Puglia, Italy: Smartaging Mindbrain

Part 1: General Information

Publication on EIP on AHA Portal	Yes
Copyright	Yes
Verification of the Good Practice	Yes
Evaluation of the Good Practice	No
Type of the Good Practice	Promising practice

Part 2: Description of the Good Practice

Name of the Good Practice	Smartaging mindbrain
Short name (Acronym)	Not applicable
URL of the Good Practice	www.smarthealth2.com/eng/ www.oplon.eu
Geographical scope	National level
Country	Italy
Region(s) involved	Puglia, Piemonte, Lombardia, Emilia Romagna
Status of the Good Practice	On-going
Stakeholders involved	• Hospitals • Primary care centres • Home care centres • Day care centres • Research centres • Academia • Specialised physicians • General practitioners • Pharmacists • Nurses • Nursing homes • Informal caregivers • Local public authorities • Small-sized industry • Medium-sized industry • Large-sized industry • Advocacy organisations of nurses • Advocacy organisations of physicians • Advocacy organisations of patients / users • Private companies
Size of population covered	1,000-9,999

Targeted audience	50-64

Summary of the Good Practice

Increase in life expectancy brought to a raise of the pathological aging and dementia (especially Alzheimer's disease, AD), leading to a low life quality, limited autonomy, and higher costs for assistance. A scientific question is: can lifestyle modify the risk of cognitive decline in elderly? Although some risk factors cannot be changed (aging, genetic predisposition, chronic kidney disease and chemotherapy due to blood cancer), they interact with other environmental factors modifiable by lifestyle. We have developed ICT solutions for the prevention and early diagnosis of dementing disorders in two national projects called "SMART HEALTH 2.0" and "OPLON", granted by the Italian Government (MIUR). The first, SMARTAGING (developed in the SMART HEALTH 2.0, enriched in OPLON) grounded upon the Italian Telecom platform ("Nuvola Italian Home Doctor") and some Telbios servers, exploits the concepts of preventive medicine providing: 1) instructions for healthy lifestyle; 2) telemonitoring of daily activities, training of cognitive functions; 3) telemonitoring of physiological parameters; 4) automatic feedback about subject's response. A successful "proof of concept" of feasibility, usability, and satisfaction was reached in clinical experiments performed in 20 Apulian elderly subjects (ten survived to a blood cancer) over 3-6 months.

The second, MINDBRAIN (grounded upon the "DECIDE" platform; www.eu-decide.eu) exploits the use of MRI and EEG biomarkers for an early diagnosis of AD. A successful "proof of concept" of its diagnostic validity was reached in clinical experiments performed in about 100 Apulian elderly subjects with cognitive impairment.
New confirmatory experiments of are in progress in chronic kidney disease subjects.

Key words: cognitive decline, ICT, healthy ageing, prevention, chronic diseases

Good practice being part of the larger programme

Yes.

The mentioned ICT solutions (Smart Health 2.0 and OPON) are building blocks of general programme aimed at testing the beneficial impact of (1) the instructions, telemonitoring, and feedback of healthy lifestyle for active aging in chronic diseases and (2) early diagnosis of dementing disorders thanks to MRI and EEG biomarkers.

Challenges / problems addressed by the good practice

a) Unhealthy lifestyle, an environmental factor boosting several diseases triggering neurodegenerative processes, especially in patients with chronic comorbidities such as renal diseases.
b) Misleading sources of this information about a healthy nutrition and physical activity as a function of age and general healthy status.
c) The need for periodic control of physiological parameters and behaviour to verify the adherence to activities in elderly and patients with chronic diseases.

d) Lack of quantitative and repeatable measurements of cognitive functions in elderly during periodical visits to family doctor. e) Most of the diagnosis of dementia occur too late and interventions are less effective.
Importance of the challenges / problems before starting to implement good practice Pathological aging and dementing disorders in elderly subjects with chronic diseases represent one of the most important burden for western societies, with a dramatic impact on families and public health. We have 7 million of patients with dementing disorders in Europe, most with AD. The promotion of healthy lifestyle and early diagnosis of AD would have a tremendous beneficial impact on this situation.
Environment before the good practice was implemented Before SMARTAGING and OPLON, In Apulia there was no ICT solution for the telemonitoring and conditioning of healthy lifestyle for active aging in a medical environment and (2) no Apulian neurological centre qualified for the use of ICT solutions for the early diagnosis of several dementing disorders thanks to MRI and EEG biomarkers.
Key innovative elements of the good practice and how the good practice improved situation compared to previous practice Nowadays, UNIBA can offer SMARTAGING and MINDBRAIN services for clinical research on the telemonitoring and conditioning of healthy lifestyle for active aging and (2) the early diagnosis of several dementing disorders thanks to advanced MRI and EEG biomarkers. The innovative elements are the following: 1) An innovative ICT- based tablet battery of 8 cognitive tasks for daily assessment of cognitive functions and brain training; 2) automatic composition of a report on the subjects' lifestyle and vital and physiological parameters as a feedback for the patient without the involvement of medical doctors in person; 3) Apulian neurological centres are aligned with the most advanced procedures for the extraction of MRI and EEG biomarkers for early diagnosis of AD.

Part 3: Transferability of the Good Practice

Cost-effectiveness of the good practice (including all kind of costs and outcomes such as better health, quality of life or other resources)	Lower costs, improved outcomes
Resources required for the deployment of the good practice (personnel, equipment, facilities, ICT and other resources required) • Adequately equipped control room (PCs, monitors, network, etc..); • Specialized physicians (Case manager); • Specialized Nurses (Care manager); • ICT specialist (software maintenance and improvement) • Devices and kits for the analysis of physiological and biochemical blood markers; • Home telemedicine kits (medical devices + HD camera);	

• Smart devices (tablet, PC, smartphone, wearable sensors, etc.); • ICT regional structure, with privacy and security systems; • Training facility.	
Total budget of the Good Practice	€100.000-€499,999
Source of funding	National funding
The main actions that have to be done to deploy the Good Practice • As part of the SH 2.0 project, we have formed new specialists – Care (nurses) and Case (physicians) Managers, with specific expertise in telemedicine. • From a planning policy point of view, we have presented the results of our Good Practice to the regional government, in order to promote the implementation of these new telemonitoring systems in daily clinical practice.	
Issues during the implementation of the Good Practice • Technical interfacing problem with the existing ICT structure; • Difficulties in the use of devices by older patients; • System scalability related to the increase in the number of patients; • Privacy Policies.	
Additional resources required to scale up Good Practice No.	
Basis to support sustainability of the Good Practice The monitoring of physiological parameters, cognitive parameters, and lifestyle, and the study of their relationship with cognitive decline are clearly based upon existent literature about risk factor for cognitive and functional decline. SMARTAING showed that the service is feasible, usable, and induce satisfaction and improvement of healthy lifestyle in the users. The new international guidelines for the early diagnosis and monitoring of AD promote the use of neuroimaging biomarkers in addition to neurological and neuropsychological exams (Dubois et al., 2014; Lancet Neurology). MINDBRAIN qualified 3 Apulian centres (Tricase Neurological Service, Casarano Neurological Service, S. Venera Hospital of Bari) for the ICT-based production of advanced MRI and EEG biomarkers.	
Evidence to observe the Good Practice A practice report (SMARTAGING and MINDBRAIN deliverables); Video or other digital media (web page, audio, ...), A visit to an implementation site (UNIBA, IRCCS San Giovanni Paolo II; Tricase Neurological Service, Casarano Neurological Service, S. Venera Hospital of Bari); Any other means (e.g. scientific papers) Scientific papers of the Operative Units.	

Part 4: Viability assessment of the Good Practice

Time needed to deploy the Good Practice Between one year and three years. SMARTAGING and MINDBRAIN were modules of the projects SMART HEALTH 2.0 AND OPLON, granted from MIUR. The documentation of these projects (deliverables) is available for any inspection and more details. Furthermore, they were based on previous ICT platforms of the European FP7 ICT Infrastructure project called "DECIDE" and the "Nuvola IT Home Doctor" of Italian Telecom (see WEB pages such as www.smarthealth2.com, www.oplon.eu, www.eu-decide-eu, https://tmed.telecomitalia.it/).
Investment per citizens / patient / client in terms of financial resources No available calculation.
Evidence behind the Good Practice Agreed evidence. Evidence is based on an agreed established monitoring system/process before and after implementation of the Good Practice As mentioned before, SMARTAGING and MINDBRAIN were modules of the projects SMART HEALTH 2.0 AND OPLON, granted from MIUR. The documentation of these projects (deliverables) is available for any inspection and more details. Furthermore, they were based on previous ICT platforms of the European FP7 ICT Infrastructure project called "DECIDE" and the "Nuvola IT Home Doctor" of Italian Telecom (see WEB pages such as www.smarthealth2.com, www.oplon.eu, www.eu- decide-eu, https://tmed.telecomitalia.it/).
Maturity of the Good Practice Proof of concept is available: it works in a test setting and the potential end-users are positive about the concept. The SMARTAGING ICT solution was developed in the SMART HEALTH 2.0, and was enriched in OPLON. It mainly grounds upon the ICT platforms by Italian Telecom ("Nuvola Italian Home Doctor"), with some services grounding upon Telbios servers. A successful "proof of concept" of feasibility, usability, and satisfaction was reached in clinical experiments performed in 20 Apulian elderly subjects (ten who survived to a blood cancer SMARTAGING) over 3-6 months. The tests included: 1) instructions to follow healthy lifestyle and reduce the risk of cognitive decline and dementia across aging; 2) daily telemonitoring of subjects' diet, physical and social activity, training of cognitive functions and smoking; 3) periodic telemonitoring of blood pressure, heart rate, electrocardiographic activity, body weight, and blood glycaemia, oxygen, and cholesterol; 4) weekly automatic feedback about subject's behaviour and physiological parameters. The MINDBRAIN ICT solution was developed using the ICT platform "DECIDE" by GARR (www.eu- decide.eu). A successful

"proof of concept" of diagnostic validity of MINDBRAIN was reached in clinical experiments performed in about 100 Apulian elderly subjects with mild cognitive impairment (MCI) and dementia mainly due to AD, exploiting the use of MRI and EEG biomarkers for an early diagnosis of AD. Actually, new confirmatory experiments of SMARTAGING and MINDBRAIN are in progress in subjects with chronic kidney disease in OPLON.
Estimated time of impact of the Good Practice Medium impact – e.g. shortly beyond the pilot project period
Impact observed Better quality of life (societal). As mentioned before, SMARTAGING and MINDBRAIN were modules of the projects SMART HEALTH 2.0 AND OPLON, granted from MIUR. These modules included "proof of concept" experiments in the clinical practice involving Operative Units in Apulia. The experiments were completed in SMART HEALTH 2.0 while they are in progress in OPLON. The results of SMARTAGING were successful and are reported in the formal documentation of these projects (deliverables). They were also disseminated in several national and international Conferences and events, in line with the project dissemination plan.
Transferability of the Good Practice Transferability has not been considered. The innovative practice has been developed on local/regional/national level and transferability has not been considered in a systematic way. More research is needed to test the transferability of SMARTAGING and MINDBRAIN services to a large amount of clinical users and patients.

Part 5: Your organisation

Name of the organisation	Azienda Ospedaliero-Universitaria Policlinico Consorziale di Bari Department of Emergency and Organ Transplantation – University of Bari
Address of the organisation	GiulioCesare square, 11, 70124 Bari (Italy)
Type of organisation	Hospitals, Resarch centres, Academia
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