Tele-medicine:
a valuable tool in dementia

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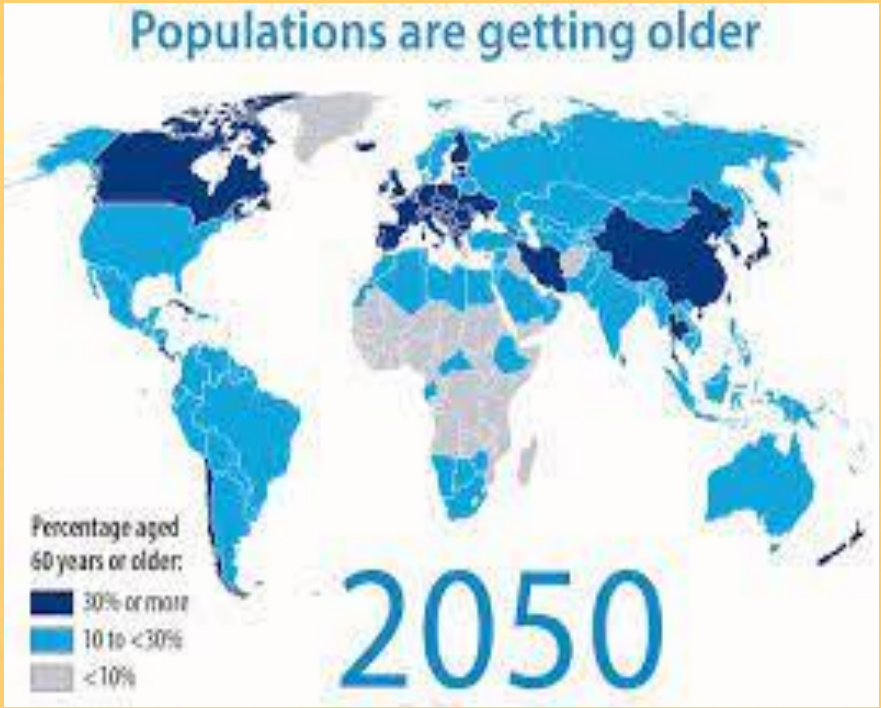
Dementia prevalence

- Significant rise in the number of older people
- In 2000, the number of people at the age of 65+ in the world: 12.4%
- Number is expected to grow to19% by 2030
- 44 million people worldwide living with dementia
- This number should triple by the year of 2050
- Slow reduction in weight and volume of the brain
- Reduction by 5%by the age of 70
  - 10%: by the age of 80
  - 20%: by the age of 90



Limitations in Conventional visits in Dementia

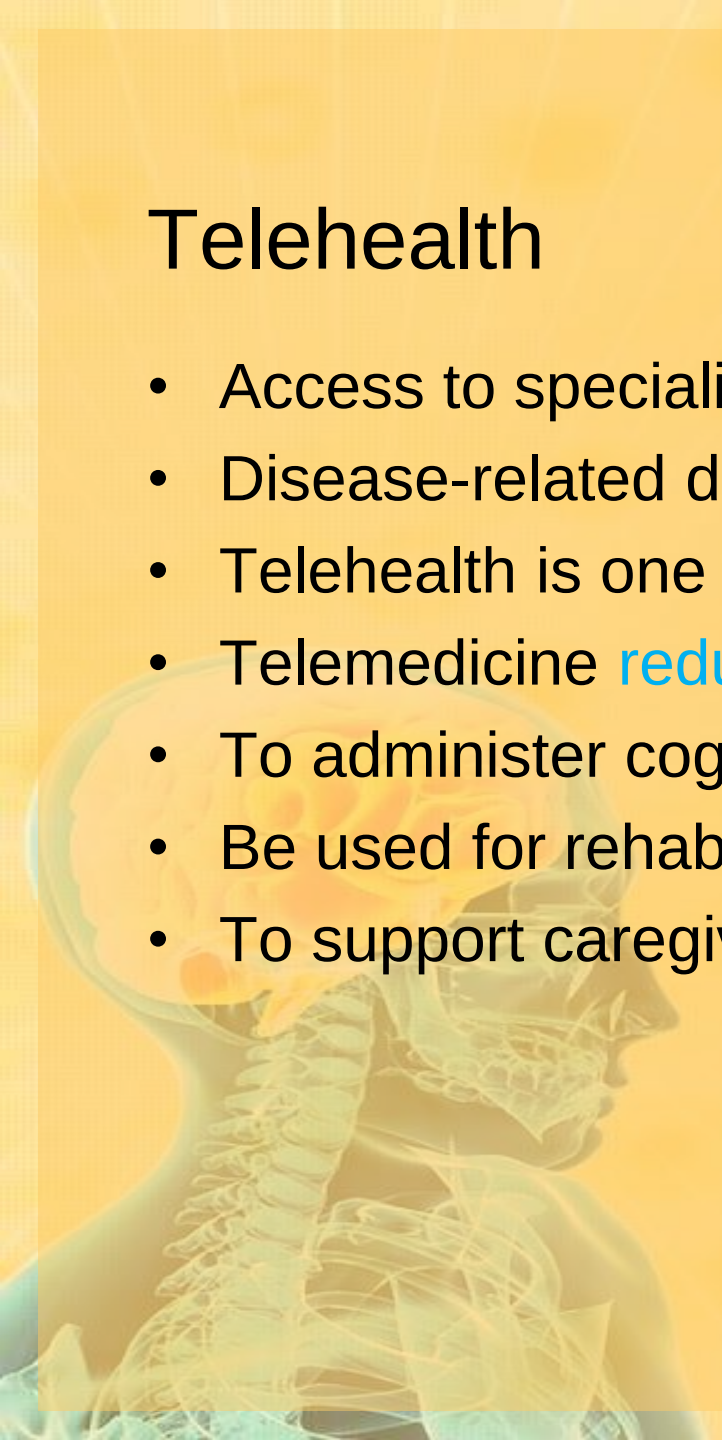
- Visiting a Cognitive Neurologist/Neuropsychiatrist : problematic and challenging
- Very limited number of Cognitive Neurologists/ Neuropsychiatrist
- Inappropriate to the high number of different types of dementia
- Elderly patients with dementia cannot find the appropriate Neurologist
- Need support to perform diagnosis procedural
- Difficulties in preparing for visit
- Visiting time is not predictable
- Patient' agitation and delirium in unfamiliar crowded environment
- Stress effect on neuropsychological assessment

Barriers in dementia patients visit

Factors related to the patients	Factors related to the Physicians	Factors related to the office/system
Lack of appropriate understanding of the cognitive decline	Very limited number of cognitive neurologists	Patient' agitation and delirium in unfamiliar crowded environment
Continuous need to receive services from caregivers	Inappropriate to the high number of different types of dementia	Stress effect on neuropsychological assessment
Difficulties in preparing for visit including dressing and transportation issues	Very long waiting list	Fatigue and inattention in the office
Difficulties in arranging an appointment	unexpected visit without a prior appointment	visiting time is not predictable
Restlessness of patients	continuously under pressure from the families	

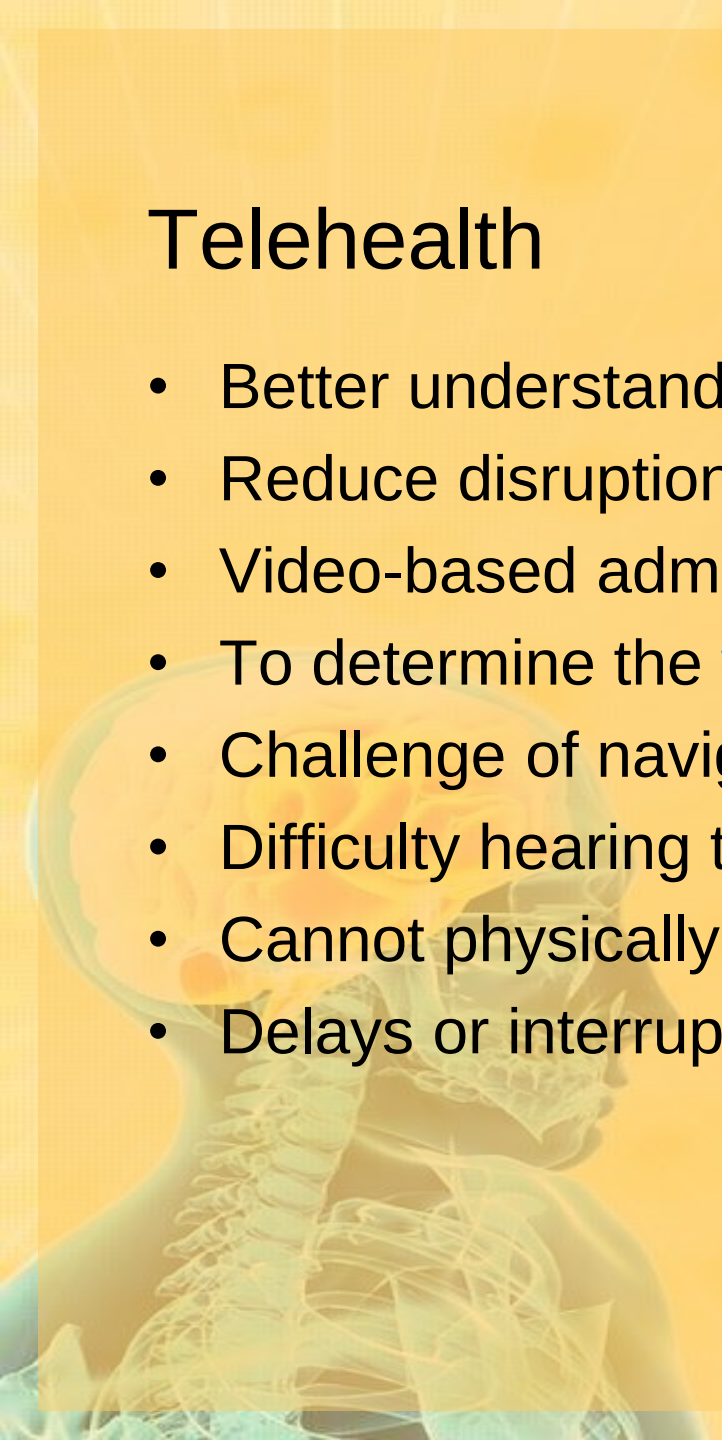
Telehealth

- Access to specialist care: improves outcomes
- Disease-related disability makes in-person physician visits burdensome
- Telehealth is one potential means for improving access to care
- Telemedicine reduces visit-associated travel and time
- To administer cognitive tests
- Be used for rehabilitative therapies
- To support caregivers



Telehealth

- Better understanding of the patient's home environment
- Reduce disruptions to the patient's routine
- Video-based administration of cognitive tests
- To determine the validity of administration for specific tests
- Challenge of navigating technology
- Difficulty hearing the instructions /seeing test stimuli
- Cannot physically interact with test materials
- Delays or interruptions in video connection



M-Health

- With the rapid advancement of sophisticated technologies
- The early detection of MCI is becoming reality
- The revolution in mobile technologies : unprecedented opportunities
- To overcome the barriers of time and context
- That characterize traditional hospital and clinical-based assessments
- NIH Consensus Group (HIMSS, 2016) defines mHealth as the use of mobile and wireless devices
- To improve health outcomes, healthcare services, and health research
- The use of mobile device scan improve
  - Diagnosis and compliance with treatment guidelines
  - Patient information

M-Health

- Great Britain :
  - 20%of older individuals who use a smartphone to go online
- The generation of “baby boomers”
- Currently approaching the retirement age
- This number will rise in future
- Smartphones and wearable sensors have the potential
- To collect a warehouse full of
  - Physiological, social, emotional, and behavioral data
  - Real time with limited burden on the client
- Important decisions about treatment options
- Monitoring response

Data Types

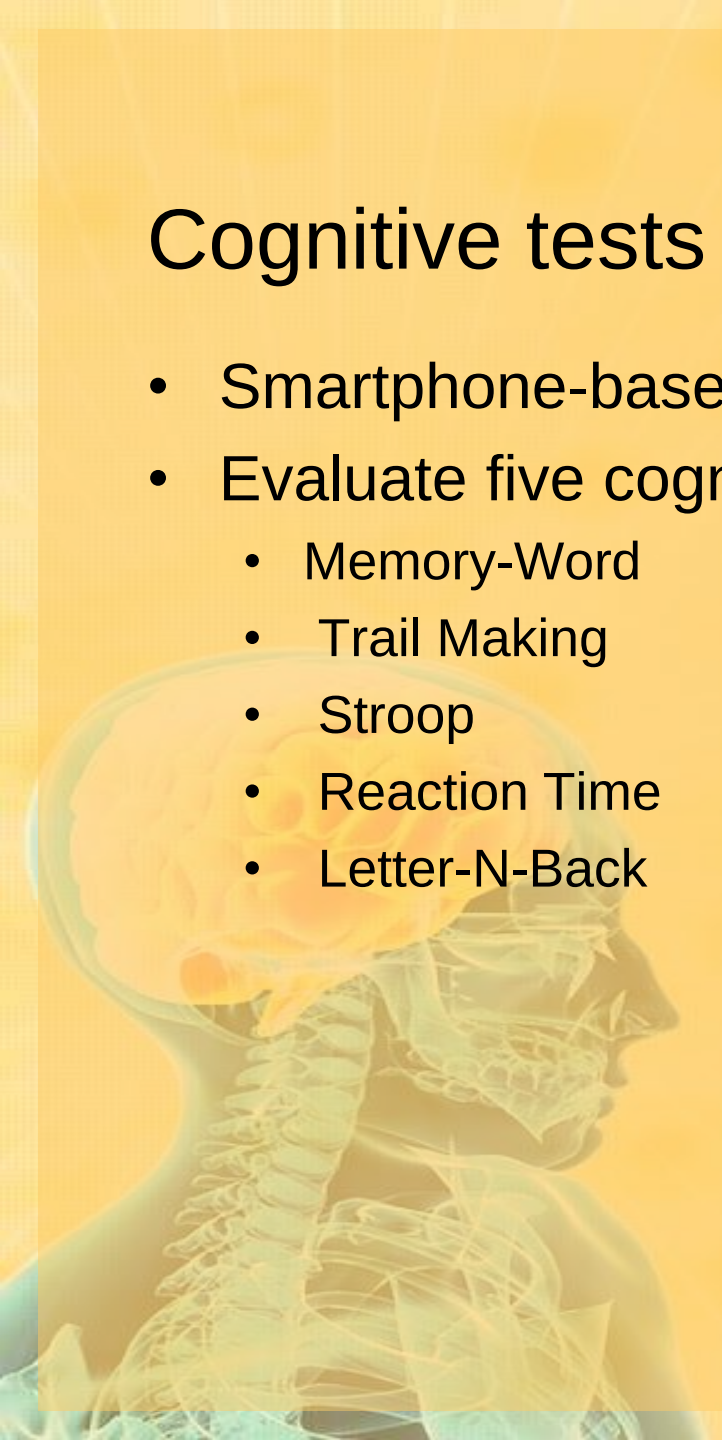
- **Self-reports** : request responses from individuals: electronic self-reporting of symptoms
- **Performance measures** : request individuals to get involved into a task to assess cognition
- **Sensor data:** can be collected from sensors from the phones or wearable sensors
- **Social media data**: collected by phone and Internet activity

Cognitive tests

- Recently published meta-analysis examined 12 studies
- Used a test-retest design to compare in-person with video-based administration of cognitive tests
- Only 1/10th of a standard deviation lower with video-based administration than with in-person administration
- Among timed tests and tests that forbade repetition
- Required a verbal response (digit span and phonemic fluency)
- Robust to video-based administration

Cognitive tests

- Smartphone-based app **iVitality**
- Evaluate five cognitive tests based on conventional neuropsychological tests
  - Memory-Word
  - Trail Making
  - Stroop
  - Reaction Time
  - Letter-N-Back



Cognitive tests

- Feasibility :adherence to perform smartphone-based cognitive tests
- Validity :assessing the correlation between conventional neuropsychological tests and smartphone-based cognitive tests
- studying the effect of repeated
- Moderate correlation between the firstly made smartphone-based test and the conventional test for the Stroop test and the Trail Making test

Cognitive Tests

- New self-administered web/based neurological tests
- With higher validity and reliability
- The **Brain on Track test**
- Consists of several subtests and may evaluate different cognitive domains
- Including random elements to minimize learning effects
- An initial (A) and a revamped version of the test (B) were used with older individuals with MCI or early dementia

Cognitive training application

- The virtual reality cognitive training application
- The virtual supermarket (VSM) can serve as a diagnostic tool of MCI
- The research study by Zygouris et al. (2015) has proved that
- VSM showed a correct classification rate of 87.3%
- differentiating between MCI patients and healthy older adults
- Probably the most effective and specific diagnostic tool for the detection of MCI

Virtual supermarket (VSM)

- Two groups
- one of healthy older adults (n =6) and one of MCI patients (n =6)
- provided with a tablet PC with custom software enabling the self- administration of the Virtual Super Market (VSM) cognitive training exercise
- The average performance of the two groups was compared
- Duration to complete the given exercise differed significantly between healthy and MCI groups

Virtual supermarket (VSM)

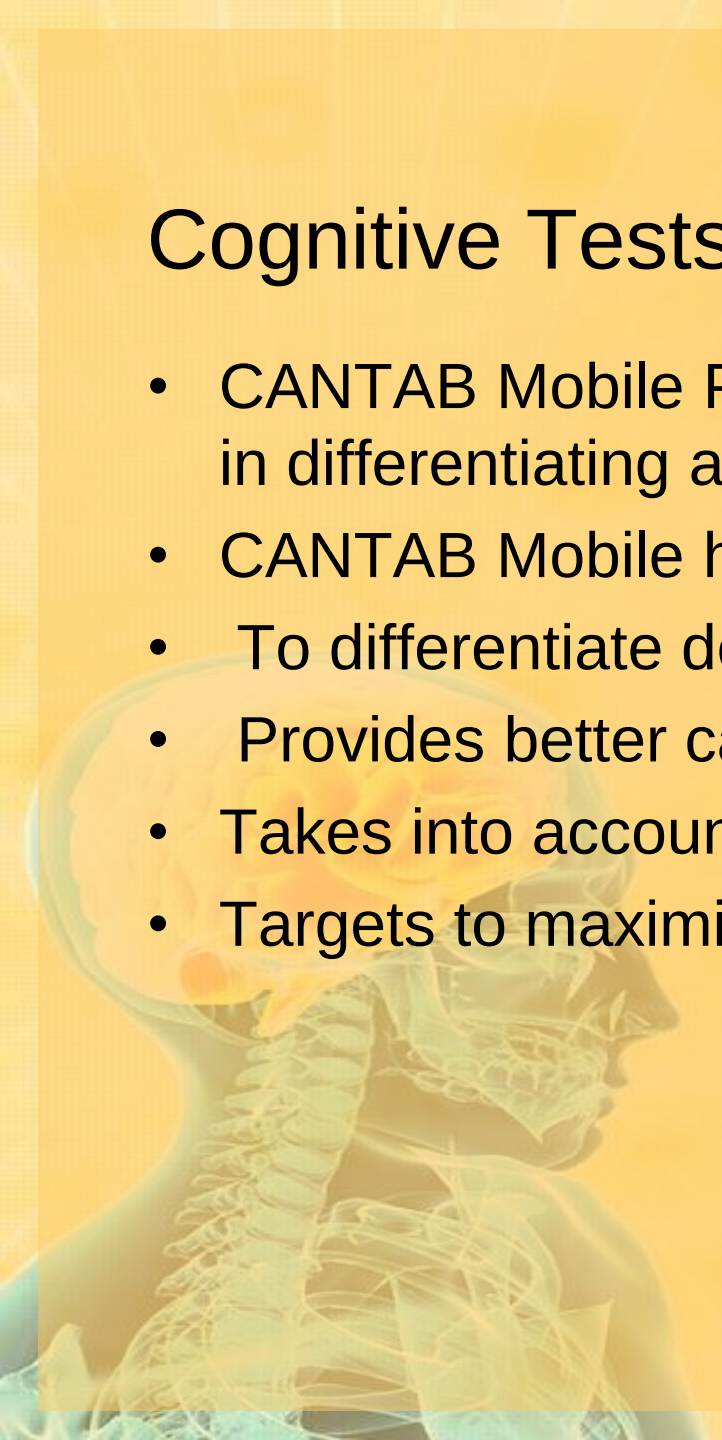
- A correct classification rate of 91.8%
- with a sensitivity and specificity of 94%and 89%respectively for MCI detection
- Average performance also correlated significantly with performance in
  - Functional Cognitive Assessment Scale (FUCAS)
  - Test of Everyday Attention (TEA)
  - Rey Osterrieth Complex Figure test (ROCFT)

CANTAB Mobile

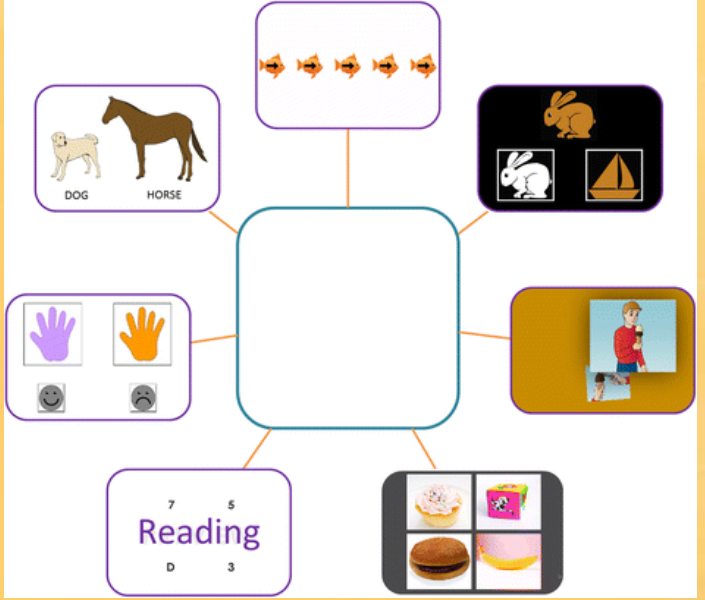
- CANTAB Mobile, which has already been in use for more than 30 years
- A sensitive screening tool to identify the earliest signs of MCI
- Fast and user friendly and available in 25 languages
- In-built Paired Associates Learning (PAL) test are automatically scored to produce an easy to interpret report

Cognitive Tests

- CANTAB Mobile PAL scores have a sensitivity of 0.83 and specificity of 0.82 in differentiating adults with MCI from healthy adults
- CANTAB Mobile helps
- To differentiate depression from dementia
- Provides better care, and reduces costs and practitioner workload
- Takes into account age, gender, and back-ground
- Targets to maximize the quality of life for older generation groups



NIH Toolbox-Cognition Battery



- The NIH Toolbox-Cognition Battery (NIHTB-CB) is a computerized cognitive assessment designed for clinical research that is administered in-person
- Evaluated the equivalency of a novel videoconference protocol for administering the NIHTB-CB
- Across all three NIHTB-CB composite scores (total, fluid, and crystallized cognition), no significant fixed effect of administration condition was found
- Novel videoconference protocol for NIHTB-CB is equivalent to the standard protocol in healthy participants
- May provide a solution for researchers seeking to engage study participants at remote sites

Touch-screen device

- Canini et al. (2014) has proved that such a touch-screen device is preferred by older people
- the touch-screen devices may guarantee the same testing efficacy of more conventional
- extensively validated devices, as mouse-control PC
- still today used in clinical environment to administer neuropsychological tests
- translating health services into touch-screen based environment
- ther applications which can help to detect MCI, such as IBM Watson or Akili Interactive Lab

COVID-19 Pandemic

- Recent months, the COVID-19 pandemic has changed the world dramatically
- shined a spotlight on the weaknesses of
  - the health care systems
  - the financial fragility of society
- Initial response to COVID-19 promoted behavioral changes
- Additionally burdensome for families who are dealing with a chronic neurodegenerative condition that affects cognition

COVID-19 Pandemic

- Over the past few months, society has settled into new norms of social distancing
- Social distancing is a phrase we are all familiar with now
- misleading, as it is physical distancing rather than social distance
- Aids in prevention of transmission of the virus
- Patients with advanced dementia have limited comprehension
- social distancing may cause anxiety
- means it falls on the caregivers to assume the responsibility to keep them safe using protocols

Effect of COVID-19 Pandemic on dementia

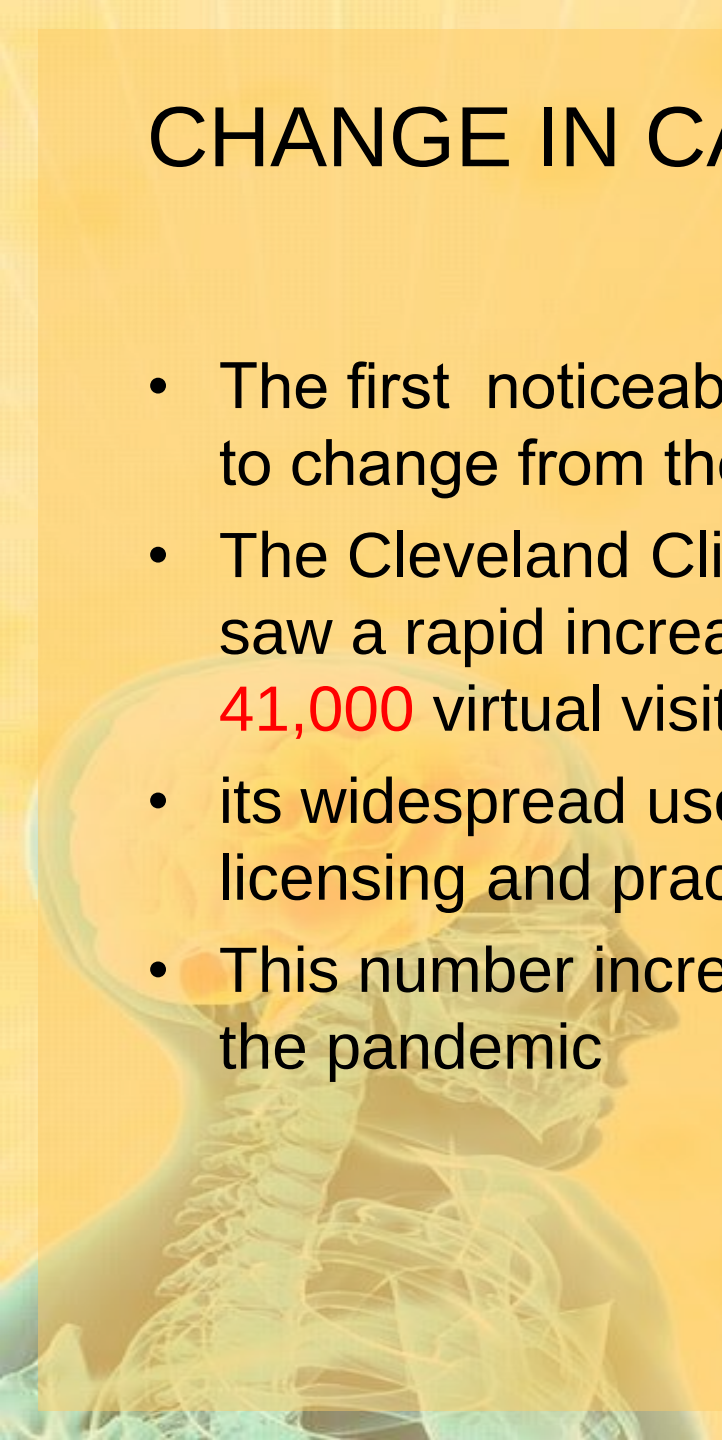
- A British study of 16,749 hospitalized patients with COVID-19 found a diagnosis of dementia also adds a risk factor unfavorable outcome with 39% higher risk of death
- Once infected by COVID-19, elderly dementia patients will most likely experience neuropsychological problems such as delirium
- Reduced physical activities
- lack of social engagements with families and friends
- Cancelled day care center programs
- May worsen the cognitive, physical, neuropsychological condition of the patients with dementia

Effect of COVID-19 Pandemic on dementia

- Being confined at home may increase levels of stress, anxiety, and a feeling of loneliness and depression
- This is critical for dementia patients, as stress is known to be detrimental to patients with cognitive impairments
- The well-being of families and caregivers
- May be suffering from reduced public health care support or home care services during the COVID-19 outbreak
- COVID- 19 required a quick shift from traditional models of health care delivery to innovative problem solving

CHANGE IN CAREGIVING

- The first noticeable change to providing care for patients with dementia was to change from the traditional model of office visit to virtual visits
- The Cleveland Clinic Health System launched its telemedicine in 2014 and saw a rapid increase in the use of virtual visit over past couple years to 41,000 virtual visits in 2019
- its widespread use has been limited by low reimbursement, interstate licensing and practice
- This number increased dramatically to about 200,000 visits per month since the pandemic

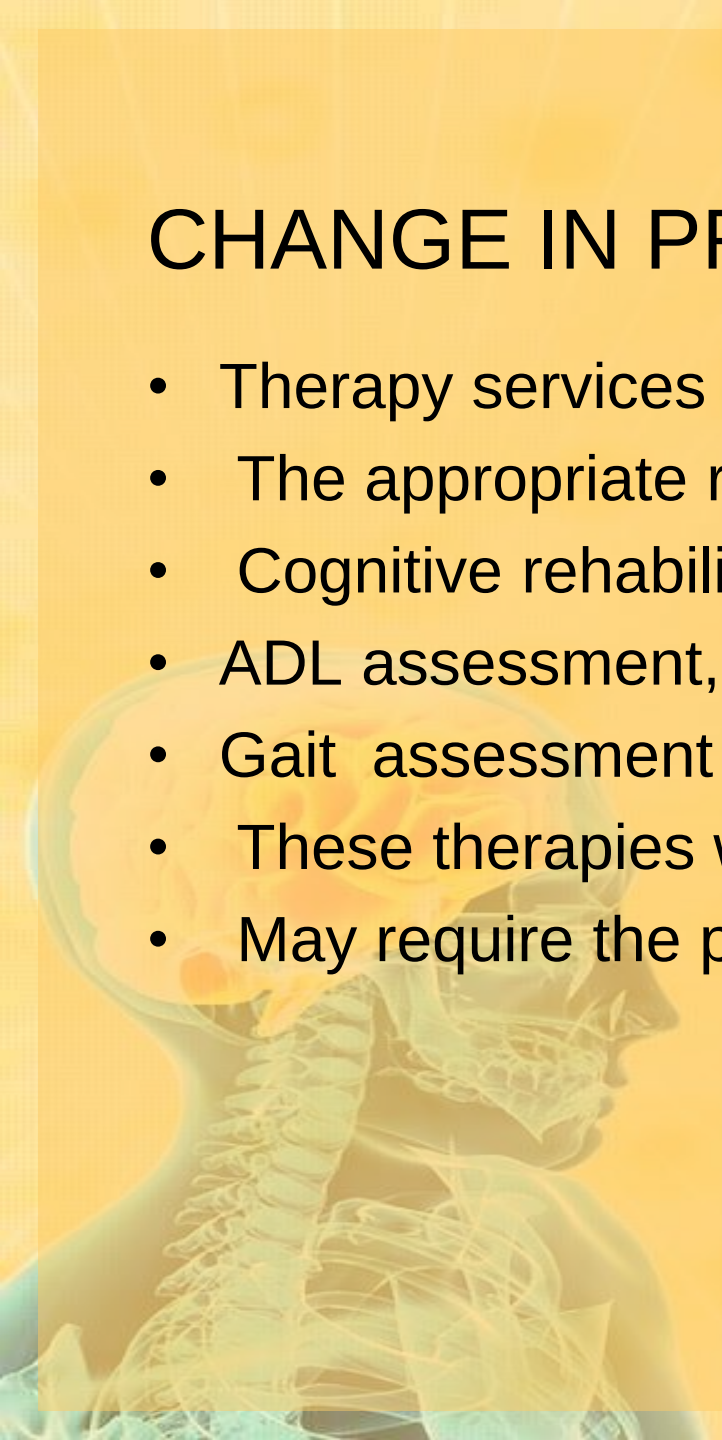


CHANGE IN PROVIDING CARE

- The silver lining of the recent pandemic maybe globalization of telemedicine
- Physician’s visits have turned into virtual visits conducted over computers, tablets, or smartphones, a pattern which may continue beyond the stay-in period
- Having a reliable device to communicate with healthcare providers for the patient and the family becomes a necessity
- Dementia management : to be quite amenable to virtual evaluation
- Cognitive assessment is strongly dependent on interview and questioning rather than direct physical examination
- patients and caregivers reported similar satisfaction with virtual visits and office visits

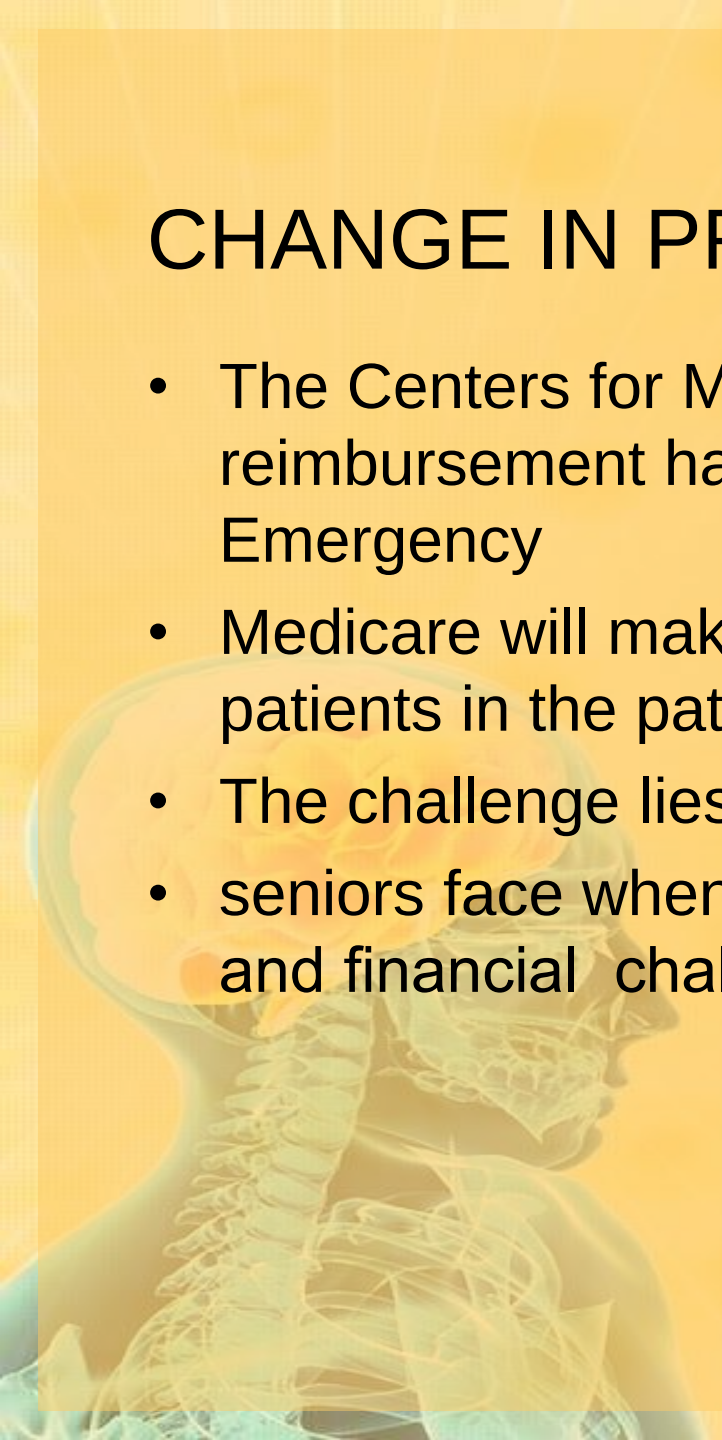
CHANGE IN PROVIDING CARE

- Therapy services also adapted to the practice of telemedicine
- The appropriate referrals for a visit may include
- Cognitive rehabilitation, exercise training
- ADL assessment, Speech/swallowing interventions
- Gait assessment and training
- These therapies will be limited by the state licensure laws
- May require the patients to reside in the state where the service is provided



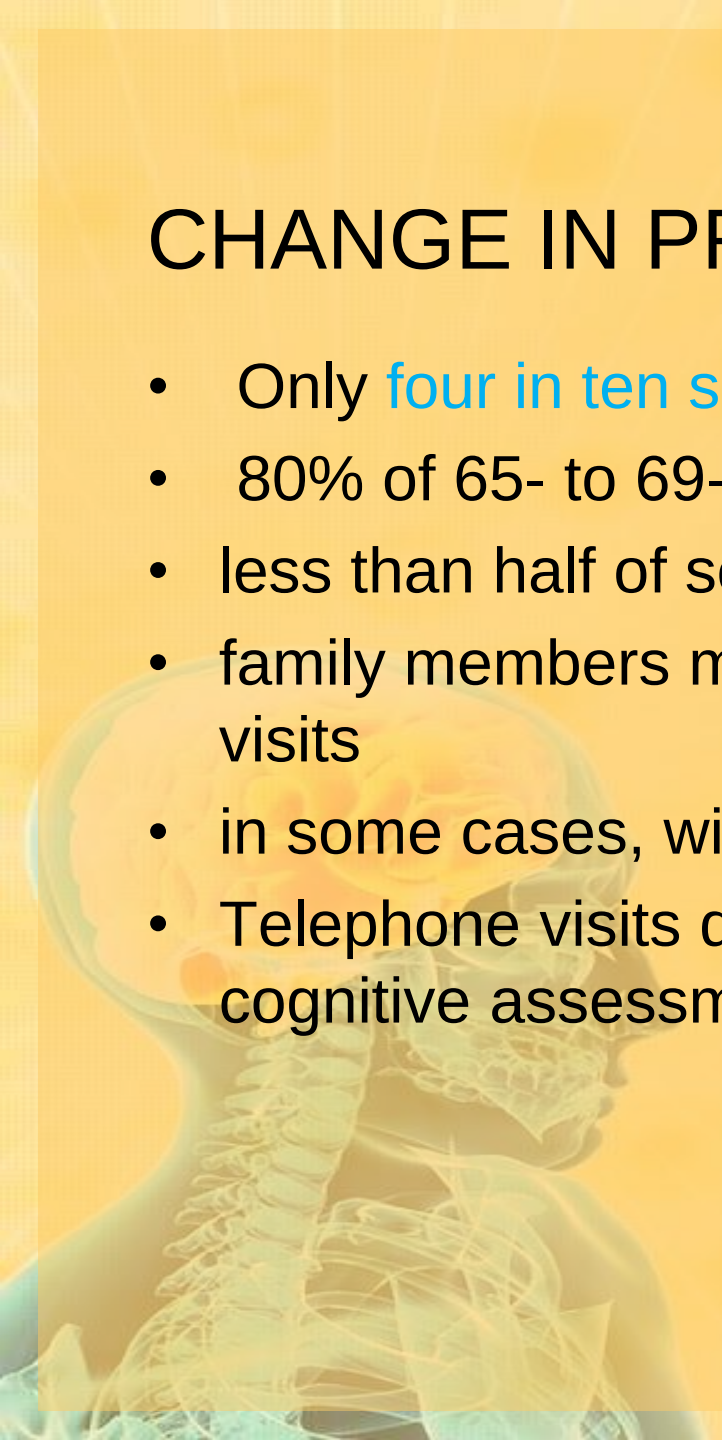
CHANGE IN PROVIDING CARE

- The Centers for Medicare & Medicaid (CMS)policy for telemedicine services reimbursement has changed for the duration of the COVID-19 Public Health Emergency
- Medicare will make payment for Medicare telemedicine services provided to patients in the patients' places of residence
- The challenge lies in the barriers
- seniors face when adopting to a new technology due to cognitive, physical, and financial challenges or lack of familiarity



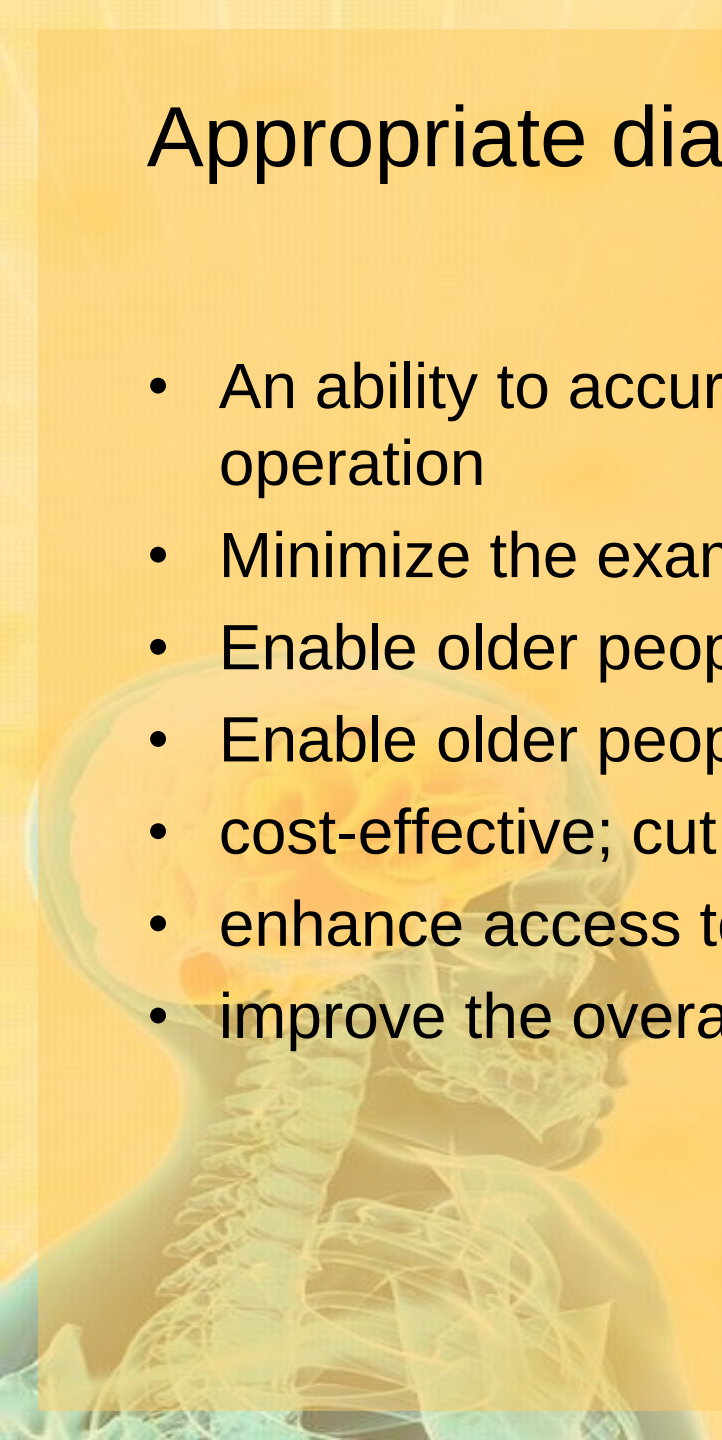
CHANGE IN PROVIDING CARE

- Only four in ten seniors own a smartphone
- 80% of 65- to 69- year-old adults are Internet users
- less than half of seniors above age 80 use the Interne
- family members may be able to provide a tablet or smartphone for the time of visits
- in some cases, will be limited to a telephone visit
- Telephone visits do not provide the capability of video examination or some cognitive assessments



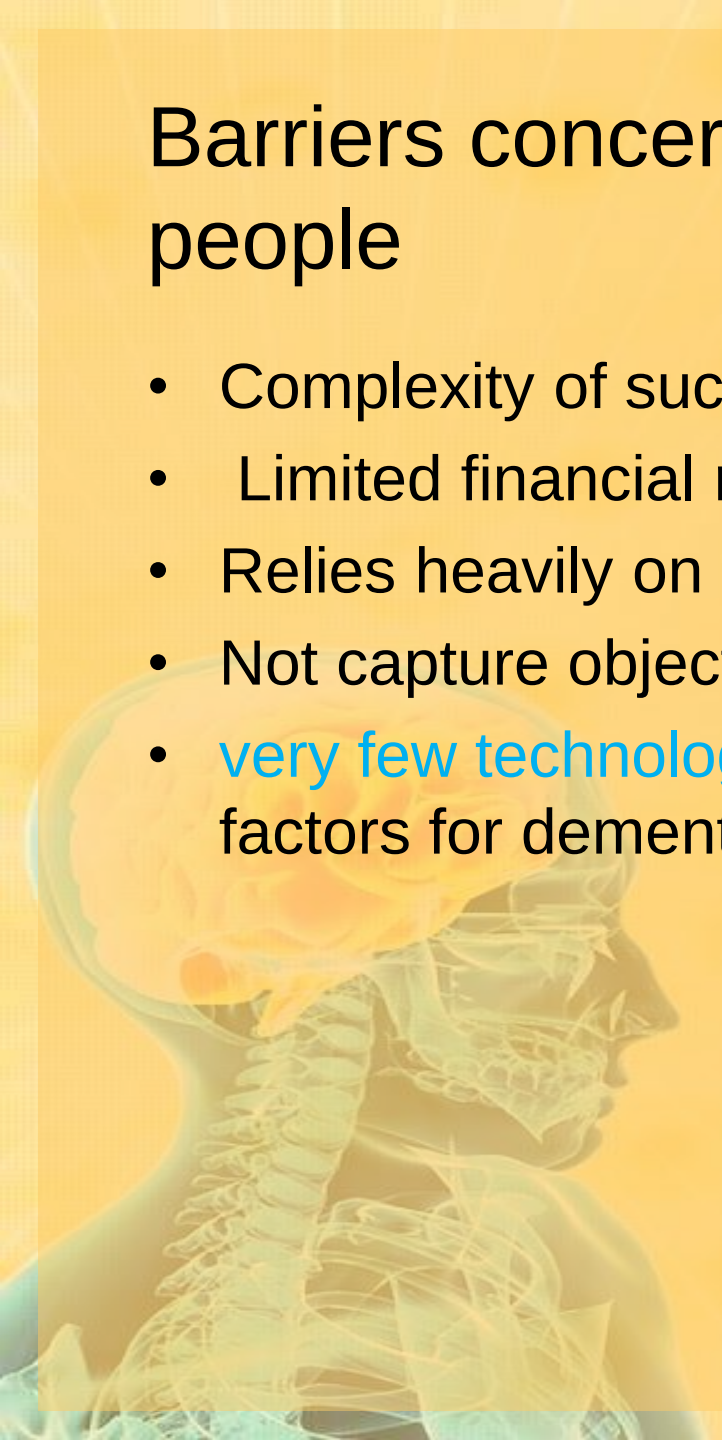
Appropriate diagnostic tools for aging disorders

- An ability to accurately record and measure the outcomes without manual operation
- Minimize the examiner’s biases
- Enable older people to remain independent in their tasks of daily living
- Enable older people to understand conditions
- cost-effective; cut potential costs on treatment of older people
- enhance access to healthcare for older people in remote areas
- improve the overall quality of life of older individuals



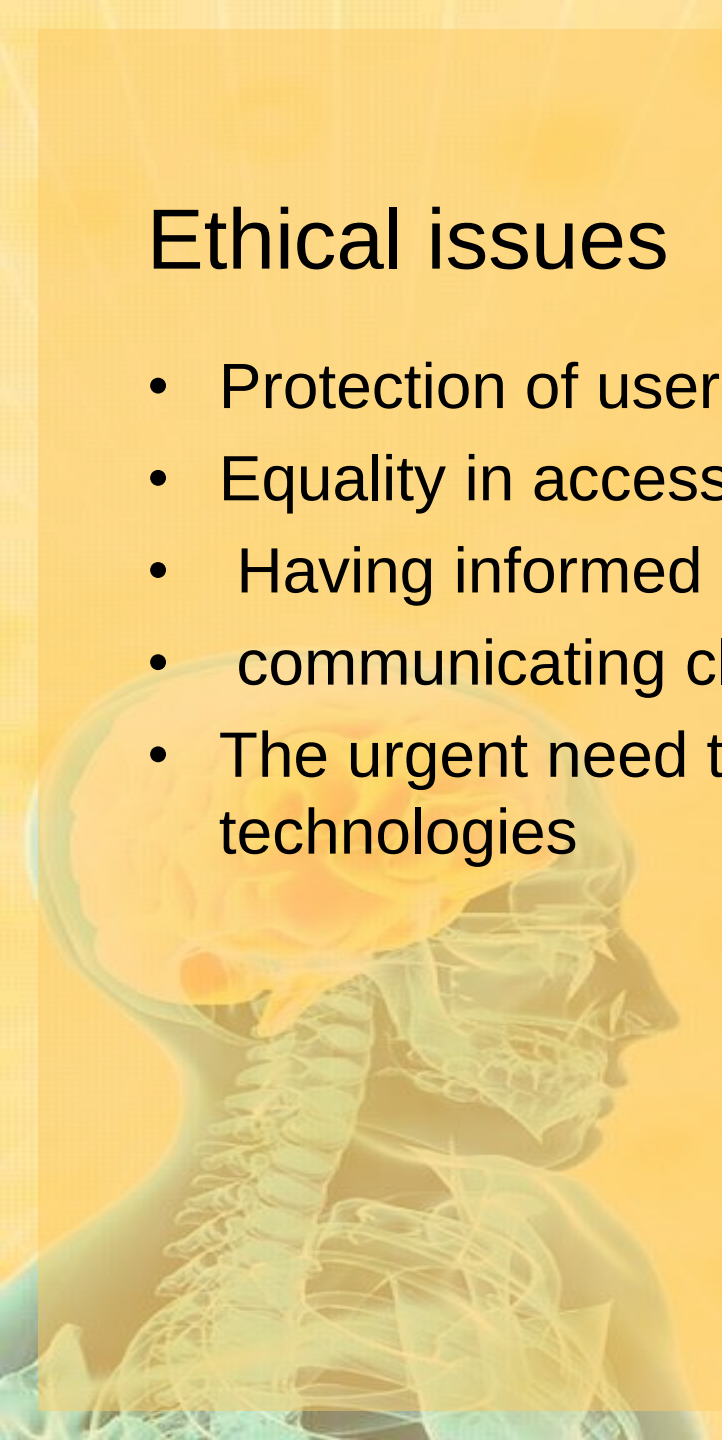
Barriers concerning the use of mobile technologies by older people

- Complexity of such devices
- Limited financial resources
- Relies heavily on self-reported information
- Not capture objective information
- very few technologies which could compute a risk and prognosticate risk factors for dementia including obesity and nutrition status



Ethical issues

- Protection of user privacy
- Equality in access
- Having informed consent
- communicating clinically relevant results to individuals
- The urgent need to demonstrate evidence of safety and efficacy of the technologies




Thanks for
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