



Coaching Technologies for Active
Ageing and Wellbeing – the EU
Projects Experience

SAAM Final Event
May 26th , 2020

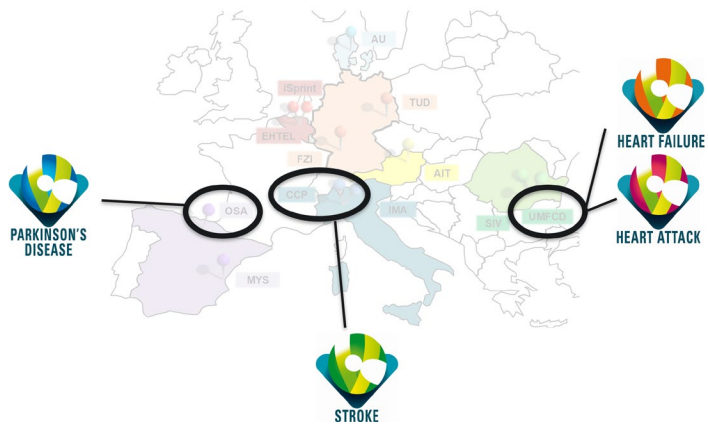
WHAT DIFFERENCE CAN THE VCARE VIRTUAL COACH MAKE FOR A PARKINSON PATIENT

Iñigo Gabilondo (Serv. Vasco de Salud - Osakidetza, Spain)

This project has received funding from the European
Union's Horizon 2020 research and innovation
programme under grant agreement No 769807.

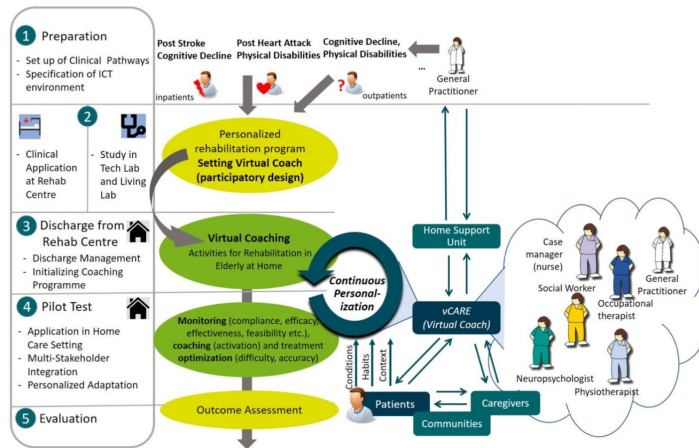


12 partners from 7 European countries



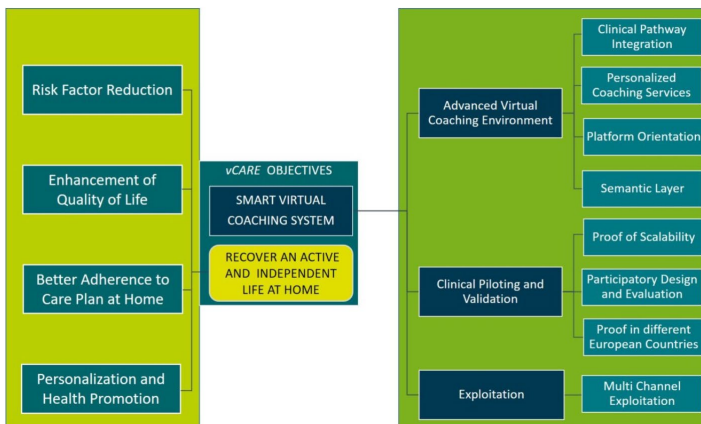
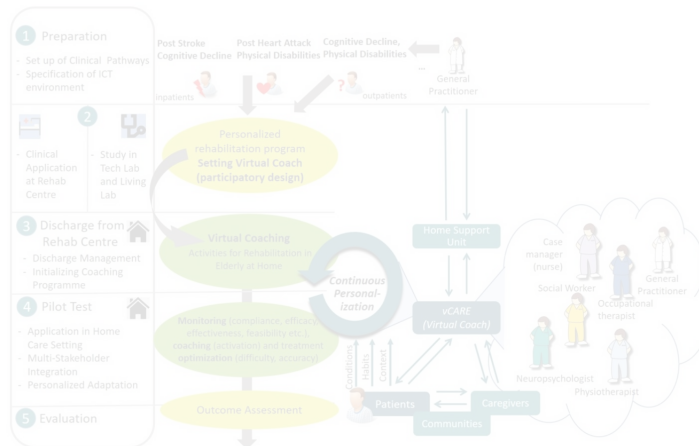
VCARE & PARKINSON'S DISEASE PATHWAY

12 partners from 7 European countries

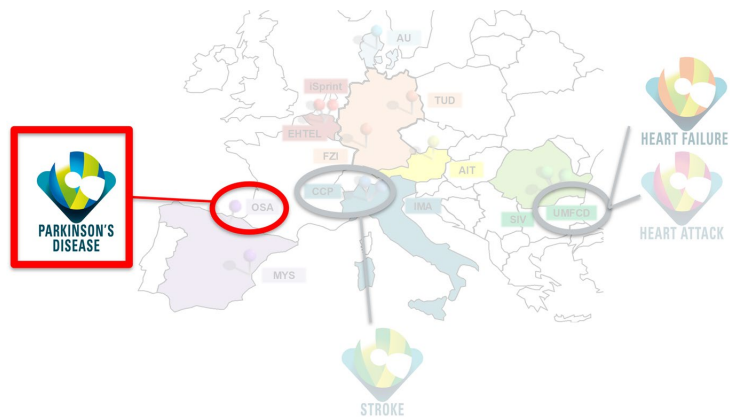


VCARE & PARKINSON'S DISEASE PATHWAY

12 partners from 7 European countries



VCARE & PARKINSON'S DISEASE PATHWAY



Basque Country

Population: 2,220,504 people

Parkinson's disease patients \approx 7,000



VCARE & PARKINSON'S DISEASE PATHWAY

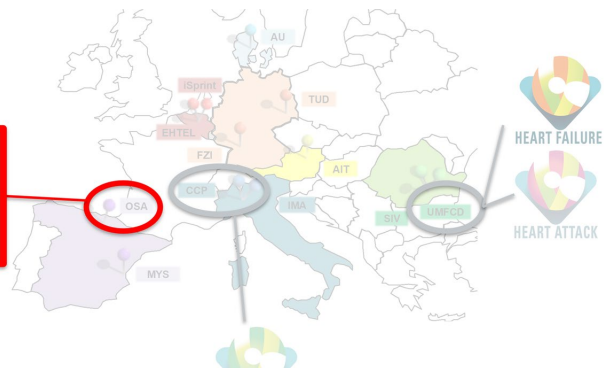


Cruces University Hospital

**biocruces
bizkaia**



1356 hospital admission beds
Reference center for 170.000 Vizcaya citizens



Biocruces Bizkaia

Investigación

Plataformas

Gestión

Servicios

Proyectos

Área Investigador

Contacto

Enfermedades del Sistema Nervioso » Enfermedades Neurodegenerativas



- Miembros del Grupo
- Líneas de Investigación
- Actividades del Grupo
- Publicaciones Científicas
- Tesis

Coordinador de Grupo

Juan Carlos Gómez Esteban
Doctor en Medicina
Profesor asociado/adjunto Unidad Docente
Facultad de Medicina y Enfermería de la
UPV/EHU, Dpto. Neurociencias
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CV resumida

PRESENTATION OVERVIEW



PARKINSON'S DISEASE: GENERAL CONCEPTS

PARKINSON'S DISEASE: UNMET NEEDS

VCARE & PARKINSON'S DISEASE PATHWAY



PRESENTATION OVERVIEW



PARKINSON'S DISEASE: GENERAL CONCEPTS



PARKINSON'S DISEASE: UNMET NEEDS

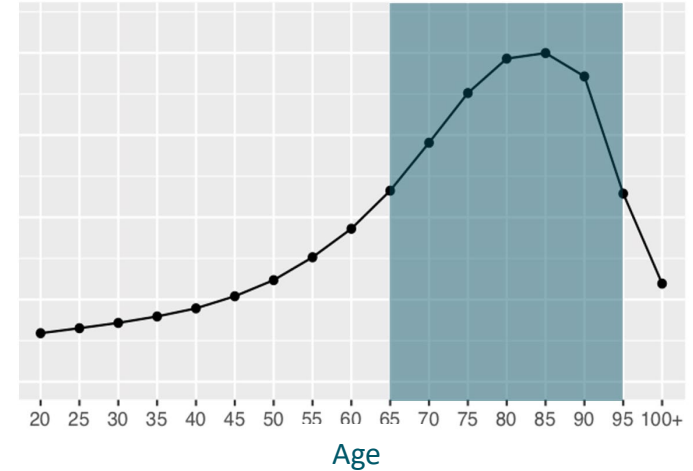


VCARE & PARKINSON'S DISEASE PATHWAY



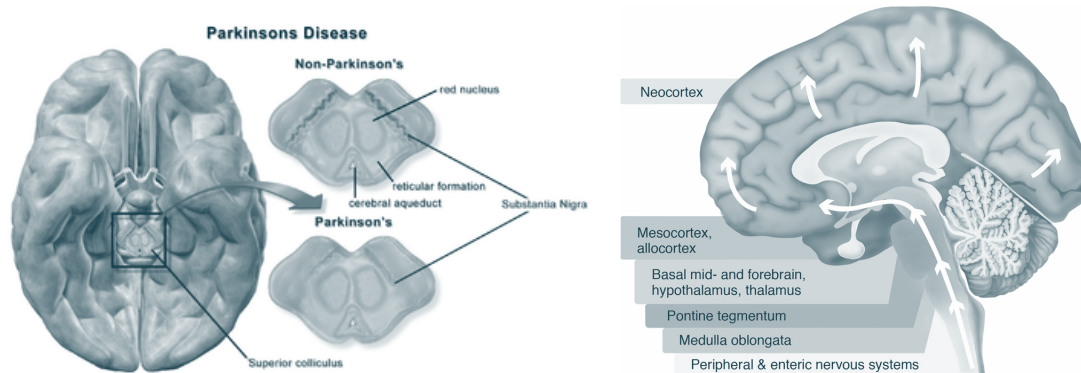
PARKINSON'S DISEASE: GENERAL CONCEPTS

- 2nd neurodegenerative disorder after AD
- Associated to ageing
- Prevalence 2-5% after 60-70 years of age



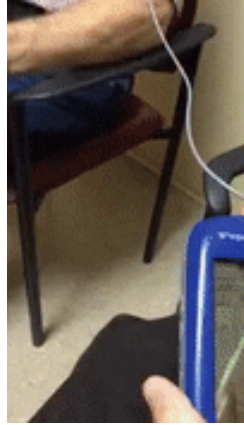
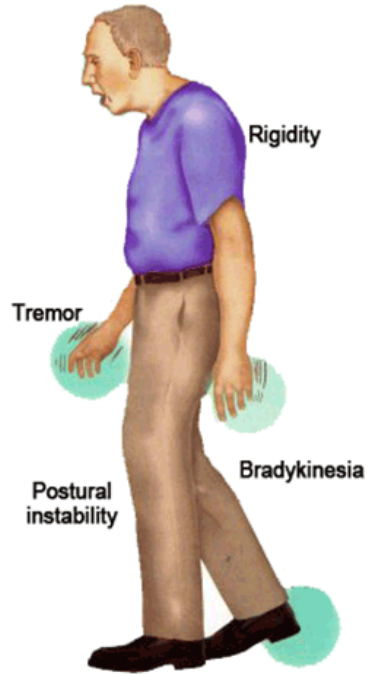
PARKINSON'S DISEASE: GENERAL CONCEPTS

- 2nd neurodegenerative disorder after AD
- Associated to ageing
- Prevalence 2-5% after 60-70 years of age
- Unknown cause, rare genetic cases
- Dopamine deficiency in substantia nigra



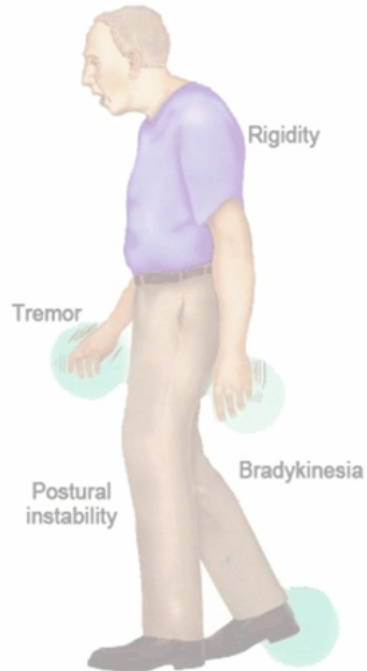
PARKINSON'S DISEASE: GENERAL CONCEPTS

MOTOR MANIFESTATIONS



PARKINSON'S DISEASE: GENERAL CONCEPTS

MOTOR MANIFESTATIONS



“ON” SITUATION:

- Adequate levels of dopamine in the brain
- Sufficient motor agility to walk and daily activities
- Usually with active tremor

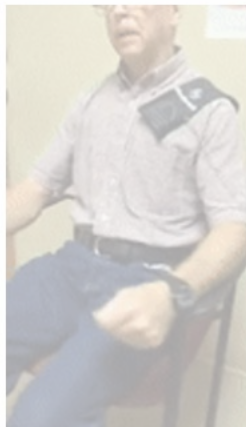
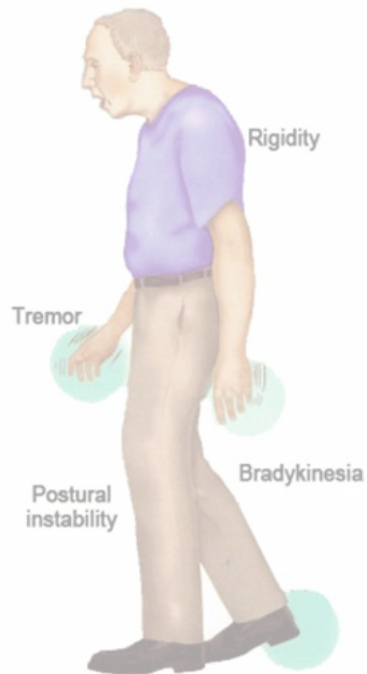
“OFF” SITUATION:

- Low levels of dopamine in the brain
- High bradykinesia & rigidity (limbs-trunk)
- High limitation to walk and daily activities
- Risk of falling



PARKINSON'S DISEASE: GENERAL CONCEPTS

MOTOR MANIFESTATIONS



Unified Parkinson's Disease Rating Scale

UPDRS - III

Motor Examination

1. Speech
2. Facial expression
3. Rigidity
4. Finger tapping
5. Hand movements
6. Pronation-supination of hands
7. Toe tapping
8. Leg agility
9. Arising from chair
10. Gait
11. Freezing of gait
12. Postural stability
13. Posture
14. Global spontaneity of movement
15. Postural tremor of the hands
16. Kinetic tremor of the hands
17. Rest tremor amplitude
18. Constancy of rest tremor

Hoehn and Yahr Stage Scale

0: no symptoms

- 1: unilateral symptoms only
- 2: bilateral symptoms without impaired balance
- 3: Mild to moderate symptoms; some postural instability but physically independent; need some assistance to recover from pull test
- 4: Extensive symptoms; still able to walk or stand without assistance
- 5: Uses wheelchair for mobility, require more assistance



Item 4: Finger Tapping
Rhythm, amplitude, interruptions, speed




Item 5: Hand Movements
Rhythm, amplitude, interruptions, speed



Item 6: Pronation-supination of hands
Rhythm, amplitude, interruptions, hesitations, speed



Item 16: Kinetic tremor of hands
Presence of tremor and amplitude



Item 7: Toe Tapping
Rhythm, amplitude, interruptions, speed



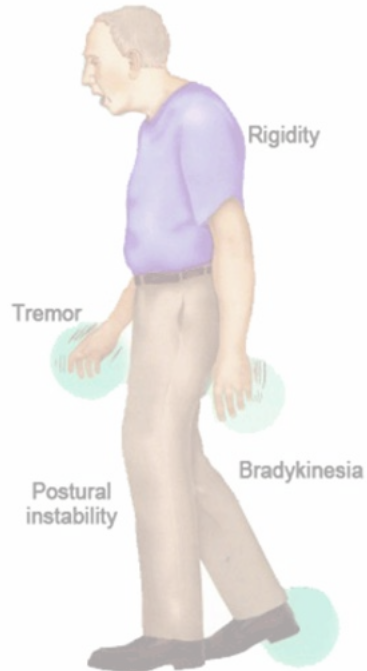
Item 8: Leg Agility
Rhythm, amplitude, interruptions, speed



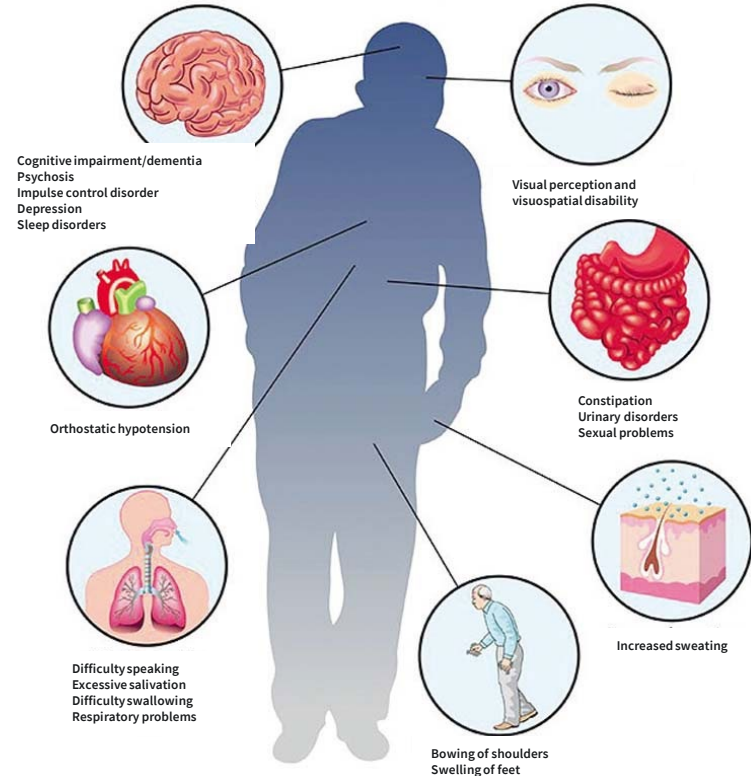
Item 9: Arising from chair
Speed, number of attempts, assistance, posture

PARKINSON'S DISEASE: GENERAL CONCEPTS

MOTOR MANIFESTATIONS



NON-MOTOR MANIFESTATIONS

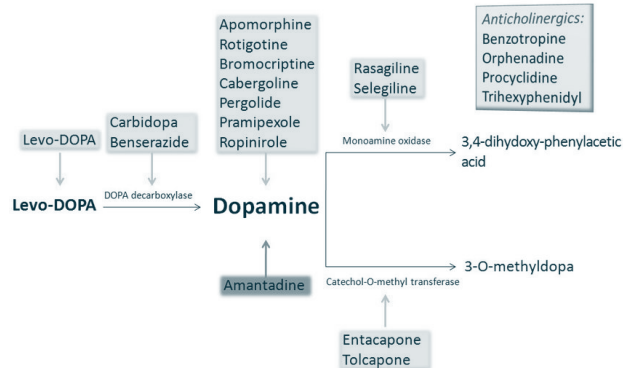


PARKINSON'S DISEASE: GENERAL CONCEPTS

STANDARD PARKINSON'S TREATMENT

ORAL/TRANSDERMAL MEDICATIONS

- Levodopa
- Dopamine agonists
- MAO-b inhibitors
- COMT inhibitors

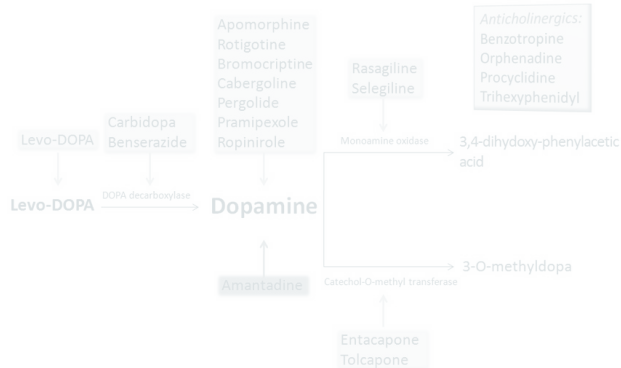


PARKINSON'S DISEASE: GENERAL CONCEPTS

STANDARD PARKINSON'S TREATMENT

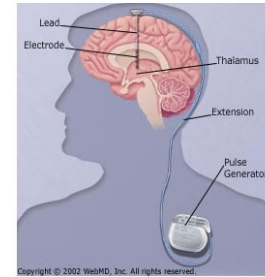
ORAL/TRANSDERMAL MEDICATIONS

Levodopa
Dopamine agonists
MAO-b inhibitors
COMT inhibitors



ADVANCED PD TREATMENT

Surgery (Deep Brain Stimulation)



Subcutaneous apomorphine Pump



Intestinal Duodopa Pump



PARKINSON'S DISEASE: GENERAL CONCEPTS

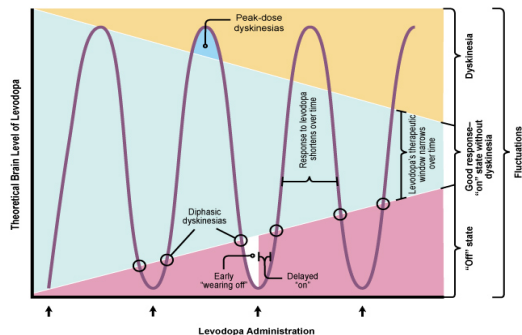
MOTOR & NEUROPSYCHIATRIC COMPLICATIONS (ADVANCED PARKINSON'S DISEASE)



PARKINSON'S DISEASE: GENERAL CONCEPTS

MOTOR & NEUROPSYCHIATRIC COMPLICATIONS (ADVANCED PARKINSON'S DISEASE)

- Motor fluctuations
- Dyskinesias



Related with reduction or
CHANGES IN RESPONSE TO LEVODOPA



PARKINSON'S DISEASE: GENERAL CONCEPTS

MOTOR & NEUROPSYCHIATRIC COMPLICATIONS (ADVANCED PARKINSON'S DISEASE)

- Motor fluctuations
- Dyskinesias
- Freezing of gate
- Postural imbalance



Related with disease-associated
BRAIN NEURODEGENERATION



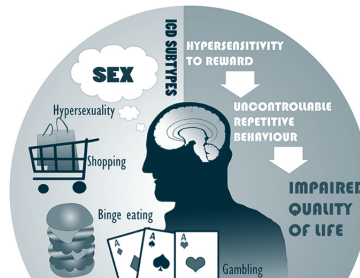
PARKINSON'S DISEASE: GENERAL CONCEPTS

MOTOR & NEUROPSYCHIATRIC COMPLICATIONS (ADVANCED PARKINSON'S DISEASE)

- Cognitive impairment & dementia
- Depression
- Psychosis (delirium & hallucinations)
- Impulse control disorder (ICD)

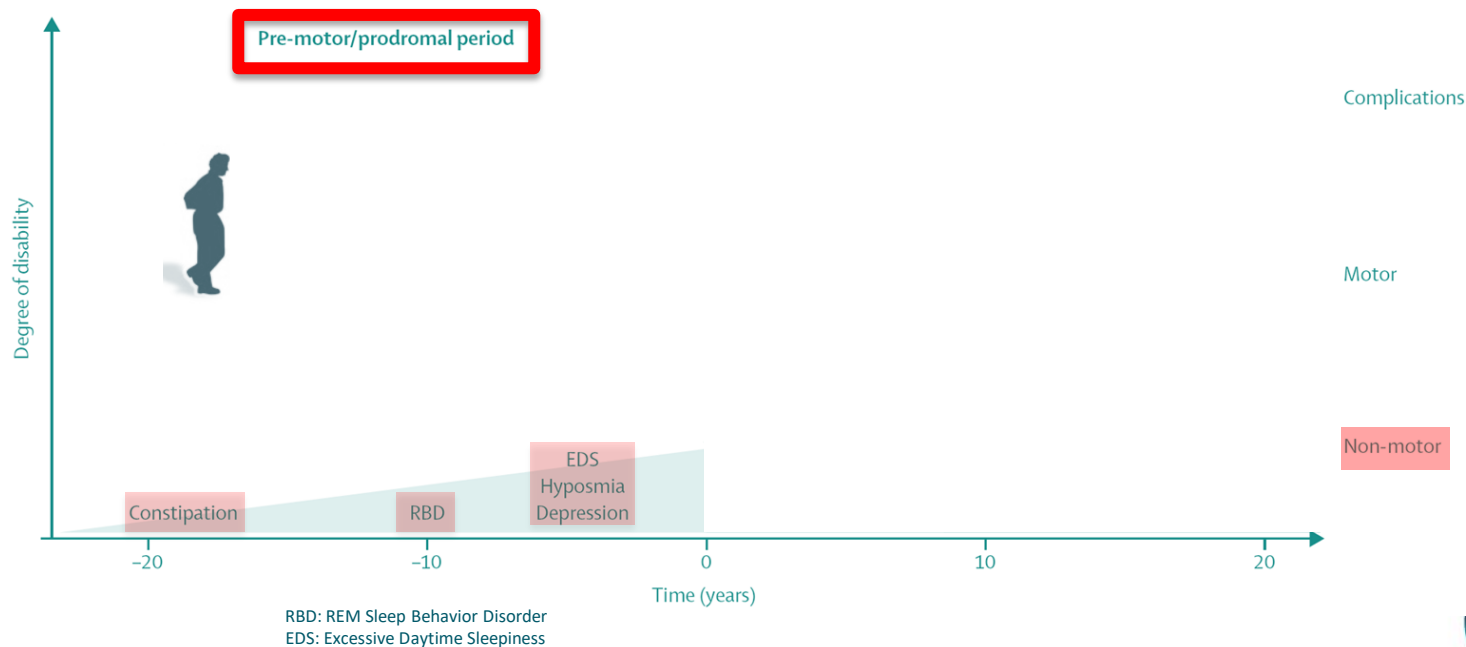


Related with
**MEDICATION & BRAIN
NEURODEGENERATION**



PARKINSON'S DISEASE: GENERAL CONCEPTS

MOTOR & NEUROPSYCHIATRIC COMPLICATIONS (ADVANCED PARKINSON'S DISEASE)



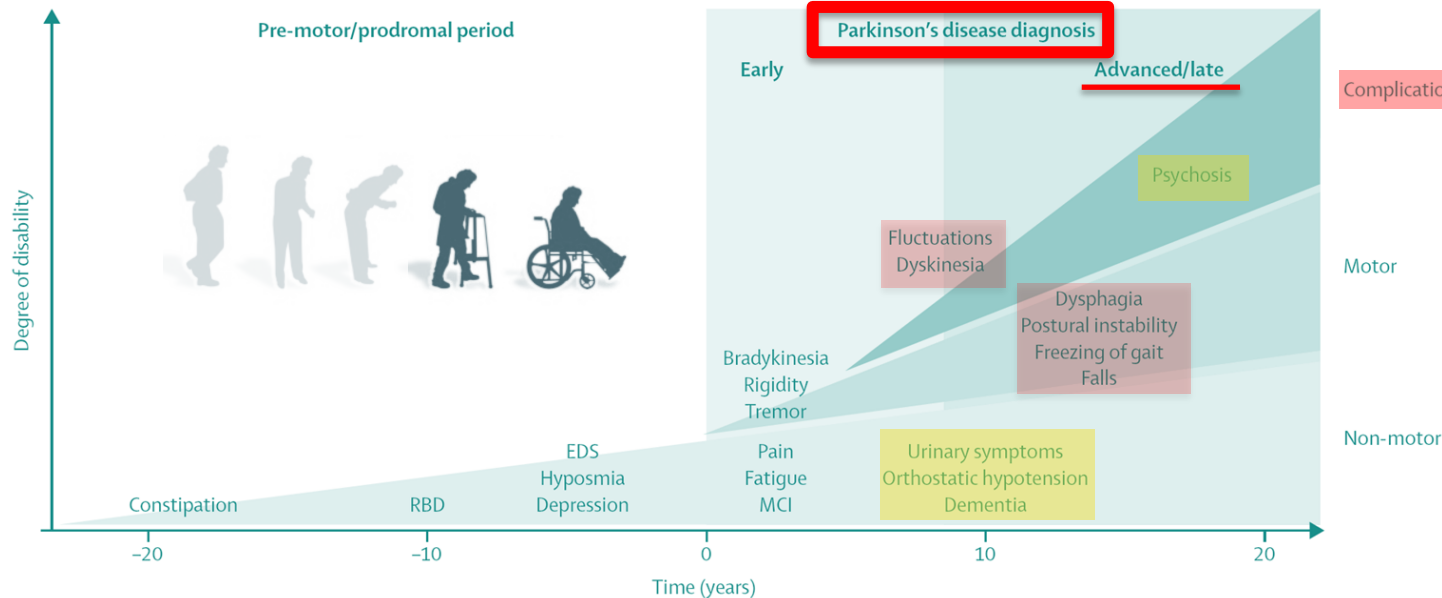
PARKINSON'S DISEASE: GENERAL CONCEPTS

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PARKINSON'S DISEASE: GENERAL CONCEPTS

MOTOR & NEUROPSYCHIATRIC COMPLICATIONS (ADVANCED PARKINSON'S DISEASE)



PRESENTATION OVERVIEW



PARKINSON'S DISEASE: GENERAL CONCEPTS

PARKINSON'S DISEASE: UNMET NEEDS

VCARE & PARKINSON'S DISEASE PATHWAY

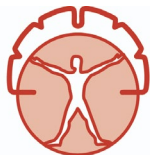


PARKINSON'S DISEASE: UNMET NEEDS

- Continuous & objective monitoring of motor and non-motor manifestations
- Risk detection and prevention
- Continuity of care
- Promotion of autonomy and self-care of the patient
- Communication tools for patient/caregivers w/ healthcare professionals



PARKINSON'S DISEASE: UNMET NEEDS



International Parkinson and
Movement Disorder Society

Task Force on Technology

MDS / About Us / Committees, Task Forces, SIGs, Study Groups, Affiliate Member Societies /
MDS Task Forces / Task Force on Technology

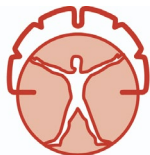
REVIEW

Technology in Parkinson's Disease: Challenges and Opportunities

Alberto J. Espay, MD, MSc,^{1*} Paolo Bonato, PhD,² Fatta B. Nahab, MD,³ Walter Meetzler, MD,^{4,5}
John M. Dean, MA, CCC-SLP,⁶ Jochen Klucken, MD,⁷ Bjørn M. Eskofier, PhD,⁸ Aristide Merola, MD, PhD,⁹
Fay Horak, PhD,^{10,11} Anthony E. Lang, MD, FRCP,¹² Ralf Reilmann, MD, PhD,^{13,14,15} Joe Giuffrida, PhD,¹⁶
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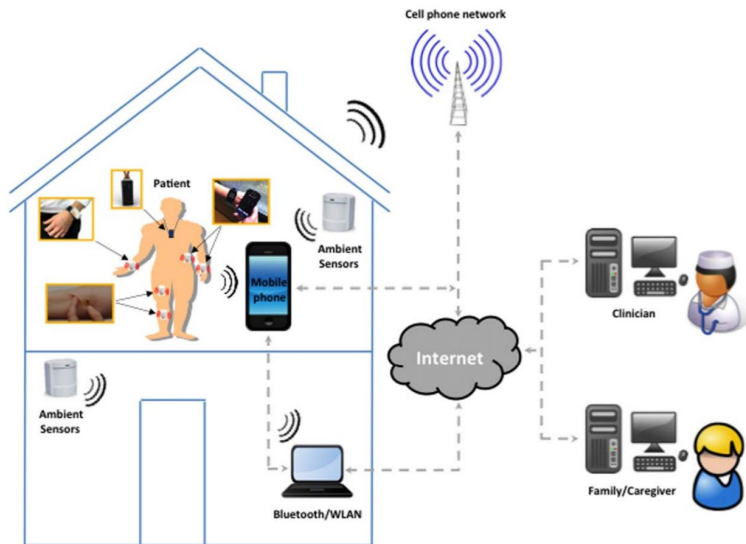
PARKINSON'S DISEASE: UNMET NEEDS



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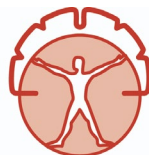
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PARKINSON'S DISEASE: UNMET NEEDS



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TABLE 1. Examples of available and needed technologies relevant to the diagnosis and clinical management of patients with Parkinson's disease

Clinical problem	Available/needed technologies	Clinical objective
Improving diagnosis	Needed: sensors for prodromal features (e.g., constipation, REM sleep behavior, anosmia); blood sensors for biomarkers (e.g., synuclein, proteomics, etc.)	Enable population screening for PD, including the earliest possible (prodromal) stages
Monitoring response to therapy and motor complications (motor fluctuations, dyskinesia)	Available: accelerometers, gyroscopes, magnetometers, electrogoniometers, surface EMG sensors Needed: small patches onto the skin or other sensors that improve patient adherence	Collect ecologically valid data of motor fluctuations, falls, freezing of gait episodes Implement sensor-based closed-loop technologies capable of delivering treatments (eg, infusion pump)
Monitoring nonmotor symptoms and progression	Available (but requiring improvements): sweat sensors, skin conductance sensors, heart rate sensors, blood pressure sensors	Collect ecologically valid data of nonmotor symptoms and progression
Improving medical treatment	Available (but requiring improvements): oral capsules, subcutaneous and gastrointestinal infusion pumps	Implement adjustable extended-release drug formulations, smart (self-adjusting) levodopa delivery infusion systems
Enhancing surgical treatment	Available (but requiring improvements): STN DBS, GPI DBS, Vim thalamus DBS	Implement closed-loop STN and GPI DBS (variable stimulation based on local field potentials)
Improving rehabilitation interventions	Available: accelerometers, gyroscopes, magnetometers, electrogoniometers, surface EMG sensors, pulse oximetry sensors, respiratory rate sensors, blood pressure sensors	Implement closed-loop cueing and feedback systems validated for home use



PARKINSON'S DISEASE: UNMET NEEDS

PARKINSON'S (PAPER) DIARY →

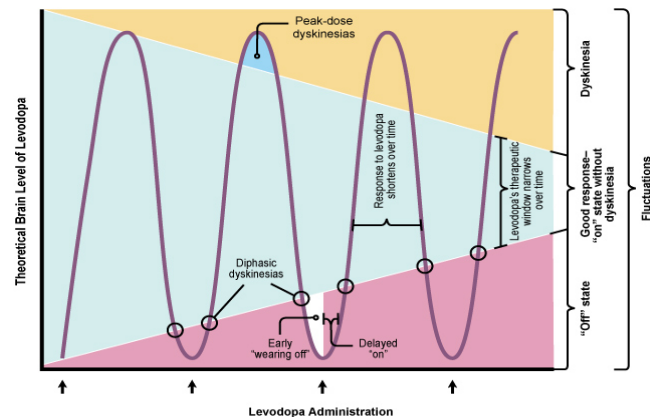
Parkinson Home Diary

24 hours registry (form) completed by patient
regarding motor status and complications

time	asleep	OFF	ON without dyskinesia	ON with mild dyskinesia	ON with moderate dyskinesia	ON with severe dyskinesia
6:00 AM						
:30						
7:00 AM						
:30						
8:00 AM						
:30						
9:00 AM						
:30						
10:00 AM						
:30						
11:00 AM						
:30						
12:00 PM						
:30						
1:00 PM						
:30						
2:00 PM						
:30						
3:00 PM						
:30						
4:00 PM						
:30						
5:00 PM						
:30						

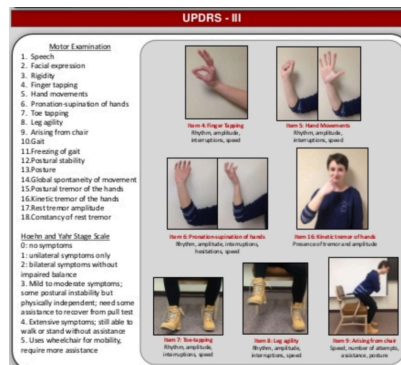
time	asleep	OFF	ON without dyskinesia	ON with mild dyskinesia	ON with moderate dyskinesia	ON with severe dyskinesia
6:00 PM						
:30						
7:00 PM						
:30						
8:00 PM						
:30						
9:00 PM						
:30						
10:00 PM						
:30						
11:00 PM						
:30						
12:00 AM						
:30						
1:00 AM						
:30						
2:00 AM						
:30						
3:00 AM						
:30						
4:00 AM						
:30						
5:00 AM						
:30						

FIG. 4. Test Diary II.



PARKINSON'S DISEASE: UNMET NEEDS

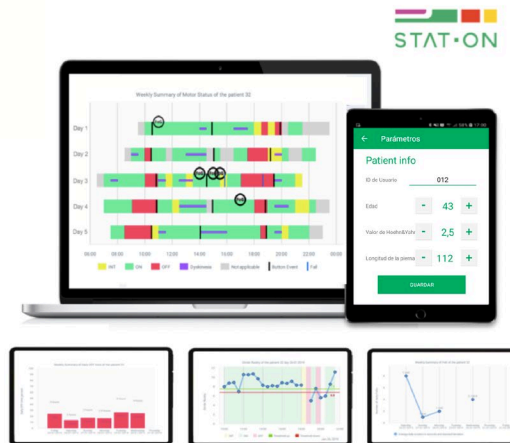
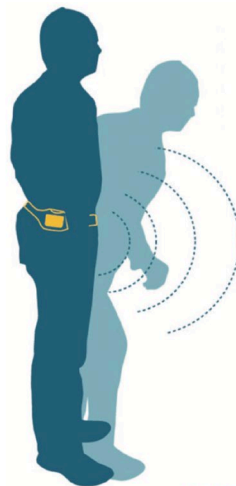
OBJECTIVE QUANTITATIVE MOTOR ASSESSMENT



PARKINSON'S DISEASE: UNMET NEEDS

OBJECTIVE QUANTITATIVE MOTOR ASSESSMENT

INVESTIGACIÓN	2009-2011		MOMOPA1	15 pacientes, colocación en la cintura, primeros algoritmos y análisis de resultados
	2010-2013		HELP - AAL	Primera aproximación a bombas de apomorfina, test con 6 pacientes
	2011-2015		REMPARK	>150 pacientes. La mayor base de datos inercial en casa del paciente conocida hasta la fecha. Foco en los algoritmos para la detección de síntomas motores
	2012-2016		MOMOPA-2	40 pacientes. Foco en determinar los estados ON y OFF con un sensor inercial
	2015-2018		MASPARK	Uso del sensor como gold standard. Cueling y mejora de los algoritmos para detectar la marcha bradicinética y la congelación de la marcha.
DESARROLLO	2017-2019		PARK-IT	SME Instruments Fase II Rediseño, industrialización, certificación
EVIDENCIA CLÍNICA	2019-2020		UPARKINSON	1- Comparación tiempo en OFF diario proporcionado por el paciente con las lecturas OFF de STAT-ON. 2- Reducción OFF después de ajuste. 3- Mejora QoL - PDQ-39
	2019-2021		MOMOPA-EC	1- Comparación entre diferentes métodos de evaluación
	2020-2023		PHARMA-CT	1- Estudios clínicos 2- Implementación como elemento de medida y control en bucles cerrados de administración de terapias con bombas de suministro de medicación



AUTOMATIC GENERATION OF REPORTS



*Results obtained in home environment conditions
 PARK-IT 2.0: H2020 - SMEINST - 2 - 2016 - 2017. Project Number: 756861

PRESENTATION OVERVIEW



PARKINSON'S DISEASE: GENERAL CONCEPTS

PARKINSON'S DISEASE: UNMET NEEDS

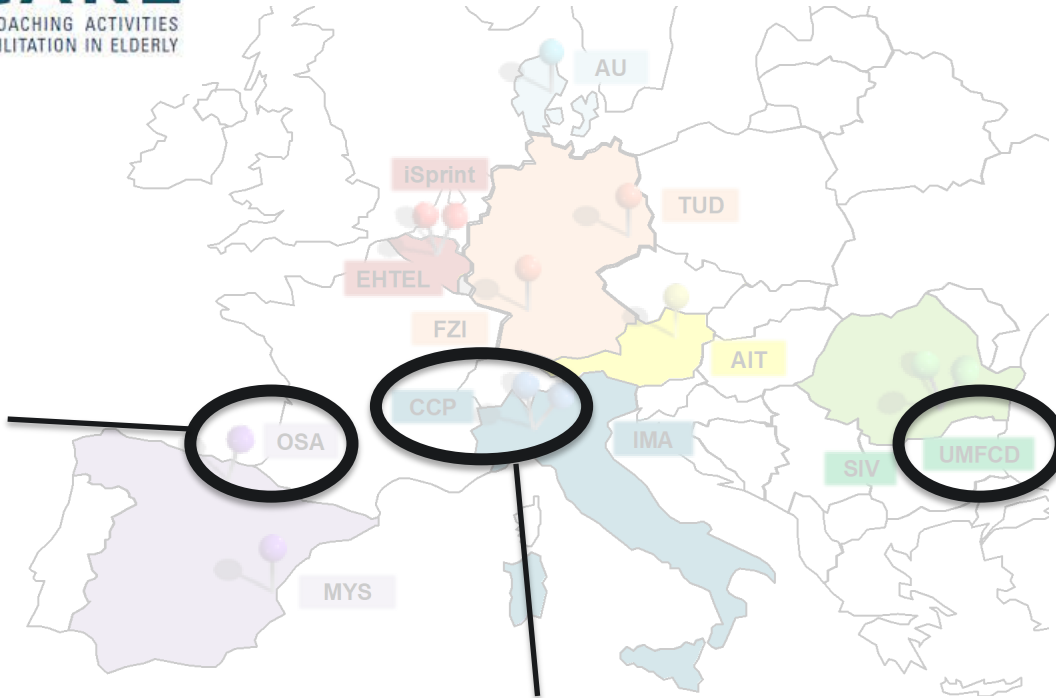
VCARE & PARKINSON'S DISEASE PATHWAY



VCARE & PARKINSON'S DISEASE PATHWAY



**PARKINSON'S
DISEASE**



HEART FAILURE



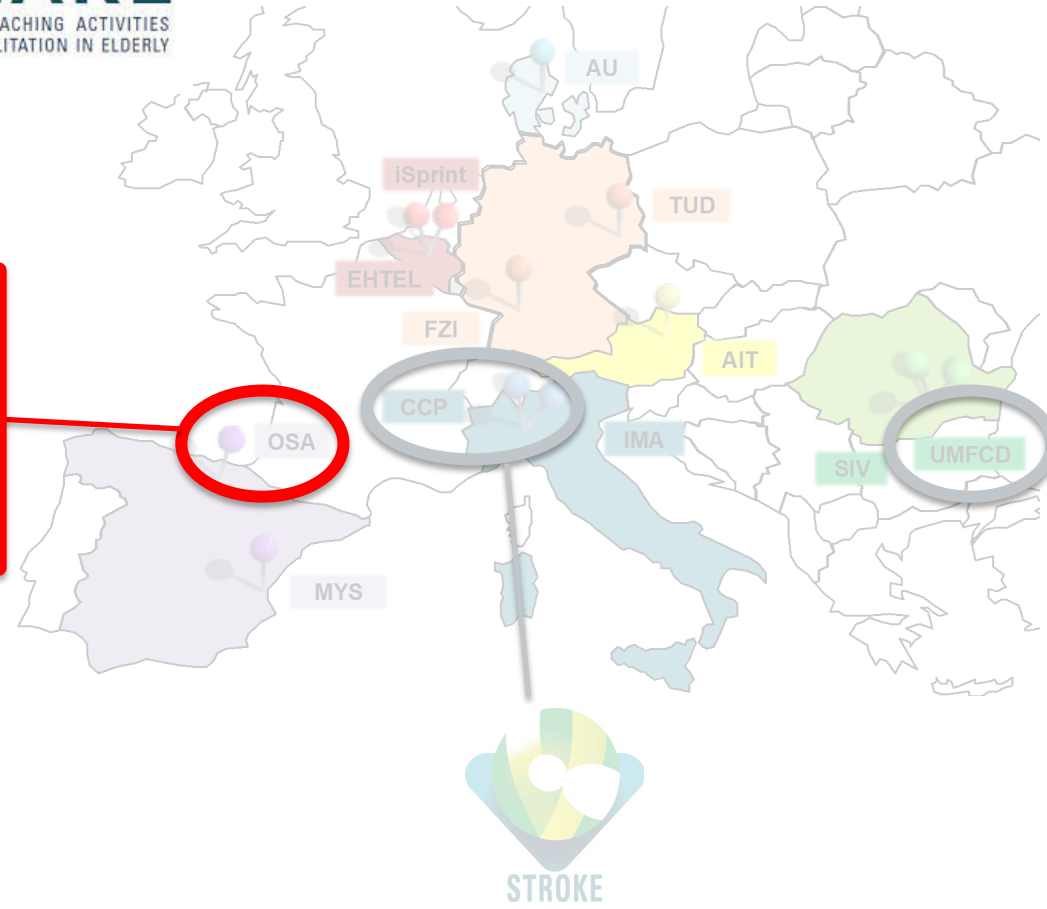
HEART ATTACK



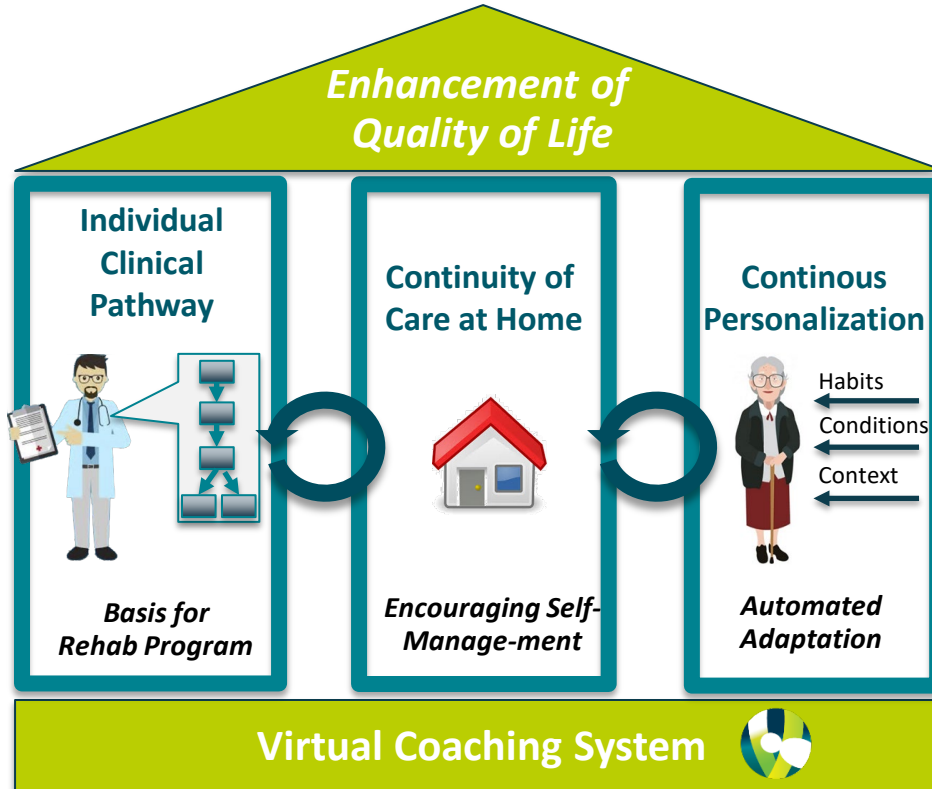
STROKE



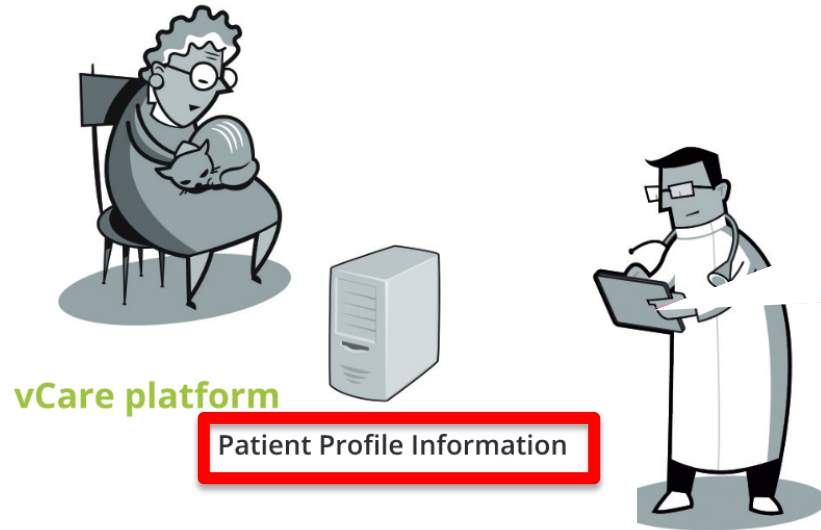
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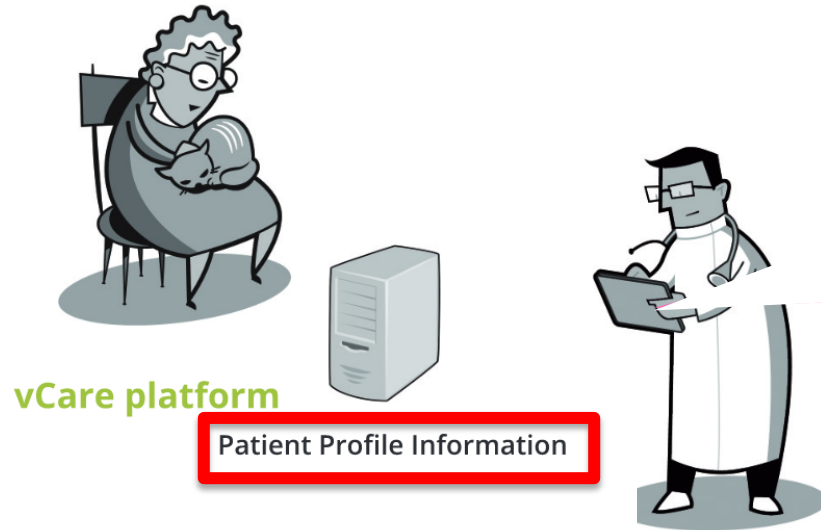
VCARE & PARKINSON'S DISEASE PATHWAY

Patient's Profile Characterization

Parkinson type		
Gait- balance impaired	Motor- fluctuations	Cognition behaviour- mood impaired
<input type="checkbox"/> NO	NO	NO
<input type="checkbox"/> NO	NO	YES
<input type="checkbox"/> NO	YES	NO
<input type="checkbox"/> NO	YES	YES
<input type="checkbox"/> YES	NO	NO
<input type="checkbox"/> YES	NO	YES
<input type="checkbox"/> YES	YES	NO
<input type="checkbox"/> YES	YES	YES

PROFESSIONAL PORTAL		
Sociodemographic characteristics		
Age		
Birth date		
Sex		
Education (years)		
Previous work		
Clinical characteristics		
UPDRS I		
UPDRS II		
UPDRS III		
UPDRS IV		
UPDRS Total		
Hoehn &Yahr		
Years of evolution		
Rigid-Akinetic (RA)	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Gait-Balance Impairment	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Risk of fall	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Walking aids prescribed	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Potential faller	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Symmetry	<input type="checkbox"/> YES	<input type="checkbox"/> NO
PIGD	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Tremor	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Tremor dominant	<input type="checkbox"/> YES	<input type="checkbox"/> NO
MoCA		
Daily life activities Scale		

VCARE & PARKINSON'S DISEASE PATHWAY



VCARE & PARKINSON'S DISEASE PATHWAY



Motor activities



Monitoring home hazards
and behaviour at risk



Sensorized
personal objects



vCare platform



VCARE & PARKINSON'S DISEASE PATHWAY



Hello I'm Cathrin! Welcome to the v-Care App!



Motor activities



Monitoring home hazards and behaviour at risk



Sensorized personal objects



vCare platform



Motivational feedback
Correction of motion



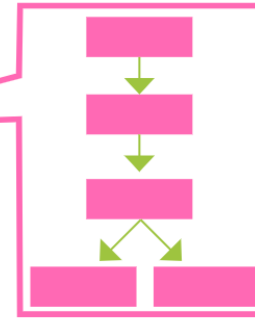
Physical exergames



Domotics
eLearning

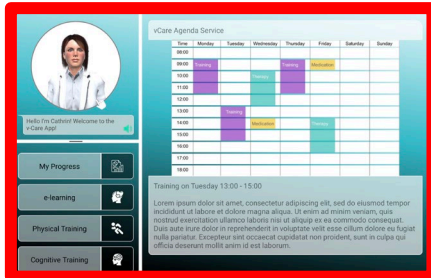


Alert reminder
Localization



Care Plan

Motor impairment
Medical prescription
Rehabilitation program
Behaviour motor activity home hazard



VCARE & PARKINSON'S DISEASE PATHWAY

Patient's Profile Characterization			Matching needs with pathway templates (Clinical Aspects Evaluation)
Parkinson type			
Gait- balance impaired	Motor- fluctuations	Cognition behaviour- mood impaired	<input type="checkbox"/> Adapted physical therapy Limb dexterity rehab <input type="checkbox"/> Gait-balance rehab <input type="checkbox"/> Limb dexterity rehab <input type="checkbox"/> Trunk bradikinesia & rigidity rehab <input type="checkbox"/> Speech rehab
<input type="checkbox"/> NO	NO	NO	
<input type="checkbox"/> NO	NO	YES	<input type="checkbox"/> Attention rehab <input type="checkbox"/> Executive Functions rehab
<input type="checkbox"/> NO	YES	NO	
<input type="checkbox"/> NO	YES	YES	<input type="checkbox"/> FOG and/or falls prevention <input type="checkbox"/> PD medication problems prevention
<input type="checkbox"/> YES	NO	NO	<input type="checkbox"/> Behavioural problems prevention
<input type="checkbox"/> YES	NO	YES	<input type="checkbox"/> Behaviour rehab
<input type="checkbox"/> YES	YES	NO	<input type="checkbox"/> Mood rehab
<input type="checkbox"/> YES	YES	YES	<input type="checkbox"/> Pain management <input type="checkbox"/> Sleep

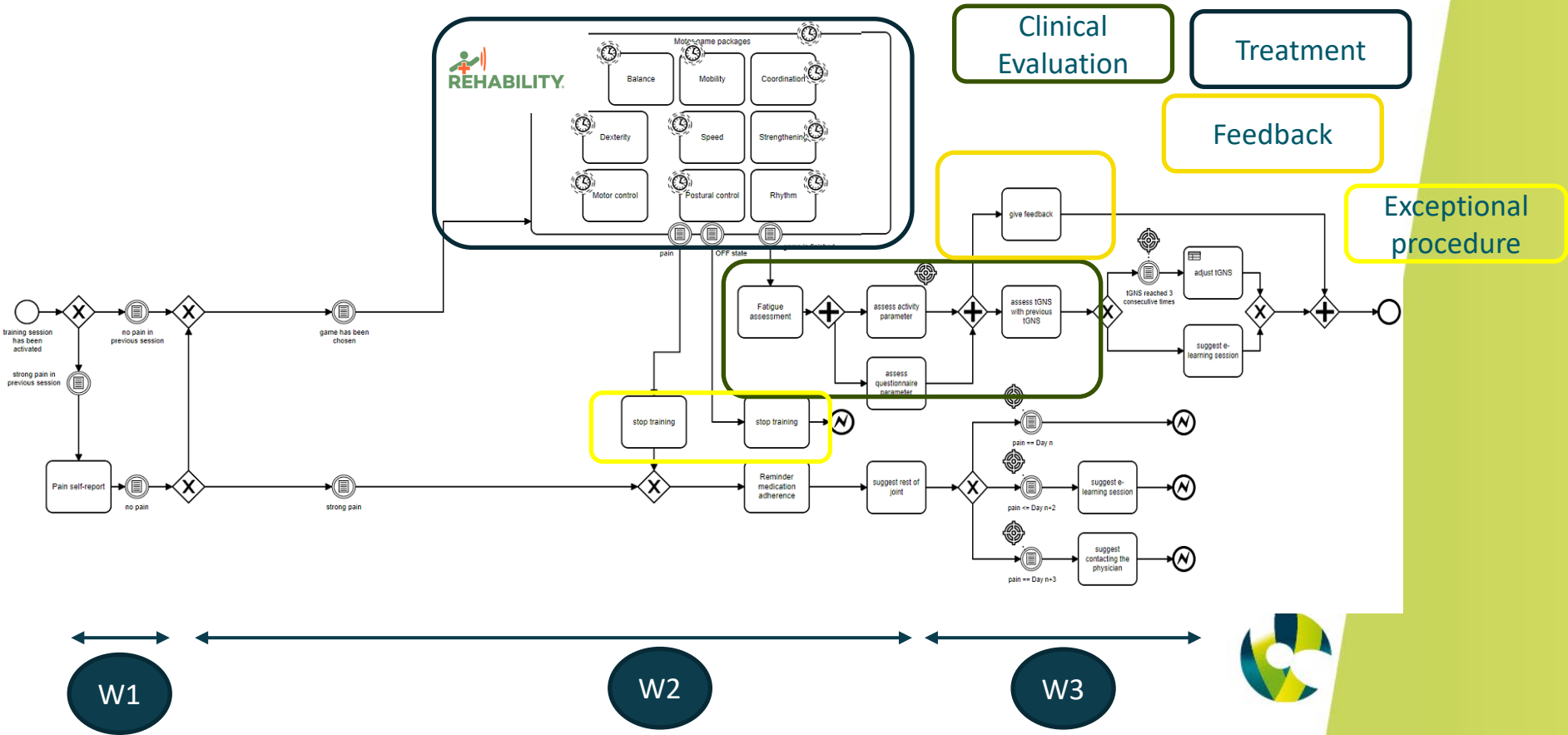
VCARE & PARKINSON'S DISEASE PATHWAY

Patient's Profile Characterization			Matching needs with pathway templates (Clinical Aspects Evaluation)		Pathway Indication	Activities
Parkinson type						
Gait- balance impaired	Motor- fluctuations	Cognition behaviour- mood impaired	<input type="checkbox"/> Adapted physical therapy Limb dexterity rehab <input type="checkbox"/> Gait-balance rehab <input type="checkbox"/> Limb dexterity rehab <input type="checkbox"/> Trunk bradikinesia & rigidity rehab <input type="checkbox"/> Speech rehab		Physical therapy	<input type="checkbox"/> Home based motor activities <input type="checkbox"/> Monitor <div> <input type="checkbox"/> Gait/Balance <input type="checkbox"/> Trunk </div> <input type="checkbox"/> Limbs <input type="checkbox"/> Speech <input type="checkbox"/> Coaching for active lifestyle <input type="checkbox"/> E-learning
<input type="checkbox"/> NO	NO	NO				
<input type="checkbox"/> NO	NO	YES	<input type="checkbox"/> Attention rehab <input type="checkbox"/> Executive Functions rehab			<input type="checkbox"/> Home based cognitive games <input type="checkbox"/> Fun supporting activities
<input type="checkbox"/> NO	YES	NO				
<input type="checkbox"/> NO	YES	YES	<input type="checkbox"/> FOG and/or falls prevention			<input type="checkbox"/> Falls prevention
<input type="checkbox"/> YES	NO	NO	<input type="checkbox"/> PD medication problems prevention			<input type="checkbox"/> E-reminders for medication / Medication intake support
<input type="checkbox"/> YES	NO	YES	<input type="checkbox"/> Behavioural problems prevention			
<input type="checkbox"/> YES	YES	NO	<input type="checkbox"/> Behaviour rehab			<input type="checkbox"/> Monitor Mood / Behav rehab
<input type="checkbox"/> YES	YES	YES	<input type="checkbox"/> Mood rehab		Emotional/social rehabilitation	
<input type="checkbox"/> YES	YES	YES	<input type="checkbox"/> Pain management			<input type="checkbox"/> Monitor Pain / Sleep
			<input type="checkbox"/> Sleep		Pain management / sleep	

VCARE & PARKINSON'S DISEASE PATHWAY

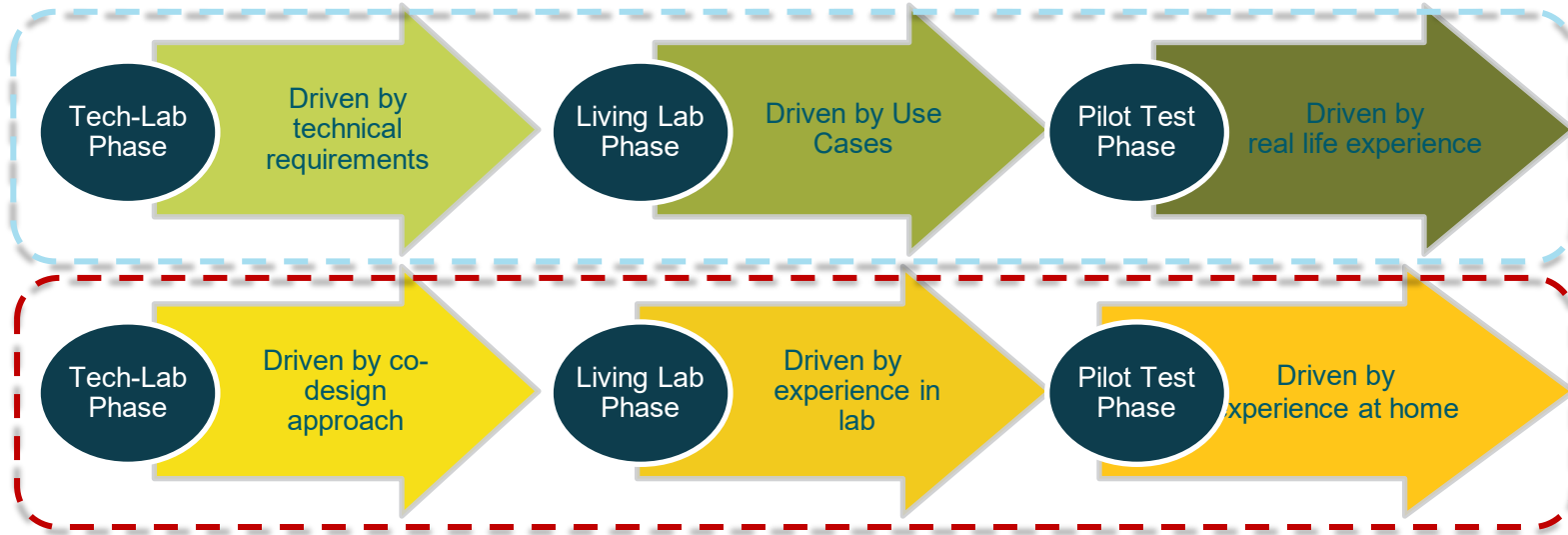
Patient's Profile Characterization		Matching needs with pathway templates (Clinical Pathway)			Pathway Indication		Activities		
	A #	Activity (A)	Release date (from TSB,	Pathology	Medical Use Case UC #				
Gait- balan impr	A-1	Home-based motor activities	01/06/2020	SD, PD	UC1, UC5, UC6			Home based motor activities	
	A-2	Coaching for an active lifestyle	01/06/2020	SD, PD	UC1, UC4, UC5, UC6			Monitor	Gait/Balance
	A-3	E-learning	01/06/2020	SD, PD, HF,	UC1, UC2, UC5, UC6, UC7, UC9			Limbs	Trunk
	A-4	Home based cognitive games	01/06/2020	SD, PD	UC3, UC4, UC6			Speech	
	A-5	Fun supporting activities	01/06/2020	SD, PD	UC3			Coaching for active lifestyle	
	A-6	Monitoring indoor	01/12/2020	SD	UC1, UC2			E-learning	
	A-7	Safety tips	01/06/2020	SD	UC2			Home based cognitive games	
	A-8	Monitoring mood	01/07/2020	SD, PD, IHD	UC3, UC4, UC5, UC13				
	A-9	Monitoring Pain and sleep	01/03/2020	SD	UC1			Fun supporting activities	
	A-10	Vocal Exercises	01/07/2020	PD				Falls prevention	
	A-11	Falls Prevention	01/04/2020	PD	UC6			E-reminders for medication / Medication intake support	
	A-12	Daily Motor Activity	01/06/2020	HF	UC9			Monitor Mood / Behav rehab	
	A-13	Aerobic Physical Activity	01/06/2020	HF, IHD	UC9, UC11				
	A-14	Resistance training	01/06/2020	HF	UC10, UC14			Pain management / Sleep	Monitor Pain / Sleep
	A-15	Medication intake support	01/06/2020	PD, HF, IHD	UC5, UC7, UC12				
	A-16	Vital stats control	01/06/2020	HF	UC9, UC10				
	A-17	Weight control	01/06/2020	HF, IHD	UC11				
	A-18	Smoking cessation activity	01/06/2020	HF, IHD	UC10, UC14				
	A-19	Anxiety and depression reduction	01/07/2020	HF	UC7, UC9, UC10				

VCARE & PARKINSON'S DISEASE PATHWAY



VCARE & PARKINSON'S DISEASE PATHWAY

ACTIVITIES WITH TEACH TEAM



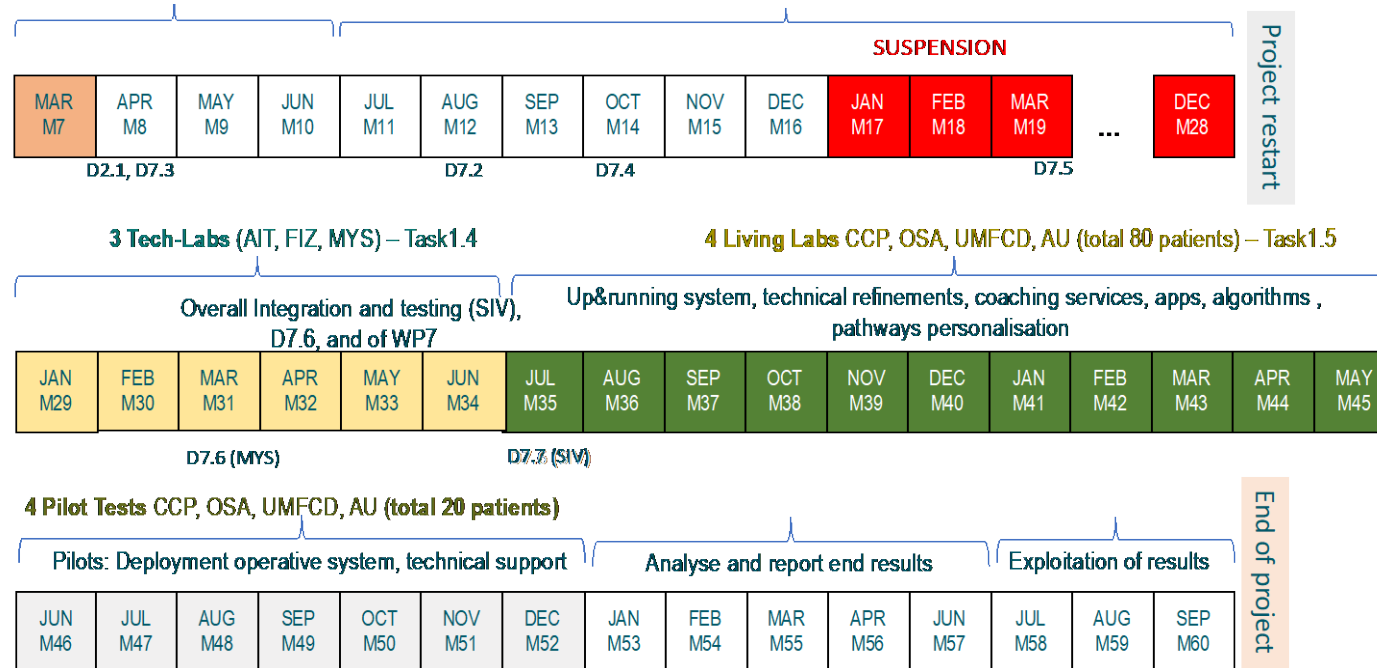
ACTIVITIES WITH PATIENTS



VCARE & PARKINSON'S DISEASE PATHWAY

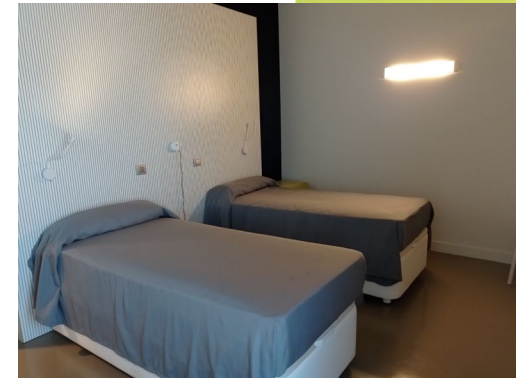
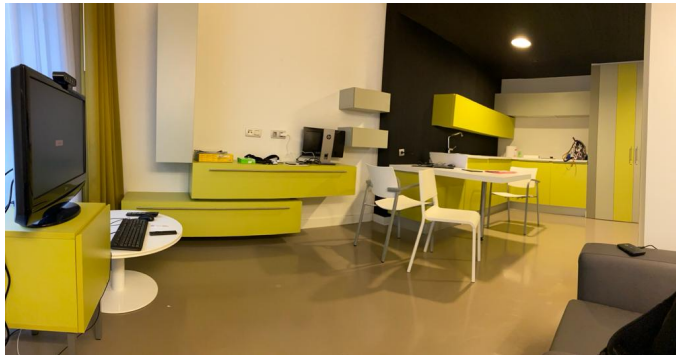
Architecture & Interface definition and technical preparations

Preliminary phase
Development, adjustments & one2one integrations




VCARE & PARKINSON'S DISEASE PATHWAY

Living lab for Parkinson's disease (Bilbao, Spain)



VCARE & PARKINSON'S DISEASE PATHWAY



Hello I'm Cathrin! Welcome to the v-Care App!

My Progress

e-learning

Physical Training

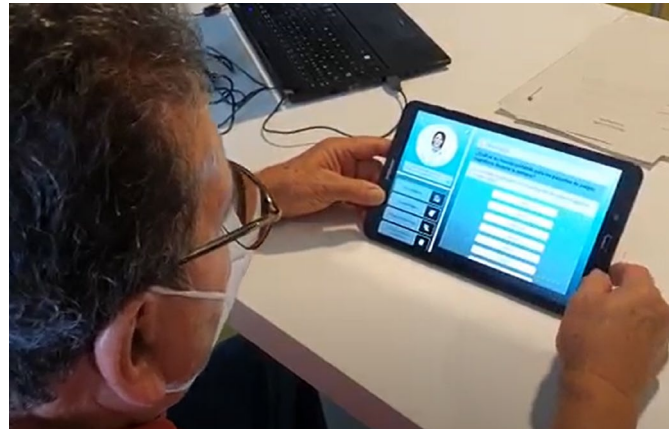
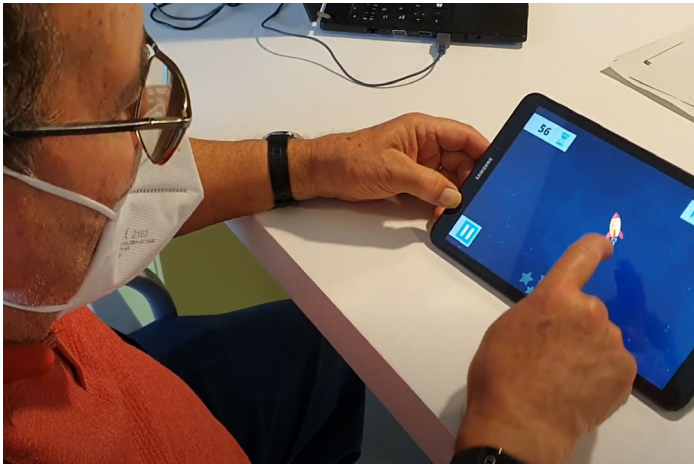
Cognitive Training

vCare Agenda Service

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
08:00							
09:00	Training			Training	Medication		
10:00			Therapy				
11:00							
12:00							
13:00		Training					
14:00			Medication	Therapy			
15:00							
16:00							
17:00							
18:00							

Training on Tuesday 13:00 - 15:00

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.



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THANK YOU



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