

# Use of camera systems to support home based multiple chronic disease (multimorbidity) self-management

**ESR 7.** *Mohamed Osman*



Horizon 2020  
European Union Funding  
for Research & Innovation



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Coláiste na Tríonóide, Baile Átha Cliath  
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# Introduction

- Over **50 million** people in Europe have more than one chronic disease\*
- This will increase health care spending to **20% of GDP\***
- Multimorbidity becomes the **number one threat** to population health and economic sustainability of health care systems\*
- New **models of care** for multimorbid patients are urgently needed\*
- **Digital health technologies** offer potential support for PwM to better manage their diseases in collaboration with their care network
- **Camera visual systems** may be used to provide rich **contextual data and insight** into everyday activities to better understand the **complexity of multimorbidity management**

\* *CORDIS EU Research Results*



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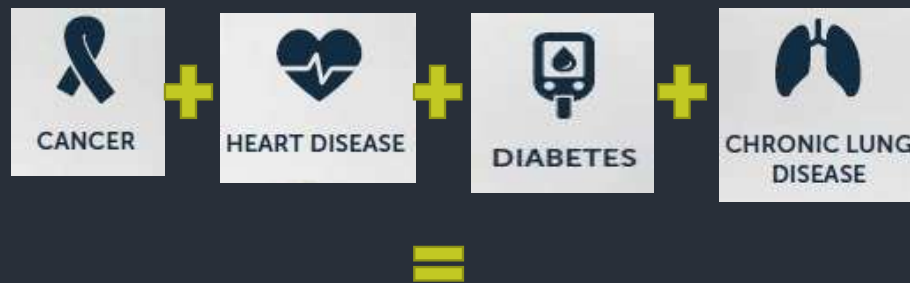
# ESR 7: Project Aims



- Explore the **role** of camera monitoring systems to support multimorbidity self-management
- Understand the **effective use** of cameras as self-management interventions
- Identify the **camera acceptance** within the home environment
- Identify the use and relevance of **visual data** within a care network to support self-management
- Explore the **privacy and data protection** considerations towards the use of cameras within a digital integrated care framework
- Explore the **factors that impact the relationship** between people with multimorbidity (PwM) and their care network (CN)

# Terminologies: Multimorbidity

These terms are used interchangeably, but Multimorbidity  $\neq$  Comorbidity



## Multimorbidity:

Coexistence of multiple chronic conditions/diseases within the same individual



Ex: Hepatic carcinoma

## Comorbidity:

The combined effects of additional conditions in reference to the **same** disease

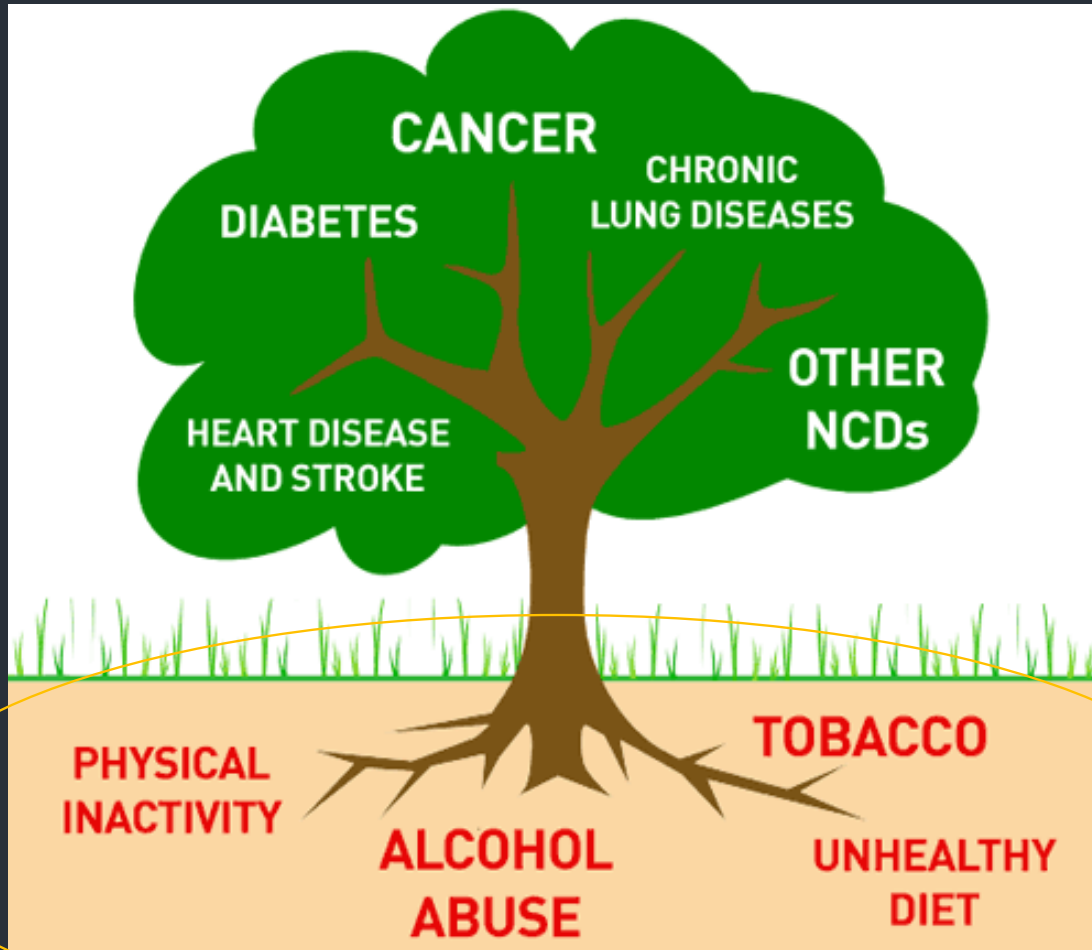
# The Leading Causes of Death

Non-Communicable Diseases

7/10\*

deaths worldwide

\* CDC, 2021



Every **\$1** invested in **proven NCD interventions** in low- and lower middle-income countries will generate at least **\$7** in increased economic development or reduced health care costs by 2030\*

Camera systems

?!

# Terminologies: **Self-management**

- **Self-management** is: *“The day-to-day management of chronic conditions by individuals over the course of an illness”*
- Includes:
  - Activities of daily living (ADL)
  - Managing medication
  - Home-based rehab programs
  - Connecting with their care network



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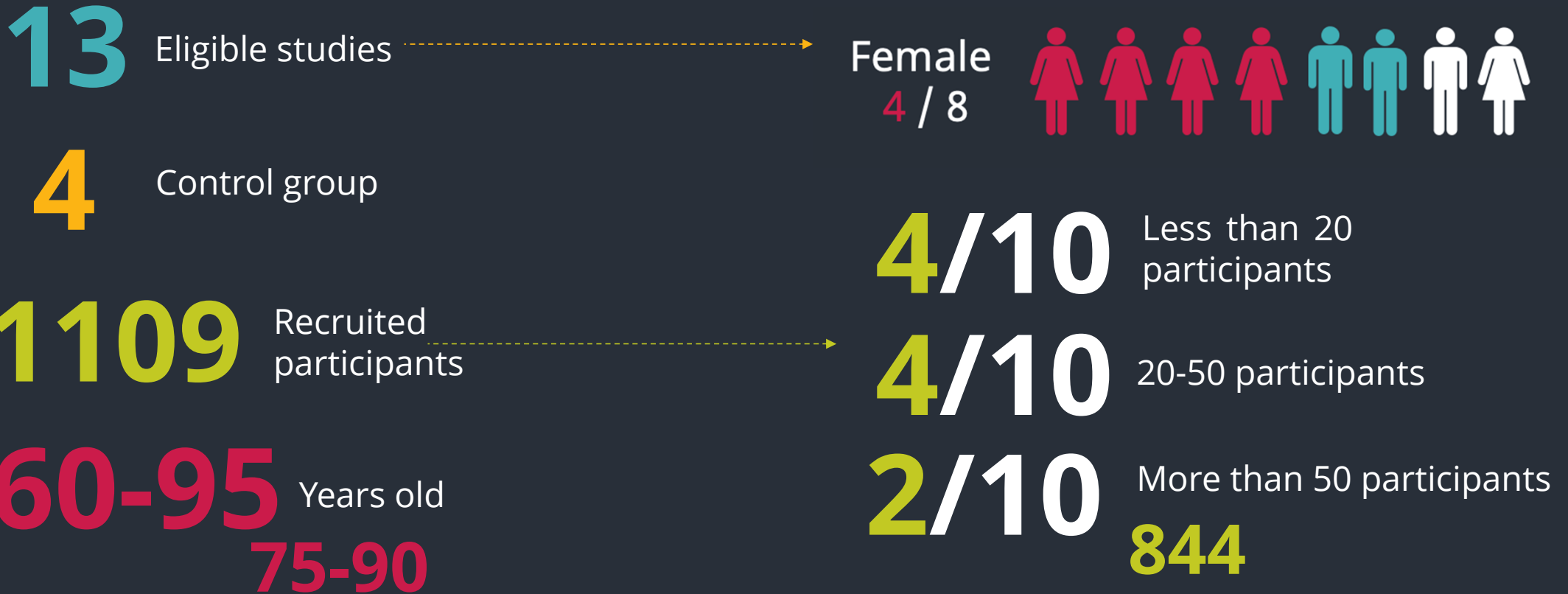
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# In-home care vs Nursing home care

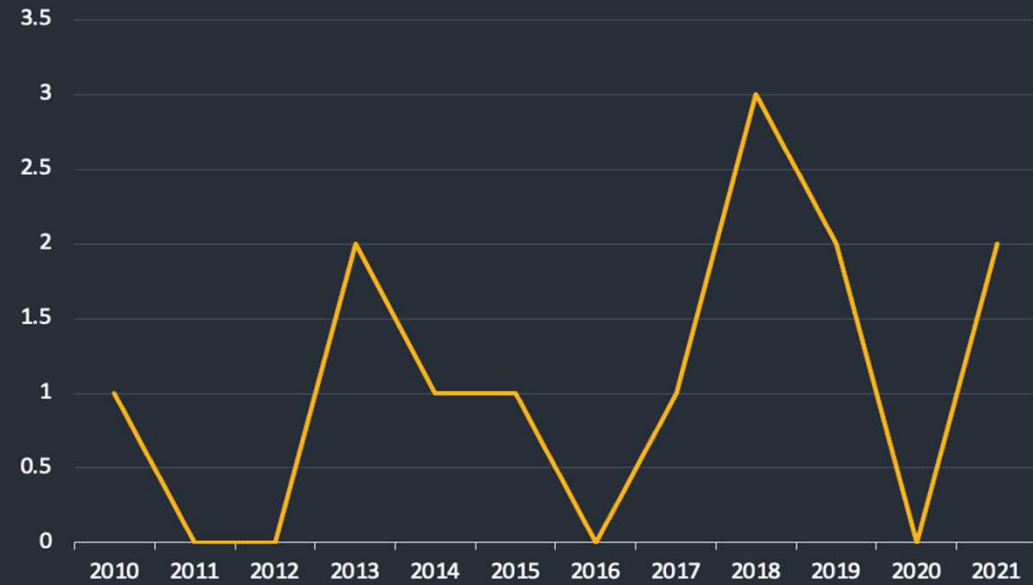
- Comfortable, familiar surrounding: i.e: Dementia patients
- Customized care options: (Menu of Services) Different care schedule, specific caregiver, 24/7
- Affordability: less expensive than nursing home care
- Personalized care: offer one-to-one care
- Safety/health benefits: COVID-19 pandemic
- Additional privacy: not sharing more common space, even for the informal caregiver
- Encouraging independence



# Scoping Review Results: Study/Sample characteristics



# Published: 2010-2021



USA



Multinational cooperation



Italy



New Zealand  
Germany  
Australia  
Netherlands

Descriptive studies

**5** To present the research projects' intervention, prototype description or field trial results

Randomized controlled studies

**3** To present the results of the used telemedicine platform, telerehabilitation intervention or the iRobi robot

Mixed-methods observational studies

**2** To investigate the use of different visual systems to self-manage their multiple chronic conditions at home using tablet PCs and a body-worn camera

Pilot or feasibility studies

**2** To assess the feasibility of technology-enabled home visits to investigate the contextual factors affecting multimorbidity self-management using the available handheld devices with cameras

Transferability study

**1** To collect primary information on the usability, acceptance, and technical issues

# Visual systems devices

Embedded camera

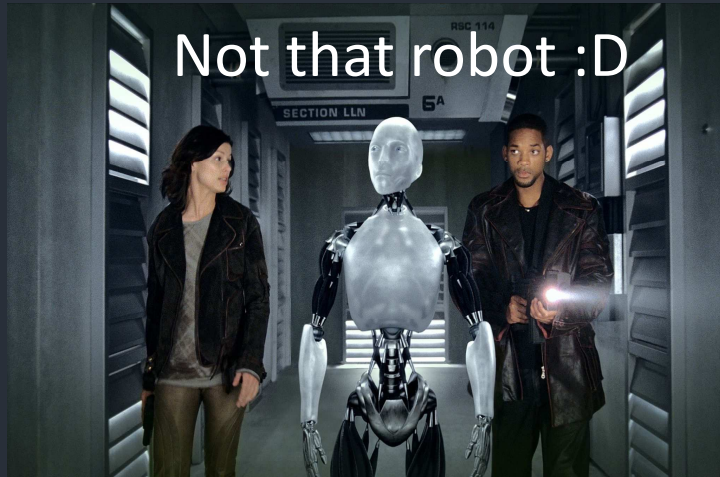
8

Videoconferencing



3

Robots



Wearable Camera

2

Camera

# Visual systems cameras

5

Mobile Camera

Represents any mobile device with a camera like mobile phones or tablet PCs

4

Fixed Camera

Any camera mounted on wall/ceiling or a web camera attached to a desk PC or laptop

2

Mix = Fixed + Mobile

2

Wearable

Digital devices with a camera pinned to their clothes on chest, attached to helmet or around neck by a lanyard

*Edesix VB-300*



*Netatmo Welcome*



*Asus Xtion Pro*



*Bumblebee*



# Visual systems cameras

8

Active

Active participant **involvement** with caregivers to **report** symptoms, case updates, **perform** a specific task or training and patient education

3

Passive

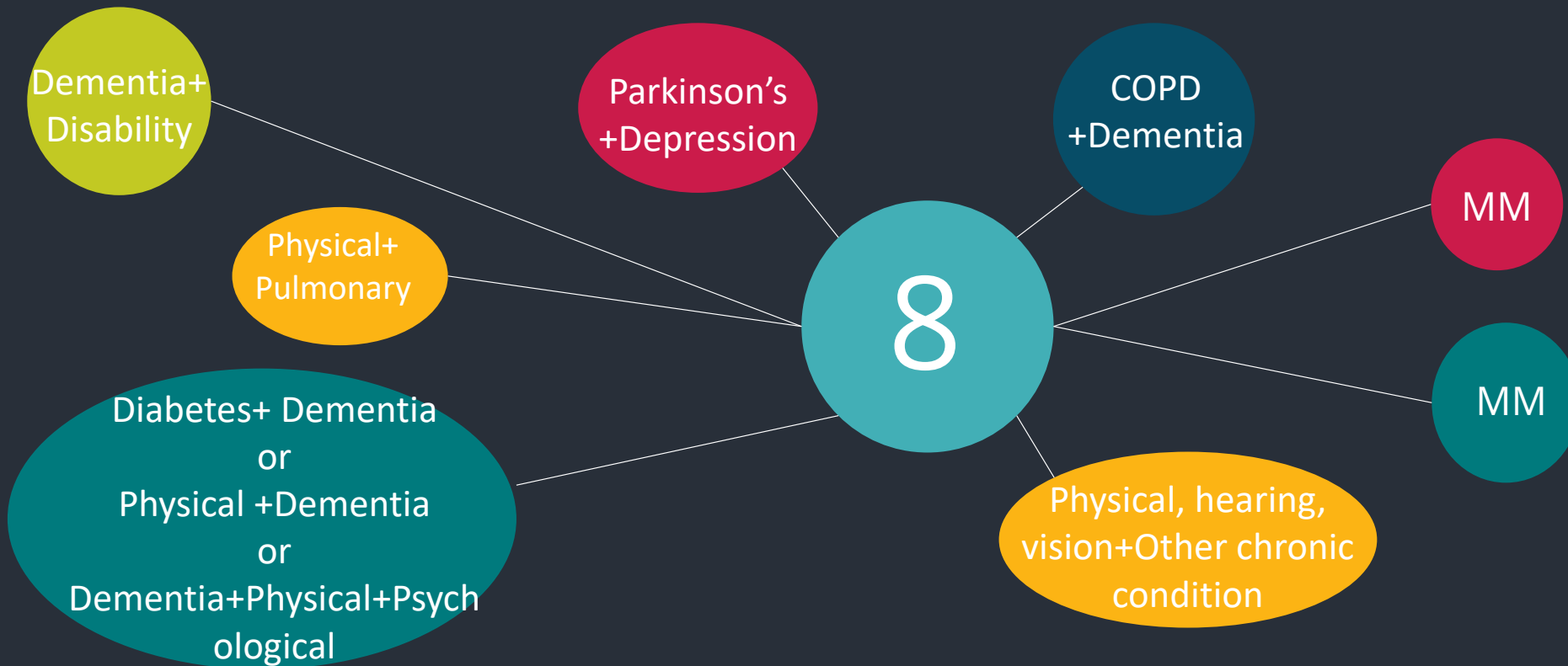
Doesn't require the participant involvement and the **caregiver had the full control** to **monitor** or **track** specific activities like sedentary behaviour (physical activity, diet, or lifestyle).

2

Mix

# Multimorbidity= 2+

Physical, Cognitive or Psychological conditions



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# Multimorbidity= 1+ 1 at least (comorbidity)





# Intervention (Visual systems) functions

## Monitoring

REMOTE Monitoring at home for different activities like **sedentary** behaviour (Physical activity, diet, and lifestyle), **medication** adherence and **social** activities

6

## Monitoring+ Coaching & Training

2

## Monitoring+ Digital Home Visit

## Assessment

1

## Coaching & Training

1

# Outputs: Users Perspective + Acceptance



- Telemedicine facilitates healthcare delivery services to the **hard-to-reach** groups
- The **exchange of information** via the videoconferencing became barrier-free with a quick support
- **Digital Home-Visits** showed technology acceptance and successful interaction
- The iRobi robot: Found it helpful to **increase the adherence** to medication and rehab exercises comparing to the control group

# Outputs: Users Perspective + Acceptance



- Improvements of both the in-home and in-lab groups using the telerehabilitation, but the **in-lab group had more improvements**
- **Technical issues**
- One-third of them asked also for an **in-person visits**
- **Minority groups** of the African and Hispanic-Americans remained less adherent to diabetic care than the white American
- Most of the robots-the iRobi and Hobbit PT2- had some technical issues causing **malfunctioning**

# Training/Modules Progress

	Training	Host
Completed (Sep-Nov 2021)	<b>Library Skills:</b> Database and systematic searching / Building search	<b>Trinity College</b> (Blackboard)
	<b>Covidence</b> software: Systematic review evidence organizations	<b>TCD</b> account/ Covidence tutorial
September, 2022	Advanced <b>quantitative analysis</b> skills: TCD certificate in statistics / One-year / Part-time / Online	<b>Trinity College</b>
Ongoing	<ul style="list-style-type: none"> <li>• <b>Research Integrity</b> and Impact in an Open Scholarship Era</li> <li>• Theory and Practice of <b>Research Methods</b> for Healthcare</li> </ul>	<b>Trinity College</b>

# Future work



# THANKS....



ANY QUESTIONS ?

## Contact information



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