

BALNEOTHERAPY, PREVENTION OF COGNITIVE DECLINE AND CARE THE ALZHEIMER PATIENT AND HIS FAMILY: OUTCOME OF A MULTIDISCIPLINARY WORKGROUP

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Abstract: According to the latest forecasts of the INSEE (1) - Institut National de la Statistique et des Etudes Economiques (National Statistics and Economic Studies Institute), ageing of the French population will increase between 2005 and 2050: whereas 20.8% of the population living in continental France reached the age of 60 years or more in 2005, this proportion would be of 30.6% in 2035 and 31.9% in 2050. In 2050, 22.3 million persons will have reached the age of 60 years or more compared to 12.6 million in 2005, increasing by 80% in a 45-year period. In line with the actual age pyramid, ageing is unavoidable, as those who will reach 60 years of age in 2050 are already born (in 1989 or before). This expansion will be most important between 2006 and 2035, when the numerous “baby-boom” generations born between 1946 and 1975, will reach these ages. In future years, lifespan improvement will only emphasize this increase. Even if life expectancy stabilizes at the 2005 level, the number of seniors reaching 60 years or more would still increase to 50% between 2005 and 2050. This issue is identical in all countries of the European Union. Ageing is a major risk factor for dementia that will considerably worsen in the next years, if no curative therapies are found. Today, 25 million persons in the world suffer from Alzheimer’s disease (AD). In France, it is estimated that 860 000 persons are affected and that 225 000 new cases are annually diagnosed. After 75 years of age, more than 20% of women and 13% of men are concerned. Forecasts for the coming years are frightening. Considering ageing of the population, the number of Alzheimer’s disease cases should raise to 1.3 million in 2020 (20 patients for 1000 inhabitants) and 2.1 million in 2040 (30 patients for 1000 inhabitants) (2).

Background: cognitive decline and Alzheimer’s disease; a long process

In AD histopathological damage development progresses slowly. The amyloïde peptide deposit distribution is unclear. On the other hand, the neuro-fibril degeneration follows a precise movement, related firstly to the entorhinal cortex and the amygdala-hippocampal area, then to the temporo-parietal, frontal cortex, and in the end reaching most of the cortex and under-cortex areas. Compensating process could block clinical identification of damages in the early stages of the disease. However, the impairment of cognitive performances and the loss of functional autonomy show up very early during the disease’s progression. In a recent case-control study, Amieva and his co-authors showed that cognitive performances modify 12 years before actual report of Alzheimer’s disease. This study also recorded that subjects presented a mild loss of their functional autonomy in day-to-day actions, on an average of 2 years after the beginning of early symptoms (3). So Alzheimer’s disease develops in three steps: an asymptomatic phase whose span cannot be determined, a prodromal phase with appearance of the first signs of moderate cognitive decline, and finally a demential phase. The symptomatic phase

has about a 15-year span; the prodromal phase can last from 3 to 4 years in average. The term Mild Cognitive Impairment (MCI) was suggested to describe subjects with moderate to significant cognitive modification that could evolve in a derogatory way within the two following years. Clinical definition criteria of the MCI were proposed by Petersen et al (4), and corresponds to: a memory complaint confirmed by family circle, an objective memory change, a normal general cognitive performance, a continuation of every day activities and an absence of dementia. This concept is particularly important because the conversion rate from MCI to dementia is important, around 12% per year (6 to 25%). 50% of the MCI would develop AD within

4 years. In their recent study, Lehrner et al (5) observed an annual conversion into AD of 6.5% amongst a group of seniors with memory complaint. The conversion rate is especially high - around 20% - with regards to persons presenting an amnesic MCI. This rate is of 3% when seniors express memory complaint without memory disorder assessed by neuropsychological tests. Dementia does not usually occur in a sudden way. Considering lifespan of persons at risk, a decrease of this evolution, by a few months delay of the demential phase, would have important consequences on dementia prevalence.

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Each of the above mentioned phases offer opportunities for therapeutic strategy set-up: 1°/ primary prevention during the asymptomatic phase: controlling risk factors, that can be modified to slowdown and avoid the appearance of light cognitive decline or dementia; 2°/ secondary prevention during the predemential phase, enabling to work on the early phases of cognitive decline in order to hold up the conversion towards dementia; 3°/ tertiary prevention during the demential phase aiming to avoid progression of the illness. Despite the progress in identification and assessment of the cognitive decline at early stages, no reliable prevention devices are actually available to help detect dementia. Today, this clearly restricts our ability to put forward early and efficient interventions in primary prevention. However, the subjective complaint of memory disorder appears to be a real risk factor for the development of Alzheimer's disease (6-9). Most research studies related to AD focussed on secondary and tertiary treatments. The interest shown to primary prevention in dementia was developed when modifiable risk factors had been identified. Only major randomized interventional studies can show the efficiency of such factors.

Once reported, AD usually evolves gradually and continuously. One of the major outcomes of AD is the progressive loss of functional autonomy that leads to physical dependence, particularly in the latest stages of the illness. The interaction between nutritional status, balance and gait disorders can hasten the dependency process. For a number of patients, appearance of physical dependence in every day activities, explains the increase in hospital and nursing home admission. It should be reminded that dementia is the first cause of senior's dependence (10).

Behaviour disorders are observed in a majority of patients suffering from dementia, particularly in AD. Even lately there is an improvement in the diagnosis at earlier stages of the disease, too many patients are consulted at a late stage when behaviour disorders become boisterous and troublesome. Mood can be upset, along with signs of depression or anxiety. At times mood lability is also noticed accompanied with alternate periods of apathy and unrest. It is also frequently associated with psychotic symptoms such as delirium and hallucination. If a majority of patients present late stage behaviour disorders, they can nevertheless appear in an early phase (11). In AD, these disorders are the main complication with regards to family circle exhaustion, hospital and nursing home admission.

Weight loss is another common complication of AD. Around 30% of patients lose weight while developing the illness (12). This phenomenon often comes up with a set of adverse consequences such as change in the immune system, sarcopenia, falls and fractures. They are the cause for dependence aggravation and risk of excess death rate.

Dementia also presents a risk factor of fall for elderly people (13). It appears that physical performances are impaired as from the first stages of the illness. Studies show that patients suffering from AD have three times more risks of serious falls and fractures compared to a population sample of the same age

(14, 15). Falls often originate from several factors: sensory deficiency impaired motor coordination, inappropriate motor response, apraxia and extrapyramidal symptoms, iatrogenia, undernourishment and sarcopenia. AD also has direct impact on the physical and psychological state of health of the family environment. This issue particularly concerns the main caregiver. His/her role increases during the progression of dependence and can become a day-to-day burden.

Alzheimer's disease: the necessity to support caregivers

AD is a disease that concerns the family. It does not only involve the patient but has an impact on the family unit and particularly on the caregiver. At the present time, a majority of patients suffering from AD live at home beside an informal caregiver (16). Most of AD patients' caregivers are women, often wives and sometimes daughters.

The role played by the carer is crucial. He/she must handle the patient on an every day basis and must deal with all the difficulties brought up by the progress of the illness: when diagnosis is announced, while managing all relevant complications, in the use of professional support, when treating with hospital and nursing home facilities, and upon the end-of-life period. The diagnosis announcement is a critical moment for the caregiver. It appears that the diagnosis revealing dementia is an important strain for the caregiver and this regardless of the seriousness of the disease (17, 18). It also appears that dementia is an issue that determines the burden born by them. They complain about the weight of their burden, the restriction of their social life and their lack of health compared to caregivers of the nondemented persons (19). The disease complications, particularly behaviour disorders, are often matters that determine the burden load. Generally, the caregiver does not use enough professional support. Several reasons have been identified: lack of means, specially in rural areas (22, 23); ignorance concerning their availability, whereas studies show that even duly informed, few will benefit (24); fear that care will be of lesser quality than that brought by caregivers themselves (25); high costs and time restrictions; worry about being misjudged (26). Urgent hospital admissions are made through decision of the family in 25% of the cases. At times, these admissions allow caregivers to "take a break" or to begin thinking about definitive admission in care facilities. But hospital admissions for nonmedical purposes seem to be underestimated, as they have not been sufficiently examined. However, they should not be considered as unjustified: the exhaustion of the caregiver is a sufficient reason for hospitalization and furthermore, they can reflect an acute pathology that should not be neglected (28). The burden felt by the caregiver and the caregiver's desire of patient placement are predictor factors of institutionalisation (29, 31). This indicates that a long and thoughtful process is needed before admission and therefore preventive actions could be set-up during this period (32). It seems substantial for certain caregivers, excluded from care facilities upon admission, to maintain this relationship (33). At this moment, the caregiver often feels a

sense of guilt. The end-of-life period is also a difficult moment for the caregiver who must cope with demanding care and assistance.

The provided help represents a heavy investment for families and often means a reorganization of family and social life. The symptoms and the evolving nature of the illness have an impact on caregiver/patient relationships (inadequate behaviour, such as excessive kindness or a redistribution of family role, can often end up with childish attitudes and possible risk of abuse). The caregiver also suffers from somatic and psychological pathologies and often neglects his/her condition and age. It has been reported in many studies, that AD is often a heavy burden for the caregiver and that it can have an impact on his/her mental health: stress, depression, anxiety, use of psychoactive drugs and sleeping (34-45). Furthermore, the caregiver is often socially isolated (decrease of social activities and leisure such as travel: afraid of leaving the patient alone, in case of "runaways" and unmanageable behaviour disorders). Added difficulties appear when the caregiver has a professional activity. It affects professional ambition, with the need to reorganize working hours (46) and sometimes it leads to ceasing all occupation (47). These aspects of AD create more than one casualty: patient and family values. This must be taken into account as caregivers ensure support of existing assets, social inclusion and in-home care.

However, in spite of the reported burden, it seems that caregivers are aware of the positive effects brought by their assistance (48). The favourable outcomes of this help are often related to a certain feeling of satisfaction (49). It would enable to strengthen bonds between caregiver/patient (50) and to improve caregiver's sense of reward.

Several studies also show that patients benefit from family involvement in the care scheme bearing with personal and professional support (51, 52) and decrease of behaviour disorders (53).

Balneotherapy: a new respite organization for both Alzheimer's disease patient and family caregiver

Certain authors have defined the idea of respite in Alzheimer's disease as a temporary physical, emotional and social care towards a dependent person, in view of bringing relief to the main caregiver (54). According to relevant publications and works, families reported that respite is a major need. Therefore, it seems that medical staff takes this necessity into account in order to provide comprehensive patient care (55). Based on such observation, Alzheimer Plan 2008-2012 provides "to develop and diversify respite organization". Their set-up, fitted to care and patient/caregiver relationships, would then become a major issue. The temporary relief of the caregiver and his active support could reduce stress and burden, improve caregiver/patient ties and help keeping up homecare and prevent crisis when urgent hospital entry is needed.

Working methods in respite organization vary from country to country. Three different types of respite structures exist in

France: day centers, temporary stay in nursing home or hospital.

The latest epidemiological data dates back to 2007 and reports 740 day care centers (for 5297 residents) and 563 temporary stay facilities (for nearly 1200 residents). New regulations aim at a better understanding of assignments but in spite of this, working methods and services offered by respite organizations remain very different (57-60). Today, in France and specifically concerning day care centers, the reported aims of these organizations, are that of "therapeutics" towards patients and "support and relief" towards caregivers (61).

However, it appears that families do not make enough use of respite organizations (55, 62). Different theories are defined in publications: they do not meet caregivers' expectations or requirements (63), families are convinced that they provide more stress than relief (64-66), they produce a sense of guilt towards patients (64).

Studies have also examined characteristic features of patients (67) and carers that do use respite (55, 66, 68, 69). In Cox's American study (69), it has been reported that carers who frequently use respite organizations (homecare, day care and temporary stay) are: those feeling less anxious, those whose burden is most heavy and those whose patient suffers from severe cognitive impairment. Other studies also show that carers use respite organizations on a later period of the patient's illness (69-71).

Different studies investigate impact of respite on stress, depression, anxiety, burden and "physical health" (sleep, physical well-being) of the main carer. It is important to observe that certain studies were related to the impact of respite alone, while others can be considered as multidimensional interventions combining information, training, counsel and support towards the carer. Most studies assessed the impact of respite with regards to psychological aspects of the main carer's well being (stress, anxiety and depression). In a majority of cases (70, 72-75), studies showed that "respite" had little or no impact of the carer's psychological well being even if some produced evidence that symptoms diminished only during the respite period (76). However, a few studies reported beneficial effects for depression and psychological distress of the caregiver (62, 77). Lastly, respite has brought benefit by lightening the carer's stress (69, 71, 78, 79). This concerns only multidimensional interventions studies, which makes the assessment of isolated respite impact even more difficult. In certain works it is shown that, even if respite had no direct impact on caregiver's stress, anxiety and depression, it did allow to reduce care-time, to manage behaviour symptoms (80), and thus help improve care-giving organization (81). Burden is another factor that is frequently examined in publications. Efficiency of a respite period concerning the illness's "objective" burden has not been found in the results of randomized clinical trials (62, 70, 72-75, 78, 82, 83).

However, high is the carer's satisfaction with regards to respite in a majority of studies (70, 73-75, 84-87). It is important to observe that multidimensional interventions,

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combining “respite” but also support, counsel, training and information towards the caregiver, reported more positive results on the same variables.

Respite impact on the patient has been assessed in publications through different variables, most often being: quality of life, functional status, behaviour symptoms and the day of entry in long-term care facility. With regards to behaviour symptoms, outcome of studies are contradictory. In fact, a most of them did not find any significant results (77), not to say a negative respite impact, on sleeping disorders (88). Another study determined a frequency decrease of patient’s productive disorders, during respite period only (84). Results are also contradictory with regards to quality of life (70, 75, 77, 82, 83). Concerning functional autonomy, the main well-conducted methodological works found no negative or positive respite impact on this matter (72, 82). Certain authors suggest however that a negative effect on respite exists where severe demented patients are concerned. This would be due to the temporary unsteady change interfering with a stable situation at home (90). The chosen time for facility admission, was the most examined criteria to study respite impact on demented patient. Lawton was one of the first to report that respite may delay entry in a nursing home. Later, randomized trials confirmed these results. However, these studies concerned multidimensional interventions and did not show how simple respite impact could determine time of entry into a carefacility.

Therefore, it does seem essential to identify a respite organization that will bring temporary relief to the caregiver. It will limit critical situations when urgent hospital entry becomes necessary. These admissions, sometimes inappropriate, have undesirable effects on the patient (iatrogenia, physical restrictions, social isolation, infectious risks...). However, it does not seem beneficial to separate patient and carer, avoiding the latter’s possible sense of guilt. A new sort of organization must then be provided, keeping the “patient-carer” relationship within a social framework. It appears that use of this other type of facility mainly concerns patients suffering from early-stage of Alzheimer’s disease: those who do not present major complications such as behaviour disorders. Considered to be a special place, balneotherapy is an ideal way to escape, and a potential moment of respite for the caregiver. Standard health resorts and their traditional spa users can restrict the social isolation often experienced by mild-suffering patients and carers.

Balneotherapy support programme for “patient-carer”

Objective

Developing a balneotherapy support programme for « patient-carer » is a great opportunity. Only works carried out through multidimensional interventions were positive concerning respite organization impact on the main caregiver and the patient. This is why the programme will include an important intervention with education, information, counsel and support to caregiver, according to his needs. This programme,

adjusted to mild-demented patients, could take place in a standard health resort during a 3-week period.

Programme content

At the beginning of the balneotherapy programme, patient and carer will go through consultations and the caregiver will have an individual interview with the coordinating practitioner of the spa resort. Furthermore, assessment will be made of the patient and carer’s different specific needs and a medical examination will be conducted on both. At this same time, a record will be made of current medical treatment, of surgery and medical history (including the common hydrotherapy pathologies and those that can lead to related specialized consultations). Assisted by the caregiver, evaluation of the patient will be performed with regards to nutritional status [Mini Nutritional Assessment (MNA), Weight]; cognitive functions [Mini Mental State Examination (MMSE)]; balance and potential falls (one-leg test); physical abilities [Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL)] and behaviour disorders. For the caregiver, an assessment will be undergone concerning burden (Zarit, time spent in assistance, different ways of intervention); medico-social aspects (home-care, income, accommodation); depression and anxiety [Raskin, Covi or Hospital Anxiety and Depression Scale (HAD)]; quality of life. A second interview will be scheduled for the carer during the first week of spa treatment to evaluate the detected needs and a relevant specific intervention will then be suggested to the “patient-carer” duo.

The advantage of such a programme is to develop the caregiver’s understanding and support of the disease and of different complications arising at home. The carer receives specialists’ recommendations, whilst taking advantage of the respite stay in a resort dedicated to this kind of support. The main aims of this education and information towards caregivers are: to keep high involvement in the care scheme and life plan; to bring awareness on the use of communication approach; to train on identifying the disease’s complications (type of disorders, circumstances of their appearance) and the means for prevention (for example: emphasizing on the importance of physical exercise with regards to balance and falls, and regular supervising of weight to avoid under-nourishment) or how to manage them (for example: emphasizing on the non-pharmacological measures when caring with behaviour disorders); to underline the importance of a tolerant et secured environment for the subject; to inform about possible assistance and take-over. With this oral information, instruction sheets will be handed out, taking into account the needs reported during medical assessment.

Moreover, during the 3-week spa treatment period, discussion groups (aiming at paying attention to the caregiver’s inner feelings) and carer/patient workgroups (such as physical exercise, relaxation, nutrition, music therapy...) could be offered. The traditional hydrotherapy activities should also allow an improved assistance when behaviour disorders appear and a lightening of the carer’s psychological burden.

Several studies reported that spa care was beneficial for the mental state of the patients (92, 93) and for their quality of life (94-96). It is also admitted that it brings benefit during pain treatment especially in arthrosis, often reported in elderly population (94-98).

Outlooks: project feasibility

This type of intervention could concern mild dementia and could require that staff from health resorts be trained with regards to Alzheimer's disease and its complications: how to detect, prevent and treat complications (especially concerning behaviour disorders with use of non-pharmacological measures); how to use geriatric tools...Furthermore, the France-Alzheimer organization could be called in, before setting up such a programme, to make sure that it brings the appropriate answers to the needs and requirements conveyed by the caregiver of demented patients.

Spa resorts for a multidomain programme to prevent cognitive decline in older and frail persons or of those suffering from memory disorders

Research of modifying risk factors is a major issue in the research of Alzheimer's disease. It is currently dominated by research works on factors related to lifestyle, and particularly on vascular risk factors (high blood pressure, diabetes, dyslipidaemia), with an increase of works related to nutrition. Other issues are also explored such as the role of medical history or of environmental factor exposure. It not only concerns the years just previous to the diagnostic, but it concerns more generally the subject's whole life-span, and in particular the "midlife" period around 50 years of age (99, 100).

Impact of physical exercise

Certain factors related to lifestyle are reported, including the practise of physical exercise, as being potential factors of protection from dementia. Interventional studies are however very few. Lautenshlager's works show that physical activity brings a beneficial effect on reducing decline rate in frail elderly persons. This randomized clinical trial involved 170 subjects with an average of 68.6 years of age and suffering from memory complaint. Tests were conducted during 24 weeks and 138 subjects were followed up during 18 months. They were divided into two randomized groups; one control group receiving simple training and information and one intervention group receiving a physical activity home programme (at least 150 minutes of moderately-intense activity per week). The main outcome criteria were the modification of the ADAS-cog score. At the end of 24 weeks, the intervention group reported an improvement of the ADAS-cog score [+ 0.26 points (95% [IC], -0.89-0.54)] compared to the control group [- 1.04 points (95% [CI], 0.32-1.82)]. Similar results were found after 18 months.

Impact of cognitive stimulation

Many works report that social contact values and social intellectual (or not) activities (such as reading, game, dancing, gardening, handiwork, travel, bilingualism) play a protective role from cognitive decline, from Mild Cognitive Impairment (MCI) or upon appearance of dementia.

Relevant interventional studies are very few. A long-term programme of standard cognitive practise was proved to be efficient on the cognitive functions, particularly in the trained areas (attentiveness, memory and reasoning), and on functional capacities of IADL (autonomy, information processing rate and problem resolution). This was shown in a unique randomized trial involving 2832 persons from 65 to 94 years of age and followed up during 5 years (102). Subjects were divided into 4 randomized groups: 1 control group and 3 intervention groups [Reasoning (capacity in resolving problems), memory and information transmission rate]. Results indicate that the "reasoning" group reports more easiness in attending to IADL after 5 years (effect size, 0.29; 99% [IC], 0.03-0.55) and that each intervention enables to keep up cognitive capacity aimed at 5 years.

Impact of nutrition

Antioxidants and group B vitamins

Several published randomized clinical trials assess the efficacy of the following supplementations: unique or multi group B vitamin (B6 vitamins, B12 and/or folates) and antioxidants such as vitamin E (103-108). None of these trials presented beneficial effects on cognitive functions. Only one trial tested, during a 3-year period, the efficacy of a folic acid (800 mg/d) supplementation on the cognitive functions of 818 men and women aged from 50 to 70 years old. It has been found, through a series of cognitive tests, that a folic acid supplementation brought significant progress in memory, rate of information transmission and in sensory-motor rate (104).

Omega-3

From our understanding, clinical trials published up until today, are not favourable towards positive effects on polyunsaturated fatty acids (PUFA) in cognitive functions. The MEMO (Mental health in the Elderly Maintained with Omega-3) study (109) provides the latest data. Its aim was to assess the efficiency of an eicosapentaenoic acid (EPA) and a docosahexaenoic acid (DHA) on the cognitive capacities of 302 subjects of 65 years of age and more, reporting no cognitive decline upon inclusion, and followed up during 26 weeks. Subjects were randomly assigned into 3 groups: 1 placebo group, 1 group receiving 1800mg/day of EPA-DHA and 1 group receiving 400mg/day of EPA-DHA. Negative results were established related to the effect of such a supplement. Other clinical trials are currently undergone.

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Dietary analysis

The epidemiological analysis of nutrition consumption and cognitive decline relationships are complex. It would be less than likely that just one component carries out a main function. A few studies examined the possible implication of food groups or nutrition profiles. A recently published article, based on the Three City French study, suggests that a wide range of food (regular consumption of fruits and vegetables, fish and oils enriched in PUFA-n3) could diminish dementia risk (110). Furthermore, another study showed a decrease of potential AD in subjects that undergo a Mediterranean type diet (111). High intake of vegetables, fruits and cereals, unsaturated fat (olive oil), average intake of fish and dairy products, low intake of meat and poultry, and finally an average consumption of wine, contributes to this diet. Based on these observations, the French PNNS - Plan National Nutrition Santé (National Health and Nutrition Programme) issued its "9 recommendations for a better aging": at least 5 fruits and vegetables per day; 3 or 4 dairy products a day; meat, fish and eggs once to twice daily; restrict fat consumption and prefer vegetable fat; restrict sweetened products; unlimited water drinking; importance of physical activity; restrict alcohol intake; restrict without stopping salt intake; eat starchy food at each meal.

Benefit of a multidomain intervention

With a lack of curative treatments, it is necessary to set up preventive interventional strategies. Several works determined that interventional strategies, even moderate, capable of delaying the beginning and/or the progress of Alzheimer's disease, had a major impact on public health (112, 113).

A number of epidemiological arguments are currently in favour of a protective role concerning certain isolated factors (physical exercise, cognitive and social stimulation, nutrition) (114, 115). One can assume that an accumulated exposure to all of these factors could potentially offer a protective role.

Benefits of a multidomain intervention set up have already been tested in the care of cardiovascular pathologies. In particular, one can mention the works performed by Fortmann et al (116) who studied the impact of a multidomain education programme on cardiovascular disease morbidity and mortality in the Stanford Five-City project, and those undergone by Luepker RV et al (117) within the Minnesota Heart Health Program. In both cases the intervention carried out during a 6-year period, aimed at reducing cardiovascular risk factors through an education programme based on distribution different information tools (newspapers, media, debates, workshops, correspondance courses).

Impact of a multidomain intervention is currently being validated through a major French multicentric prevention trial involving 1200 frail elderly people aged 70 years and followed up during 3 years (MAPT study - Multidomain Alzheimer Preventive Trial). This study's aim is to examine the efficacy of an isolated fatty acid omega-3 supplementation, of an isolated multidomain intervention (nutritional advice, cognitive training,

physical exercise, social activities), or both associated, on the development of cognitive functions. This study includes 2 different sections: 1 training and information section and 1 section in the form of a prevention consultation.

Keeping an active lifestyle, regarding nutrition, physical activity as well as cognitive activity, is the aim of these training/information sessions. They last 2 hours (1h «cognition», 30' «physical exercise», 15' «nutrition») and bring together 6 to 8 subjects in each group. Participants attend 2 sessions per week during the first month, 1 session per week during the second month and then 1 session per month.

Cognitive stimulation sessions include 2 sections: 1 reasoning section for the reinforcement of reasoning and logical capacities and 1 memory section for the improvement of mnesic capacities by using mental imaging.

Physical activities sessions encourage the practice of a physical endurance activity of moderate intensity 30 minutes per day (mostly walking).

Lastly, nutrition sessions concern nutritional recommendations based on the PNNS - Plan National Nutrition Santé (National Health and Nutrition Programme) in the way of advice sheets.

The prevention consultation, or health promoting consultation allows: to provide an in-depth multidimensional assessment of the senior's state of health, to follow up identified medical problems in joint effort with general practitioners, to increase the awareness of general practitioners toward this population, to raise awareness of seniors to the factor risk exposures, and to begin a real long-term prevention action. This consultation must also make seniors more sensitive to certain food behaviour benefits (by following the PNNS recommendations), to good personal health practices (particularly physical activity) and to the management of vascular risk factors, all of which can contribute to AD prevention. The MAPT study participants receive this prevention consultation upon assignment, at 12th and 24th month.

Personalized multidomain programme during balneotherapy for "frail" seniors

Target population: frail elderly persons and/or with memory disorder complaint

Frailty is a recent concept used to designate elderly people who a high risk of dependence, of facility admission, of comorbidity and of mortality compared to the general senior population. In their works, Fried and coll were the first to determine the main characteristics of frailty: weakness, low endurance, reduced physical activity, slow gait and unintentional loss of weight (118, 119). Buchman et al (120) reported that frail elderly subjects (according to Fried's definition) present a higher risk in developing AD. Moreover, an increasing rational is observed related to gait and cognitive functions decline (121-123). Lastly, some studies also pointed

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out that loss of weight could precede the AD diagnostic (124-127). A low BMI (Body Mass Index) would be an early indication of the disease's onset (128). A 5.5-year study conducted with 918 religious members found that an annual loss of one BMI point is related to an AD risk increased by 35% (129). Other multidomain approaches have been performed to define frailty and have resulted in the adjustment of a frailty index. They take into consideration the level of dependence (130, 131) or the disorders identified during clinical examination, such as sensory disorders, incontinence disorders or cardiovascular risk (131). Urinary incontinence is particularly considered as a factor of social isolation and depression (132). It is also a frequently reported disorder in older people with functional and cognitive decline (133). Subjects with vision and/or hearing impairments have more risk in developing cognitive disorders. Dependence assessed by IADL scale (141) seems to be related, in an independent manner, to many features of the frailty syndrome such as isolated mnemonic impairment, vision and hearing impairments and fear of falling and subjective poor health. In the current state of knowledge and with regards to the lack of validated assessment tools, a group of experts (142) recently concluded that gait speed would be the most relevant frailty marker in patients.

Frailty concerns a significant proportion of the senior population and henceforth with a higher to develop cognitive decline. This frailty status is an early sign of dependency and would be an AD development risk factor. It is therefore essential to detect these frail elderly persons as soon as possible, in order to set up relevant prevention measures.

It seems important to take into account subjects who suffer from memory disorders as well. The subjective complaint of memory disorder is very common in the elderly population, even though all patients do not report it to their general practitioner. However, this complaint could be one of the first signs of impairment in cognitive functions, though they are unidentifiable through common neuropsychological tests. Furthermore, several studies mention that subjective memory complaint is a risk factor for AD development. A recent study based of the GuidAge study data (AD secondary prevention trial involving 70-year old and over nondemented subjects or those having reported memory impairment to their general practitioner), revealed that more than half of the included subjects had an objective memory disorder [as defined by a Clinical Dementia Rating (CDR 144) of 0,5]. In this study, a self-questionnaire about difficulties that patients could encounter during their daily activities was also submitted to them. The percentage of subjects reporting difficulties varies from 6.2% to 78.6% according to items. This study seems to point out that special attention should be given to memory disorder complaint represented as an early potential indicator of cognitive decline or of AD.

Programme presentation

Multidomain intervention in balneotherapy consists of a health promoting consultation and of education and training sessions held out during 3 weeks involving groups of 6 to 8 frail elderly persons, all volunteers. Upon arrival at the health resort, benefit receivers will be given information about the present project. On the day after their arrival, those interested make an appointment with the health facility's coordinating practitioner.

The health promoting consultation aims at screening potential clinical disorders. Moreover, it will allow to raise the subjects' awareness about the multidomain intervention programme and to secure their full support. A letter will be sent to the family doctor informing him of the identified disorders, if any.

As from the third day and during 3 weeks, participants (from 6 to 8 persons) will undergo training and multidomain information sessions (nutrition, physical activity and cognitive activity). They will have 12 sessions organized at a rate of 4 sessions per week during

3 weeks. These sessions will take place during 2 hours beyond the scheduled basic spa care (between 2:00pm and 6:00pm). During the last session, the newly acquired techniques will be emphasized in order to encourage participants to continue at home.

Outlooks: feasibility study

We propose to adjust balneotherapy to the MAPT programme. Along with basic hydrotherapy care, subjects could then also take part in a cognitive decline prevention programme.

Considering the 3-week stay in balneotherapy, we will test the feasibility of the multidomain intervention during 3 months, within 3 different groups (limited to 6-8 persons) in 2 resorts.

The main aim of the project is to assess the "multidomain" intervention feasibility (nutrition, physical exercise, cognitive stimulation, social activities) for frail elderly people aged 70 years and over undergoing hydrotherapy. The outcome criteria of this feasibility study will be: the study's participation rate, the observance level for different interventions and the subjects' satisfaction at the end of the study.

The studied population: the multidomain intervention will be proposed to seniors upon arrival in the spa facility. During the first appointment, the coordinating practitioner will verify that the person meets the inclusion criteria (age 70 years old, frailty criteria or memory disorder complaint, lack of dementia, MMSE \geq 24).

During training and information sessions, attendance will be reported by the presenter in order to assess the observance level. A satisfaction questionnaire should be filled out by the participants, at the end of the programme and of the hydrotherapy stay.

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