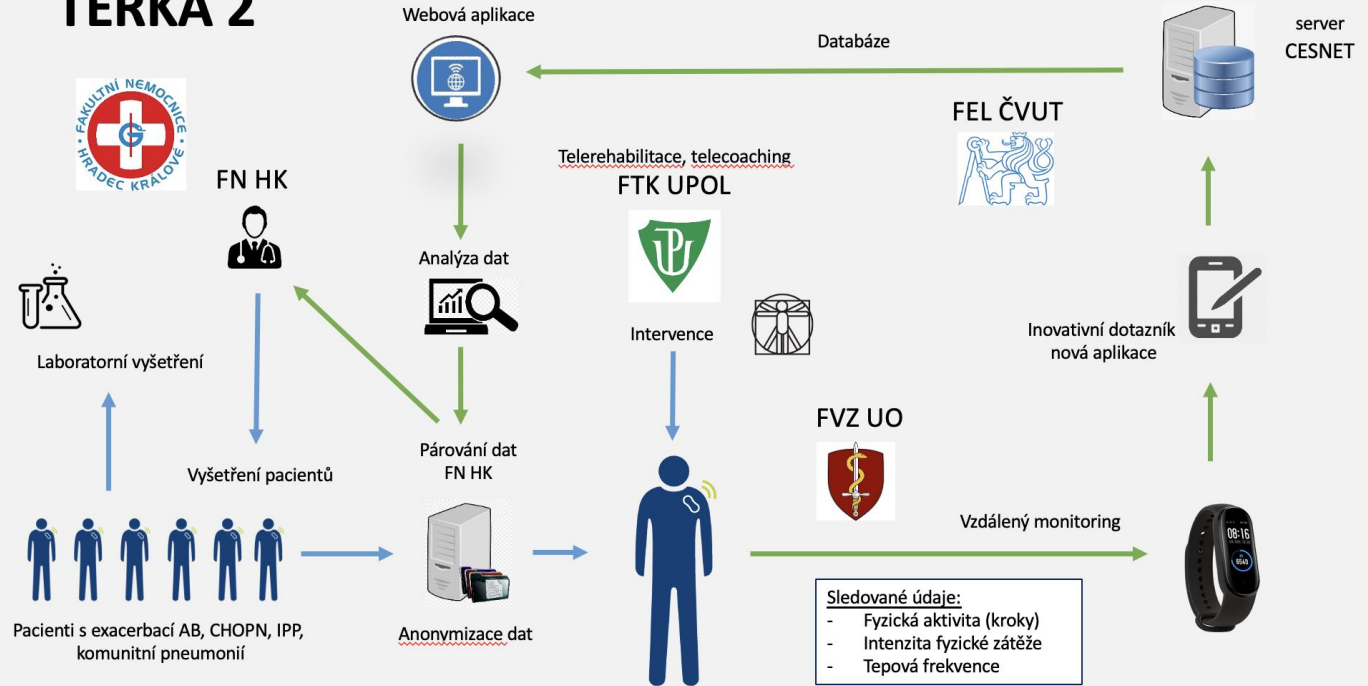



Fig. 1. Overall technical schema of the system.

# TELEMENTORING (3D experiment)

## Hradec Králové, 2022

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# Itibo, Keňa 2023

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npor. Ing. Bc. Jiří Néma

humanitárně rozvojový projekt  
zdravotnického zařízení pod záštitou  
nevládní humanitární organizace Adra, o.p.s.  
v jiho-západní části **Kení**.



















Annotate

Save Image

Measure

Area  
53,6cm<sup>2</sup>

Circumference  
26,0cm

Distance +  
8,00cm

0,0  
Frame Rate  
20 Hz  
2D Gain  
53  
Depth  
16,0 cm  
Transducer  
C5-2  
Preset  
Abdomen  
Power  
-0,3 dB



-0  
-5  
-10  
-15

P



16cm





# NATO ACT 5G Experiment RIGA, Lotyšsko 2023

- pplk. doc. MUDr. Martin Jakl, Ph.D.
- npor. Ing. Bc. Jiří Néma
- kpt. Ing. Petra Dvořáková
- plk. gšt. RNDr. Hynek Schwach, Ph.D.

**5G  
DEFENCE**

test site | Latvia



**NATO**  
+  
**OTAN**

**2023 Next Gen  
Communications Network  
Technology Event**



5G  
DEFENCE

Imintel NOKIA



	STATUS	COMMENTS
MDO-SA Experiment	✓	COMPLETE TUESDAY. THANK YOU EVERYONE!
VR for C2	✓	Test ok
Agile for C2		
Sensors Fusion		
Quantum & Missing Assets		
Cloud		
Cloud-First	✓	
Autonomous		
Natural Lang		
Decision Rate		
UAV Op in a GPS Denied Env		
Medical Manag		
Prototype Dem		
Medical Tele-Hell		
Experiment	✓	
Training machine & NLP	✓	
MM-50 Air Gun		
Cloud		
Cloud-First	✓	
Autonomous		
Natural Lang		
Decision Rate		



**NATO**  
**OTAN**



**5G**  
**Technol**

un@nato.int

**Aim**  
To validate concepts and

**Objecti**  
1. Assess the













# Patient Tracking Prototype





AGEMENT  
TOTYPE

PROTOTYPE

PROTOTYPE

FUTURE DEVELOPMENT



MMp  
ROLE 1

MMp  
ROLE 3

MMp  
Casualty Staging Unit

MMp

MEDICAL MANAGEMENT PROTOTYPE

MEDICAL MANAGEMENT PROTOTYPE

PROTOTYPE

PROTOTYPE

FUTURE DEVELOPMENT







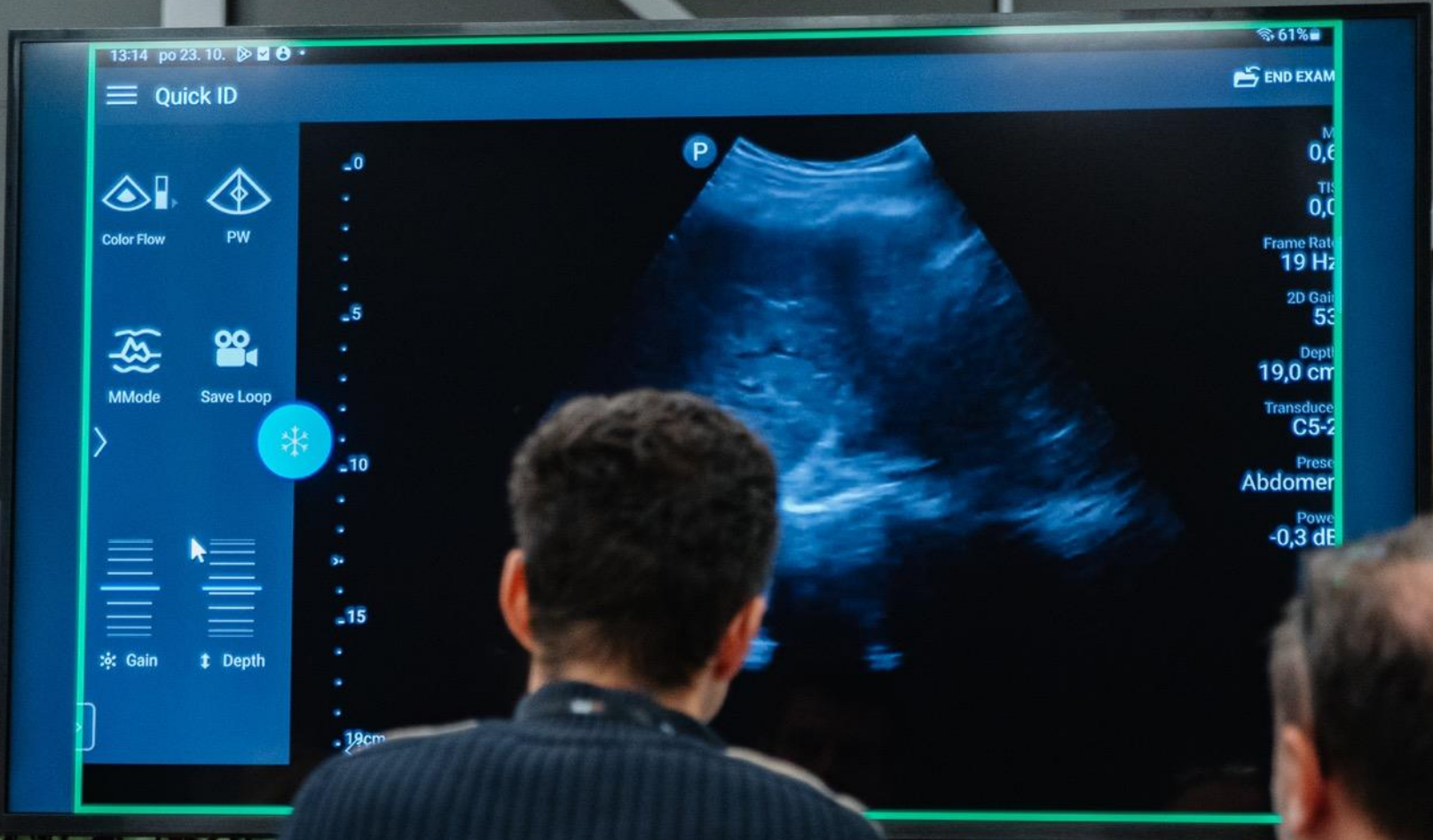






5G  
DEFENCE









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**DEFENCE**  
test site / Latvia



# 2023 Next Gen Communications Network Technology Event



The event goal is to support NATO's Digital Transformation and progress NATO toward a multi-domain operations enabled alliance.



