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Prevention of functional decline in elderly patients in family medicine

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Prevention of functional decline in elderly patients in family medicine

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SUMMARY

Population ageing is a major challenge for health systems, as many individuals lose independence and require support in their daily activities with advancing age. Patients wish to remain independent as long as possible, and preserve their quality-of-life. In this context, family physicians' role also evolves, from curing disease to preserving functional ability. How best to do this is still a matter for debate. Geriatricians have developed the concept of geriatric assessment, which combines assessing for different syndromes known to impair daily functioning with developing an individualized care plan. Such approaches have shown their value in the context of hospitals, specialty consultations, or home-based care. Our team has adapted the content of comprehensive geriatric assessment for use in family medicine. The AGE tool (Active Geriatric Evaluation tool) combines assessment of independence in four activities of daily living with screening for eight geriatric syndromes. First, we showed that the performance of such a short tool used by family physicians was comparable overall to a comprehensive geriatric assessment conducted by a geriatrician to screen for geriatric syndromes. Second, we set-up a pragmatic cluster-randomised trial among family medicine practices in order to show whether the use of the AGE tool could indeed slow down functional decline. The study included 42 family physicians and 429 patients aged 75 years and over. Half of the physicians were invited to use the AGE tool (intervention group) while the others continued to care for their patients as usual (control group). We compared differences in independence in activities of daily living, quality-of-life and health care use over the course of two years between both groups. We found no difference in any of these parameters, despite acceptable levels of adherence to the intervention. The qualitative evaluation conducted alongside the study highlighted that both patients and physicians perceived the intervention positively, even if it did not necessarily modify daily practice of physicians. We conclude that encouraging family physicians to screen older patients for geriatric syndromes and proposing management attitudes is not sufficient to limit their functional decline. We recommend to further explore the advantages of family practices as entry points for geriatric evaluation, but to accompany the process by structural changes that favour interprofessional teams and coordinated care.

RESUME

Le vieillissement de la population est un défi majeur pour les systèmes de santé, car avec l'âge de nombreuses personnes perdent leur autonomie et ont besoin de soutien dans leurs activités quotidiennes. Les patient·e·s souhaitent rester indépendant·e·s le plus longtemps possible et préserver leur qualité de vie. Dans ce contexte, le rôle des médecins de famille évolue également, de la guérison de la maladie à la préservation des capacités fonctionnelles. La meilleure façon de procéder reste débattue. Les gériatres ont développé le concept d'évaluation gériatrique, qui combine la recherche de différents syndromes connus pour altérer le fonctionnement quotidien avec l'élaboration d'un plan de soins individualisé. De telles approches ont montré leur valeur dans le contexte des hôpitaux, des consultations spécialisées, ou des soins à domicile. Notre équipe a adapté le contenu de l'évaluation gériatrique complète pour une utilisation en médecine de famille. L'outil AGE (Active Geriatric Evaluation) combine l'évaluation de l'autonomie dans quatre activités de la vie quotidienne avec le dépistage de huit syndromes gériatriques. Premièrement, nous avons montré que la performance de l'outil bref utilisé par les médecins de famille était globalement comparable à une évaluation gériatrique complète menée par un gériatre pour dépister les syndromes gériatriques. Deuxièmement, nous avons mis en place un essai pragmatique randomisé en grappes parmi les cabinets de médecine de famille afin de montrer si l'utilisation de l'outil AGE pouvait effectivement ralentir le déclin fonctionnel. L'étude comprenait 42 médecins de famille et 429 patient·e·s âgé·ê·s de 75 ans et plus. La moitié des médecins a été invitée à utiliser l'outil AGE (groupe intervention) tandis que les autres ont continué à soigner leurs patient·e·s comme d'habitude (groupe témoin). Nous avons comparé les différences d'autonomie dans les activités de la vie quotidienne, la qualité de vie et l'utilisation des soins de santé sur deux ans entre les deux groupes. Nous n'avons trouvé aucune différence dans aucun de ces paramètres, malgré des niveaux acceptables d'adhésion à l'intervention. L'évaluation qualitative menée parallèlement à l'étude a mis en évidence que tant les patients que les médecins perçoivent l'intervention positivement, même si elle n'affecte pas nécessairement leur pratique quotidienne. Nous concluons qu'il ne suffit pas d'encourager les médecins de famille à dépister et prendre en charge les patient·e·s âgé·e·s pour les

syndromes gériatriques pour limiter leur déclin fonctionnel. Nous recommandons d'explorer plus avant les avantages des cabinets de médecine de famille comme points d'entrée pour l'évaluation gériatrique, mais d'accompagner le processus par des changements structuraux qui favorisent les équipes interprofessionnelles et des soins coordonnés.

INTRODUCTION

The Swiss health context

Switzerland has one of the highest life expectancies in the world, reaching 81.5 years at birth for men and 85.3 years for women in 2016 [1]. At age 80, men have a life expectancy of 8.8 and women of 10.4 years. The 65+ (aged 65 years old and above) represent 18% of the Swiss population, a proportion that is expected to rise in the coming years, as baby boomers reach retirement age [2]. The vast majority older individuals live at home (98.5% of 65-79 years old, respectively 84.0% of 80+ years old) [3]. However, about 6% of 65-79 years old and 16% of 80+ reported limitations in basic activities of daily living in 2017, while 16% of 65+ reported strong limitations in instrumental activities of daily living [4]. In Switzerland, at least 93% of 75+ consulted a physician at least once a year [4]. By contrast, only a minority of Swiss community-dwelling elders used home care: 12% of women and 6% of men aged 75-84 years old, respectively 28% and 20% of those aged 85+ [4].

Still, among OECD countries, Switzerland has the highest proportion of adults aged 65 and over receiving long-term care (combining home-based care and residential care). The country is also among the countries with the highest proportion of home care among long-term care (75%) [5]. In terms of health financing, the country has the highest share of out-of-pocket spending on health, 23% of which is spent on long-term care [5]. This can lead to unequitable distribution of care. For example, in the canton of Vaud, access to home and community-based services was shown to be associated with financial status, and the functionally vulnerable were less informed about these services [6].

Health policy is a cantonal prerogative in Switzerland, although the different cantons and the federal state coordinate their actions as part of a national health policy dialogue. The Federal Council approved a global “Health2020 strategy” to guide cantonal actions, which has been declined in a number of topical national health strategies, such as dementia, mental health, or prevention of non-communicable diseases. Coordinated care was identified as one of the priority topics of the Health 2020 strategy, but most initiatives are still in their pilot stage.

Swiss primary health care is mostly delivered by family physicians, in a fee-for-service system. Swiss family practices are characterized by being more often solo-practices compared to other industrialized

countries, although younger physicians favor small group-practices (<5 FPs) and interprofessionality [7]. Practices usually include medical assistants that assist FPs for administrative tasks, laboratory and radiology (3-year apprenticeship), but only rarely nurses. Uptake of electronic medical files in Switzerland is slow when compared with other countries (54.2% in 2015). Overall, few data on Swiss primary care are collected, and quality monitoring is almost inexistent, making comparison with other countries difficult [5].

Functional decline

Population ageing is a major challenge for health systems confronted with an increase in multimorbid and frail patients, and Switzerland is no exception. With advancing age, individuals give more importance to functional autonomy and social functioning, and less to morbidities [8]. Feelings of safety, health and mobility, and autonomy are indeed the three main domains associated with quality-of-life by older individuals [9]. The World Health Organization's *World report on ageing and health* has defined healthy aging as the process of developing and maintaining the functional ability that enables wellbeing in older age [10]. The WHO proposes a framework for ageing based on the interplay between intrinsic capacity (IC) and functional ability (FA) (Figure 1). Intrinsic capacity is defined as the combination of the individual's physical and mental, including psychological, capacities; and functional ability as the combination and interaction of IC with the environment a person inhabits. Functional ability is further defined as the "*health-related attributes that enable people to be and to do what they have reason to value*". Therefore, tailoring interventions that maintain functional ability and quality of life should be the main objectives of care in older patients.

Intrinsic capacity and functional ability do not remain constant but decline with age as a result of underlying diseases and the ageing process.

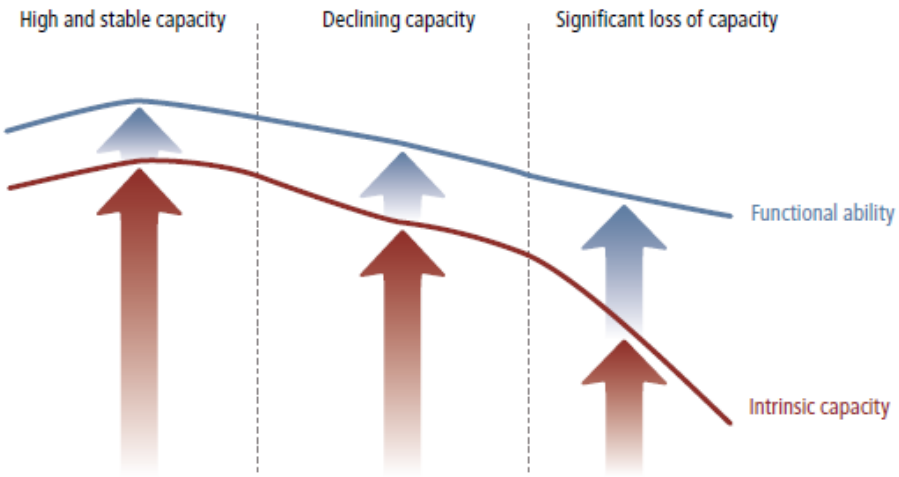

Figure 1. A public health framework for Healthy Ageing: opportunities for public-health action across the life course. Copied from [11]

Measures of function

Functional ability is often measured via the ability of performing activities of daily living (ADL). The most frequently used scores are the basic ADL score developed by Katz (or Katz index) that comprises six items (bathing, dressing, toileting, transferring, continence, and feeding) [12], and the Lawton instrumental ADL score that comprises eight items (phone, shopping, food preparation, housekeeping, laundry, mode of transportation, responsibility for own medication, and ability to handle financing) [13]. The Lawton IADL scale was initially developed as a clinical tool, while the Katz's ADL scale was meant from the start to be used both as research tools and as clinical tools to guide patients' progress in rehabilitation. Various combinations of these scores have been used since, sometimes in combination with scores of mobility, of physical functioning (SF-36), of impairments in bodily and mental function, or physical measurements [14]. There is also a great variety in the use of ADL scores over the 50 years since their conception, in the choice of items included, and the way they are measured (independence levels per item as 5-point scale, three to four levels, binary).

As a research tool, there is little consensus in what changes in functional ability to assess over time, from differences in total scores (ADL + IADL, or a subset thereof), or losses of at least one item ("incident

disability"). The obvious ceiling effect, due to the fact that at population level the majority of individuals score at the maximum, is a statistical problem that is usually overlooked. Surprisingly, while it is quite obvious that performance of these activities differs by gender, particularly for instrumental ADL, this point is rarely addressed in the studies using ADL scores. Some authors have modified the score towards more gender-neutral activities ("doing things around the house" instead of cleaning, for example). But differences in disability trajectories between men and women are usually not taken into account [15-17]. Indeed, improvements and agreement in metrics, measures and analytical approaches was among the key areas for action identified in the World report and health and ageing [14].

Geriatric syndromes

Many chronic conditions affect functional performances. As individuals advance in age, chronic conditions become increasingly prevalent and functional performance declines [18-20]. If chronic diseases are often well defined, it is less the case of *geriatric syndromes, w*hich are multifactorial clinical conditions that share common features such as older age. Tinetti and colleagues proposed the following definition: ‘‘ *Geriatric syndromes are multifactorial health conditions that occur when the accumulated effects of impairments in multiple systems render [an older] person vulnerable to situational challenges*».[21] Geriatric syndromes may be due to multiple causes, but the main point is that they can be managed without a full understanding of the underlying pathologies [22]. Furthermore, geriatric syndromes are directly associated with functional decline [23]. If recognized early, adapted preventive measures can be initiated to reduce part of the burden due to geriatric syndromes [24, 25].

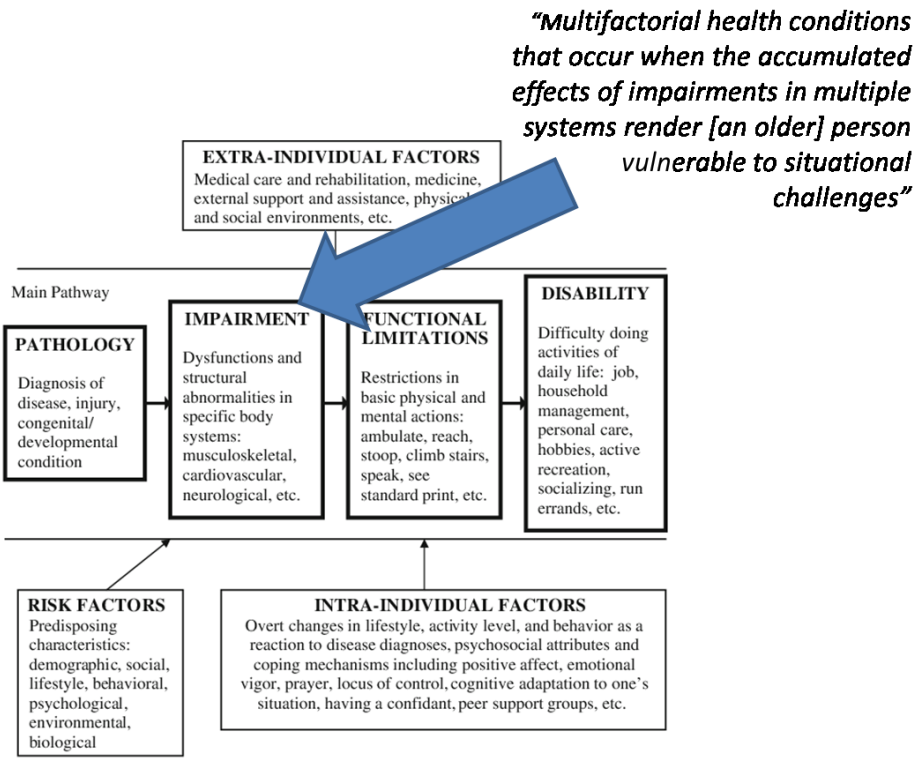

Figure 2, The disablement process, adapted from Verbrugge & Jette [26] with incorporation of geriatric syndromes [21]

As with functionality, there is little agreement on what to include among geriatric syndromes, depending on the setting (geriatrics, hospital, primary care), and the objective (rehabilitation, individual assessment, population-based surveys). Some cite delirium, falls, frailty, dizziness, syncope and urinary incontinence [27]. Others add to this list specific impairments such as impairments in hearing, vision, gait, cognition or mood [28], and more general conditions such as malnutrition, elder abuse or sleeping problems. There is also no consensus in the delineation between geriatric syndromes, frailty and functional decline.

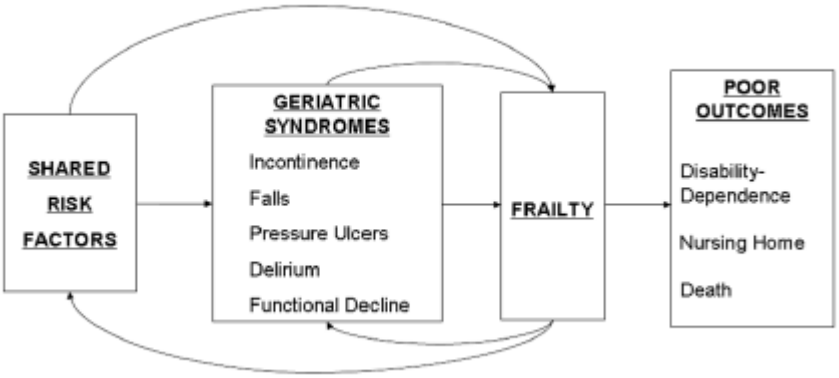

Figure 3. One example of conceptual model for geriatric syndromes, frailty and disability. Copied from [27].

Frailty can be defined as "progressive age-related deterioration in physiological systems that results in extreme vulnerability to stressors and increases the risk of a range of adverse outcomes including care dependence and death" [29]. While we all intuitively agree to the concept of frailty, its actual measurement is a major challenge. Some authors advocate for the use of a "frailty phenotype" [30], while others prefer "frailty indexes", which exist in many forms. Others use simple measures such as hand grip strength or the timed-up-and-go test, as proxies of frailty. While the frailty concept makes sense at population level [30], there is still little evidence supporting interventions that limit frailty of individuals. Another concern is that the term frailty is not well accepted by patients themselves [31], thereby limiting its use on clinical practice.

One important point is that the classical "primary / secondary / tertiary prevention" framework does not apply as such when it comes to frailty or geriatric syndromes, as we are not talking about diseases with a clear definition of disease onset, but rather an accumulation of impairments. Similarly, the screening versus early detection dichotomy does not apply, because we are talking of gradual and insidious development of conditions, that do cause symptoms but these symptoms are not necessarily looked for and recognized as such, and if they are, they are often attributed to normal ageing. In this work, we decided to use terminology of screening for geriatric syndromes, not in the sense of searching for an asymptomatic condition, but of recognizing a symptomatic condition otherwise overlooked. This is in line with the US preventive task force that recommends screening for depression for example.

Comprehensive geriatric assessment

Comprehensive geriatric assessment (CGA) consists in a “multidisciplinary diagnostic and treatment process that identifies medical, psychosocial, and functional capabilities of older adults to develop a coordinated plan to maximize overall health with aging” [32]. It is often referred to as “the cornerstone of modern geriatric care” [32]. Hospital-based CGA has been shown to prevent functional decline in participants [33-36], improve survival and reduce admissions to nursing homes [37]. CGA interventions have also been tested as home-based programs, where they reduced functional decline [24, 38, 39].

By contrast, a recent systematic review of CGA in primary care found only four studies conducted in such a setting [40], with mixed impact on clinical outcomes and no impact on functional ability in the only study assessing it [41]. In those studies, geriatric assessment was comprehensive and delivered by geriatricians or specifically trained nurse practitioners.

One of the key issues that can explain the observed differences in success of CGAs conducted in various contexts is the definition of the population at risk. Indeed, the “geriatric population”, corresponding to patients seen by geriatricians, represents only to a minority of all older individuals in society, thus corresponding only to the tip of the iceberg. Similarly, home-based programs often include individuals already known to home-based care. Referring to Kaiser’s model of integrated care, these patients represent only the 5-20% of all patients. However, in the context of the older segment of the population, one can argue that the challenges related to ageing concern much more than those 20%. The question is, how can they be reached?

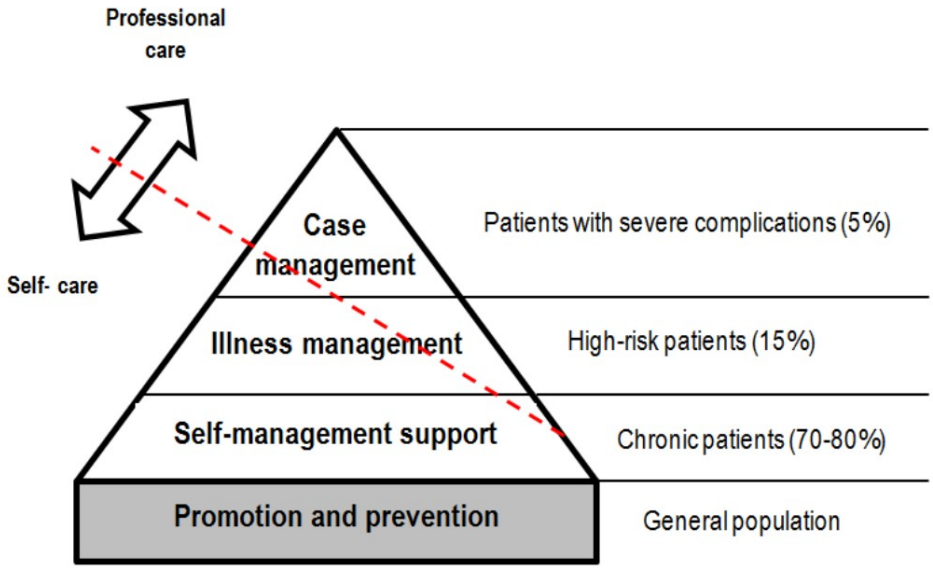

Figure 4. Kaiser's pyramid model of integrated care

Brief geriatric assessment – tools for primary care

Considering the success of CGA in targeted populations, one could expect greater benefits if the intervention was proposed to larger segments of the older population. Knowing that most older individuals consult their FP regularly, family medicine practices could constitute an interesting entry point. However, while primary care physicians perform prevention and management of common chronic conditions adequately, screening, prevention and management of geriatric syndromes are often incomplete [42, 43]. Several reasons can explain this low rate of early diagnosis of geriatric syndromes in primary care. First, primary care physicians remain mostly unfamiliar with the concept of geriatric syndromes, mostly developed by geriatricians. Second, many physicians report a lack of confidence, for example for detecting and diagnosing neurocognitive disorders, where they fail to act proactively [44]. Third, a comprehensive assessment takes time, and as such is difficult to integrate in primary care consultations. Finally, FPs may question the relevance of early diagnosis of age-related problems [45] and doubt the efficacy of interventions aiming at functional decline prevention, still seen as a fatality.

Management of geriatric syndromes

Even if family physicians remain unfamiliar with the geriatric syndromes concept per se, recommendations for clinical management of these syndromes by FPs have been developed and FPs become increasingly familiar with them. Management measures include investigations to confirm or precise a diagnosis or the source of a problem (for example conducting a home visit to evaluate a patient's feeding habits), and various types of interventions such as physical therapy, medication change, liaising with patients' relatives or home-based care services. Recognition of geriatric syndromes should lead to individualized care plans that capture the multidimensionality of these interventions and allow information sharing as part of interprofessional teams [46]. However, most management recommendations target individual syndromes such as dementia [47], falls, or urinary incontinence. In many countries, specific vertical care programs are set up to improve management of specific conditions, such as the Leenaards memory centers in Switzerland [48], or the Fracture Liaison Service in France [49]. Such programs improve the management of the targeted syndrome, but widespread applicability for patients with multiple issues raises concern.

The AGE program

In this context, one possible approach is to improve uptake and ownership of the geriatric assessment and management by the FP. This was the approach chosen by the Active Geriatric Evaluation (AGE) program.

The overall aim of the AGE program was to develop and assess a comprehensive evaluation & management tool (AGE tool) for older patients in family medicine, with the objective of preventing functional decline. The AGE program started in 2011 and consisted in four steps:

1. a literature review to identify suitable screening tools for individual geriatric syndromes, development of a theoretical framework (figure 1), and construction of the brief assessment tool for FP's [28];
2. validation of the geriatric consultation as a gold standard for assessing geriatric syndromes (study named AGE 1) [50];

3. estimation of the diagnostic performance of the screening instrument (brief assessment tool BAT) in general practice (study named AGE 2, see project 2)[51];
4. estimation of the efficacy of the AGE tool, combining assessment and management components, implemented in family medicine (pragmatic cluster-randomized trial named AGE3, see projects 3 and 4).

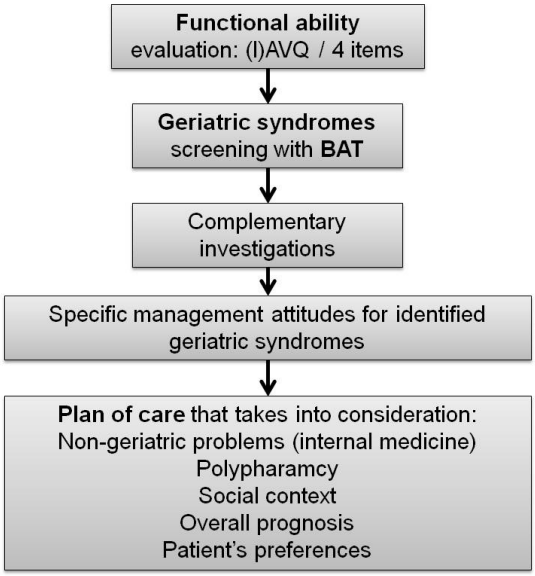

Figure 5. Theoretical framework of the active geriatric evaluation

Assessment component of the AGE tool

The assessment component of the AGE tool consists in a yearly brief assessment of four activities of daily living, and screening for eight geriatric syndromes: cognitive impairment, mood disorder, gait and balance impairment, visual impairment, hearing impairment, urinary incontinence, malnutrition and osteoporosis The items covered correspond to those targeted by the other tools available to FPs [52], such as the Gerontopôle Frailty Screening Tool[53] the MAGIC assessment[54], or the Saint-Louis University's Rapid Geriatric Assessment[55] (Table 1), and covers all areas more recently recommended by WHO's ICOPE approach [46]. The AGE tool does not target frailty nor sarcopenia covered by some tools. While we acknowledge these as important concepts in the management of the elderly, particularly for research, their true meaning remains difficult to grasp for FPs, in the lack of a common definition and/or direct operational consequences for the patient. One of the specificities of the

AGE tool is that it includes also clinical examination and not only items of the history, which is more congruent with FP practice.

Table 1. Comparison of items included in the Active Geriatric Evaluation, the Gerontopôle Frailty Screening Tool[53] the MAGIC assessment[54], or the Saint-Louis University's Rapid Geriatric Assessment[55]

Items	Active Geriatric Evaluation tool	WHO ICOPE screening tool	Gerontopôle Frailty Screening Tool	MAGIC assessment	Saint Louis University Rapid Geriatric Assessment
Disability	4 items of IADL	ADL		1. Daily activities (difficulty in)	
Cognition	Cognitive impairment: Minicog	3-words recall Orientation in place and time	Has your patient complained of memory problems?	9. Cognition: clock test	Rapid Cognitive Screen (RCS): recall 5 objects, clock test, story
Mood	Mood impairment: 2 questions	Depression: 2 questions		7. Depression: 2 questions	
Urinary	Urinary incontinence: 4 questions			5. Urinary Incontinence (2 questions)	Worrisome incontinence
Gait and balance	Gait and balance: chutes dans l'année, troubles de la marche	Chair rise test	Does your patient present slow gait speed (i.e., >4 seconds to walk 4 meters)?	4. Falls: nb of falls past 6 months (+/-2)	Sarcopenia (SARC-F): Strength, Assistance in walking, Rise from a chair, Climb stairs, Falls
Vision	Visual impairment: near vision pocket card	Do you have any problems with your eyes		2. Vision: reading newspaper and recognizing people	
Hearing	Hearing impairment: whispering test	Whisper test OR audiometry OR automated app-based digits-in-noise test		3. Hearing: difficulty hearing conversation	
Nutrition	Weight loss	Weight loss >3 kg past 3 months Appetite loss	Has your patient involuntarily lost weight in the last 3 months?		Loss of weight: Have you lost more than 5% of your weight in the last 6 months?; SNAQ

					(Simplified Nutritional Assessment Questionnaire)
Osteoporosis	History of fracture, height loss, wall-occiput distance, rib-pelvis distance				
Fatigue			Has your patient been more fatigued in the last 3 months?		Fatigue: Are you fatigued?
Frailty			Has your patient experienced increased mobility difficulties in the last 3 months? Do you think your patient is frail?		Resistance: Cannot walk up one flight of stairs? Aerobic: Cannot walk one block? Illnesses: Do you have more than 5 illnesses? (+ nutrition)
Social	Included in general conceptual framework	Accommodation, finances, loneliness, leisure interests, risk of abuse	Does your patient live alone?	8. Social environment: 2 questions	
Immunization				6. Immunization (influenza, tetanus, diphteria)	
Constipation					Constipation
Advanced directive					Advanced directive

However, while there is increasing evidence on how to assess older individuals, quality of the evidence supporting screening interventions is often of low or moderate quality [56]. As a result, the US preventive task force was unable to provide recommendations supporting screening for visual acuity, hearing loss, or cognitive disorder [57] in older individuals. By contrast, screening for depression, osteoporosis (in women), and risk of falls is recommended [58].

Management component of the AGE tool

The recommendations for management included in the AGE tool were divided in two distinct steps: 1) additional tests following a positive screening to confirm or exclude the diagnosis and 2) specific management attitudes. Recommendations in the management part were further graded between major and minor. The diagnosis and management recommendations incorporated in the AGE tool were based on a literature review of existing guidelines and Swiss reviews, reviewed by an expert panel consisting of four geriatricians working in an outpatient setting in the study area (Table 2). As such, they were fully in line with the management recommended by local experts at the time of the trial In order to preserve the pragmatic approach of the study, GPs remained free to follow the proposed attitudes.

Table 2. Proposed strategies when screening using the brief assessment tool (BAT) of AGE is positive

Syndrome	Screening	Additional investigation if screening positive (diagnostic confirmation)	Proposed management attitudes
Functionality	Can you dress yourself? Can you prepare your meals alone? Can you make your own shopping? Can you make your payment alone?		
Urinary incontinence	4 questions: Do you have difficulty holding urine or urge feelings? Do you sometimes find it difficult to reach the	**Complete focused medical history and examination: sensation of emptying, dysuria, pollakiuria, urogynecological problems, urinary retention, prolapsus, rectal examination**	**Prescription of urinary protection**

	toilet in time? Do you have involuntary urine loss when coughing or effort? Do you sometimes wear pads?	**Voiding calendar (timing of mictions, nycturia)**	Consider specialized physiotherapy and rehabilitation
		Urinary dipstick	**Voiding behavioral hygiene.**
		Radiological examination for post-mictional residue	Consider anticholinergic / alphablocker
		Review medication	Refer to gynaecologist / urologist for specialty care / ev surgery
Mood disorder	PHQ-2	**Complete medical history.**	**Initiate depression follow-up**
		Perform eventually Geriatric Depression Scale (short form).	Antidepressant drug
		Assess alcohol consumption	**Motivational intervention on alcohol consumption**
Cognitive impairment	Mini-Cog	**Medical history, compare with functional status (ADL IADL)**	**Home care support**
		MMSE or Moka test	**Meet family / network**
		Refer to memory clinic/geriatrician, +/- MRI).	**Consider specific treatment according to diagnosis (hypothyroidism)**
		Lab tests: full blood count, HbA1c, creatinine claearance, ASAT, ALAT, Gamma-GT, Na, K, Ca, vitamin B12, folic acid, TSH	Acetylcholinesterase inhibitors
		Review medication	**Adapt medication**
		Assess driving ability	
Visual impairment	Near vision pocket card	**Complete visual acuity assessment (Snellen chart)**	**Ergotherapist to check indication for auxiliary means**
		Refer to ophthalmologist for full assessment (cataract, glaucoma,..)	
Hearing impairment	Whisper test	**Perform otoscopy (cerumen impaction)**	
		Refer for audiometry	**Prescription of hearing aid**
Gait and balance	History of falls during past year	**Complete medical history and examination: cardiovascular, neurological, osteoarticular, Schellong test. Examine feet and shoes.**	**Home hazard assessment (ergotherapist) & home care support**
	Gait observation	**Refer to specialty care if needed (neurology,…)**	**Exercise prescription, physiotherapy, adapted shoes**
		Review medication	**Adapt medication**

		Assess alcohol consumption	**Motivational intervention on alcohol consumption**
		Check calcium and vitamin D	**Consider calcium and vitamin D prescription**
Osteoporosis	History of osteoporotic fracture height loss since age 25 wall-occiput and rib-pelvis distance	Perform osteodensitometry	**Exercise prescription, physiotherapy.**
		Check calcium and vitamin D	**Consider calcium & Vit D supplementation**
			Consider treatment with biphosphonates
Malnutrition	Weight loss >5% past month or 10% past 6 months	**Perform digestive (including constipation) and dental examination**	**Treat other causes (depression,…)**
		Review medication	**Home care support (meals, shopping…)**
		Assess financial situation	Hyperproteic supplements

Thesis objectives

Comprehensive geriatric assessment is among the interventions that limit functional decline in selected older individuals. However, currently this intervention is not available to the majority of older adults at risk of decline. Considering that most have a family physician, proposing a geriatric assessment within the context of family medicine is a promising approach. Therefore, the general aim of this work was to assess how family medicine can integrate a brief geriatric evaluation into care of older individuals, and whether this prevents functional decline.

Thus, the main objectives of this thesis were:

1. To describe the population of older patients managed in family medicine in western Switzerland
2. To assess the performance of a brief geriatric evaluation by the family physician compared to a comprehensive geriatric assessment
3. To assess the efficacy of an active geriatric evaluation on prevention of functional decline in elderly patients followed in family medicine
4. To assess adherence and acceptability of an active geriatric evaluation for detection of functional decline and geriatric syndromes in family medicine

OVERVIEW OF MAIN RESULTS

Paper 1. Drug Prescription in Older Swiss Men and Women Followed in Family Medicine.

Status: published in Paper published in "Drugs Real World Outcomes" in March 2020 (last author), [59]

Candidate's contribution: data analysis, interpretation of results and drafting of the manuscript.

Paper 2. Performance of a brief geriatric evaluation compared to a comprehensive geriatric assessment for detection of geriatric syndromes in family medicine: a prospective diagnostic study

Status: published in BMC Geriatrics in March 2018 (first author)[60].

Candidate's contribution: data analysis, interpretation of results and drafting of the manuscript.

Paper 3. Discussing age-related functional decline in family medicine: a qualitative study that explores both patient and physician perceptions

Status: published in Age and Ageing (last author) [61].

Candidate's contribution: design of qualitative research questions with Joëlle Schwarz, supervision of Ophélie Viret (MD candidate), interpretation of results, manuscript review.

Paper 4. Standardised brief geriatric evaluation versus routine care for preventing functional decline in primary care: a pragmatic cluster-randomized trial

Status: submitted to the Lancet on October 7th, 2020 (first author)

Candidate's contribution: development of study protocol, submission to ethics committee, study implementation and coordination, data analyses (secondary outcomes), interpretation of results and drafting of the main manuscript.

MAIN RESULTS

Paper 1. Drug prescription in older Swiss men and women followed in family medicine

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Abstract

Background: We sought to estimate prevalence of polypharmacy, most prevalent drug classes, prevalence and type of potentially inappropriate prescribing among older male and female patients in family medicine.

Methods: Secondary analysis of baseline data from a pragmatic cluster-randomized trial data on efficacy of a screening and management tool for geriatric syndromes, among older community-dwelling patients (≥75 years) included by forty-two family physicians. Information on drug prescription and clinical diagnoses (ICPC-2 coded) were extracted manually from the medical records. Prevalence of polypharmacy, defined as the use of at least five permanent oral or parenteral drugs, and of potentially inappropriate medications (PIM), identified according to 2015 updated Beers criteria, were compared between men and women.

Results: We included 429 patients (269 women and 160 men; mean age 82.9 and 81.8 years, respectively). Polypharmacy was found in 59.9% of them. Analgesics, antithrombotic agents and agents acting on the renin angiotensin system were the most frequently prescribed drug categories. Three quarters of patients (76.7%) were prescribed at least one PIM according to Beers criteria, without difference by sex/gender (p=0.760). The most frequent PIM were proton-pump inhibitors over eight weeks, diuretics, benzodiazepines, aspirin for primary prevention, and chronic use of NSAIDS. Prescription patterns markedly differed by sex/gender, but number and patterns of inappropriate prescription were comparable overall.

Interpretation: Both polypharmacy and PIM were very common in older patients followed regularly in family medicine in Switzerland. Interestingly, most PIM involved only a limited number of medication classes.

Trial registration: clinicaltrials.gov NCT 02618291

Key points:

- Both older male and female patients followed in family medicine are prescribed high number of drugs, but different drug classes are prescribed to older men, respectively older women
- Potentially inappropriate prescribing is very common both in older men and women
- Most potentially inappropriate medications are concentrated among few drug classes

- Targeted deprescription advice, differentiated by sex/gender, and focusing on the most prevalent drug classes, could simplify deprescribing for family physicians

Introduction

Polypharmacy and inappropriate prescribing are important clinical challenges, especially among older patients, who often suffer from multiple chronic conditions. Polypharmacy is heterogeneously defined in studies as the utilization of multiple medications by patient, although most studies agree on a threshold of at least five medications [62]. In Switzerland, one fourth of community-dwelling patients aged over 65 years self-report taking five or more drugs [63] although higher rates were found based on claims data [64, 65].

Polypharmacy is associated with potentially inappropriate medications (PIM) [66]. Prevalence of PIM varies according to age, context (community-dwelling vs. care home), and criteria used to define it [67-69]. Swiss data in community-dwelling patients over 65 years old report prevalence of PIM around 20% [64, 70, 71], increasing to 74% in nursing home residents [65]. These studies were however limited to claims data or conducted in specific populations, and clinical information to estimate inappropriate prescribing was often weak. The most prevalent classes of PIM were psycholeptic, followed by sex hormones and genital system modulators, psychoanaleptics, anti-inflammatory and anti-rheumatic products, and cardiac therapy [64]. However, detailed data on prescriptions patterns, polypharmacy, and PIM remain limited in Switzerland, especially for patients followed-up in family medicine.

Sex/gender differences have been reported in prevalences both of polypharmacy and PIM. In the adult population, men are prescribed less drugs than women, even after excluding sex/gender-related morbidity, although the difference decreases with age [72]. Among the older, evidence on gender difference in polypharmacy varies, but older women seem to receive more PIM [69, 73-75]. When studies do report gender differences, they most often lack further exploration or explanation of the gender discrepancy. Hofer-Dückelmann explored the reasons for higher polypharmacy in older women, highlighting the gendered different attitude towards intake of drugs; the female propensity to see a physician and discuss problems, family responsibility and caregiving activities, provider-patient relationship, education, social deprivation and self-rated health [76]. Differences in drug prescription were studied in the field of cardiovascular prevention; a Swedish study found that older women were

more likely to be treated with diuretics and nitroglycerin, while in case of diabetes older men were more likely to receive antihyperglycaemic drugs [77]. Other studies showed that older women receive more psychotropic medication [78-80]. Until now, sex/gender differences in drug prescription have not been explored in the Swiss context.

This study aims to bring insights about drug prescription patterns in male and female older patients followed in family medicine in the French-speaking part of Switzerland. The objectives were to estimate the prevalence of polypharmacy and of most prevalent drug classes; the prevalence of PIM and type; and last, the association between polypharmacy/PIMs and the sex/gender of patients.

Method

Study design

We conducted a secondary analysis of baseline data from a pragmatic cluster-randomized trial on efficacy of a screening and management tool for geriatric syndromes in family medicine (NCT 02618291). In this trial, 42 private family medicine practices in western Switzerland, selected based on their willingness to participate in the trial, included at least 10 community-dwelling patients (≥75 years old), randomly selected among routinely followed patients (at least two visits in the past year) between September 2016 and January 2018.

Drug use and clinical information

Information on drug prescription and clinical diagnosis was extracted manually from the medical records (paper or electronic) by a trained research assistant and entered into a standardized and pretested case report form. Designation was matched with corresponding ATC code (Anatomical Therapeutic Chemical classification) [81], using a predefined list of 2'628 commercially available drugs in Switzerland. Drugs were categorized in the corresponding third degree ATC class. Only oral or parenteral drugs were considered for this analysis. We distinguished drugs taken continuously from occasional medication, based on the information recorded as comments in the case report form. For example, mentions of "stand-by treatment", conditional use ("in case of"), and limited time ("until") were considered occasional treatment. Continuous use was considered the default prescription in the

absence of comments. Patient chronic conditions present in the medical file were coded by the same study staff according to a predefined list of 75 diagnoses based on International Classification of Primary Care – 2nd Edition (ICPC-2, Wonca International Classification Committee) [82]. Polypharmacy was defined as the use of at least five permanent oral or parenteral drugs [83].

Potentially inappropriate medications

PIM were identified according to 2015 updated Beers criteria [67] using the ICPC-2 diagnosis and ATC classification. Following Beers criteria, PIM were divided into five sections: medication to avoid in most older patients; drug-disease or drug-syndrome interactions; drugs to be used with caution in older patients; drug-drug interactions meaningful in a geriatric setting; and finally drugs that should be avoided or the dose reduced with an impaired renal function. Only the first three sections were used to assess the total number of PIM, to allow for comparison with previous studies, as the last two sections were only added into the 2015 update.

Sex/gender

Patient sex/gender categorization was based on the information available in the medical record, as recorded by the physician. Because of the impossibility to disentangle the effects of sex (understood as biological characteristics) and gender (socially constructed), we decided to refer to the combined effect of sex/gender [84, 85].

Data analysis

A Wilcoxon rank-sum test was used to assess whether there was a difference in the number of medications between men and women. Proportions by sex/gender were compared with chi-square and Fisher's exact tests. We used logistic regression to estimate odd ratios of prescription of different drug classes by sex/gender. Considering that patients were recruited via their physicians, we used a mixed logistic regression model with a random intercept by physician to adjust the odd ratios, and compared the added value of adding the random intercept by likelihood ratio tests. P-values below 0.05 were considered significant. Stata software (version 14, College Station, USA) was used to analyze the data.

Results

Forty-two general practitioners (18 women and 24 men) participated in the trial, each enrolling a median number of 11 patients (IQR 7-12). Final data consisted of 429 patients with a median age of 82 years (IQR 78-86), 62.7% of whom were female. Patient sociodemographic and clinical characteristics are shown in **Table** 3. Women were slightly older (82.9 vs 81.8 years old, p=0.021), were more frequently living on their own (64.8% vs. 26.4%, p<0.001), receiving home–based care (21.3% vs 11.3%; p=0.009), had a lower education level (p<0.001) and were less likely to drive (35.9% vs 76.9%; p<0.001). The number of ICPC-2 diagnoses was comparable between men and women (p=0.194). The proportion of men, respectively women, with at least one condition reported by ICPC-2 chapter were comparable for most chapters, with the exception of eye conditions (14.1% vs 25.6%, p=0.003), musculoskeletal conditions (66.9% vs 42.5%, p<0.001), and conditions of the genital system (14.1% vs 34.4%; p<0.001).

Table 3. Sociodemographic and clinical characteristics

	Women (N=269)	**Men (N=160)**	**p-value**
Mean age	82.9 (SD 5.2)	81.8 (SD 4.5)	0.021
Living alone	N=262	N=160	
	169 (64.5)	42 (26.3)	<0.001
Driving a car	N=265	N=160	
	95 (35.9)	123 (76.9)	<0.001
Receiving home-based care	N=269	N=160	
	57 (21.2)	18 (11.3)	0.009
Receiving help from other caregivers	N=253	N=150	
	64 (25.3)	24 (16.0)	0.029
Education (degree reached)	N=249	N=149	<0.001
- Did not finish primary school	7 (2.8)	0 (0.0)	
- Primary school	85 (34.1)	28 (18.8)	
- Secondary school	42 (16.9)	11 (7.4)	
- Professional degree	86 (34.5)	57 (38.3)	

- Higher education (university or equivalent)	29 (11.7)	53 (35.6)	
Median number of chronic conditions	4 (2-5)	4 (3-6)	0.194
Conditions by ICPC-2*chapter	N=269	N=160	
General	17 (6.3%)	8 (5.0)	0.573
Blood	34 (12.6%)	22 (13.8%)	0.741
Digestive system	77 (28.6%)	47 (29.4%)	0.868
Eye	38 (14.1%)	41 (25.6%)	0.003
Ear	34 (12.6%)	23 (14.4%)	0.609
Cardiovascular	232 (86.3%)	145 (90.6%)	0.179
Musculoskelettal	180 (66.9%)	68 (42.5%)	<0.001
Neurological	74 (27.5%)	36 (22.5%)	0.251
Psychological	87 (32.3%)	53 (33.1%)	0.867
Respiratory	38 (14.1%)	33 (20.6%)	0.080
Skin	44 (16.4%)	26 (16.3%)	0.977
Endocrine/Metabolic and nutritional	125 (46.5%)	66 (41.3%)	0.293
Urological	75 (27.9%)	43 (26.9%)	0.821
Genital	38 (14.1%)	55 (34.4%)	<0.001
Abbreviations: ICPC: International Classification of Primary Care			

Polypharmacy and drug classes by sex/gender

Patients were prescribed a median of seven drugs (IQR 5-10), or five drugs (IQR 3-8) if excluding occasional medication, without difference between men and women (p= 0.469, respectively p=0.636; data not shown). The prevalence of polypharmacy (defined as at least five permanent drugs) was 59.9% (61.9% in men and 58.7% in women, p=0.521). The most frequent drug classes are listed in Table 4. Analgesics and antithrombotic agents were prescribed to more than half of patients. Agents acting on the renin-angiotensin system (48.7%), mineral supplements (44.3%) and lipid modifying agents (39.9%) were the next most frequent drug classes, followed by psycholeptics 26.6%) and drugs for acid related

disorders (26.3%). Women were more likely to be prescribed mineral supplements (54.3% vs. 27.5%; OR 3.12, 95%CI 2.05-4.77), psychoanaleptics (28.3% vs 16.9%; OR 1.94, 95%CI 1.19-3.17) and thyroid therapy (16.0% vs 5.6%; OR 3.37, 95%CI 1.60-7.10), while men received more prescriptions for antithrombotic drugs (62.5% vs 43.1%; OR 0.45, 95%CI 0.30-0.68), lipid-modifying agents (49.4% vs 34.2%; OR 0.53, 95%CI 0.36 – 0.79), urologicals (24.4% vs 5.6%; OR 0.18, 95%CI 0.10-0.35) and drugs used in diabetes (19.4% vs 10.0%; OR 0.46, 95%CI 0.27-0.81)). Four drug classes were frequently prescribed for intermittent use: analgesics, psycholeptics, antiinflammatory and antirheumatic products, and drugs for constipation. A significant variation of the prescription by physician, estimated by adding a random intercept in the model, was found for agents acting on the renin-angiotensin system ($p=0.007$), lipid modifying agents ($p<0.001$), beta-blocking agents ($p=0.027$), and vitamins ($p<0.001$).

Table 4. Oral and parenteral drug class prescribed to at least 75 years old patients followed in primary care and included in the study, by sex/gender.

Drugs classified by Anatomical Therapeutic Chemical (ATC) classification system, third degree class. Odd ratios of class prescription by sex/gender from a logistic regression model, raw and after adding a random intercept by physician. Restricted to drug classes prescribed to at least 10% of either male or female patients. In bold: statistically significant OR, respectively p-values.

Drug class (ATC)	Class name	All drugs (intermittent use included)		Continuous use only										
		Total users, n	%	Total users, n	%	Women, n (N=269)	%	Men, n (N=160)	%	OR (baseline: men)	95%CI	Adj OR	95%CI	p-value for cluster effect
N02	Analgesics	236	55.0	82	19.1	54	20.1	26	16.3	1.29	0.77-2.17	1.36	0.79-2.35	**0.017**
B01	Antithrombotic agents	224	52.2	217	50.6	116	43.1	100	62.5	**0.45**	**0.30-0.68**	0.45	0.30-0.68	0.436
C09	Agents acting on the renin-angiotensin system	212	49.4	209	48.7	125	46.5	80	50.0	0.87	0.59-1.28	0.84	0.56-1.28	**0.007**
A12	Mineral supplements	194	45.2	190	44.3	146	54.3	44	27.5	**3.13**	**2.05-4.77**	3.27	2.10-5.08	0.074
C10	Lipid modifying agents	173	40.3	171	39.9	92	34.2	79	49.4	**0.53**	**0.36-0.79**	**0.49**	**0.32-0.76**	**<0.001**
N05	Psycholeptics	167	38.9	114	26.6	75	27.9	38	23.8	1.24	0.79-1.95	1.23	0.78-1.95	0.372
A02	Drugs for acid related disorders	145	33.8	113	26.3	43	26.9	69	25.7	0.94	0.60-1.46	0.95	0.60-1.51	0.126
C07	Beta blocking agents	134	31.2	133	31.0	80	29.7	53	33.1	0.85	0.56-1.30	0.81	0.52-1.26	**0.027**
M01	Antiinflammatory and antirheumatic products	113	26.3	60	14.0	38	14.1	22	13.8	1.03	0.59-1.82	1.05	0.59-1.88	0.196
N06	Psychoanaleptics	109	25.4	103	24.0	76	28.3	27	16.9	**1.94**	**1.19-3.17**	1.94	1.18-3.17	0.459
C03	Diuretics	101	23.5	98	22.8	60	22.3	38	23.8	0.92	0.58-1.47	0.94	0.58-1.51	0.095

A06	Drugs for constipation	104	24.2	57	13.3	35	13.0	22	13.8	0.94	0.53-1.66	0.94	0.52-1.70	0.113
A11	Vitamins	72	16.8	71	16.6	47	17.5	24	15.0	1.20	0.70-2.05	1.33	0.73-2.40	**<0.001**
C08	Calcium channel blockers	71	16.6	65	15.2	45	16.7	20	12.5	1.41	0.80-2.48	NA		
G04	Urologicals	58	13.5	53	12.4	15	5.6	39	24.4	**0.18**	**0.10-0.35**	NA		
A10	Drugs used in diabetes	58	13.5	58	13.5	27	10.0	31	19.4	**0.46**	**0.27-0.81**	NA		
H03	Thyroid therapy	53	12.4	52	12.1	43	16.0	9	5.6	**3.37**	**1.60-7.10**	3.51	1.63-7.57	0.115
C01	Cardiac therapy	51	11.9	34	7.9	20	7.4	14	8.8	0.84	0.41-1.71	0.79	0.37-1.66	0.093
B03	Antianemic preparations	41	9.6	40	9.3	16	10.0	25	9,3	0.92	0.48-1.78	1.06	0.50-2.23	**<0.001**
C05	Vasoprotectives	36	8.4	36	8.4	26	9.7	7	4.4	2.34	0.99-5.52	2.52	1.03-6.16	0.157
M04	Antigout preparations	34	7.9	31	7.2	13	4.8	17	10.6	0.43	0.20-0.90	0.42	0.19-0.90	0.213
NA: not applicable: non- convergence of mixed logistic regression model.														

Potentially inappropriate medication, and sex/gender

The percentage of patients having at least one PIM was 76.7%, with a median number of two PIM per patient (IQR 1-3). The 10 most prevalent PIM, representing 93.8% of all identified PIM, are listed in**Table 5**, along with the rationale for the recommendation. The most frequent medications to avoid for most older adults were proton-pump inhibitors (PPI) prescribed for a duration over eight weeks (23.1% of the patients), benzodiazepines (21.5%), chronic use of oral non-cyclooxygenase-selective NSAIDs (16.8%) and nonbenzodiazepine/benzodiazepine receptor agonist hypnotics (9.8%). Most frequent drugs that should be used with caution in most older adults included diuretics (28.4% of the patients), aspirin for primary prevention of cardiac events (19.8%), vasodilators (15.8%) and selective serotonin reuptake inhibitors (12.4%).

Table 5. List of the ten most prevalent potentially inappropriate medications according to the 2015 updated Beers criteria and summary of the rationale for the recommendation.

Beers criteria's item	ATC class	n	%	Rationale
Diuretics	C03	122	28.4%	*Use with caution, may exacerbate or cause syndrome of inappropriate antidiuretic hormone secretion or hyponatremia*
Proton-pump inhibitors	A02BC	99	23.1%	*Avoid scheduled use for >8 weeks unless for high risk patients*
Benzodiazepines	N05BA12 N05CD04 N05BA06 N05BA56 N05BA04 N05CD07 N05CD05 N05BA05 N05BA02 N03AE01 N05BA01 N05BA17 N05CD01 N05CD10	92	21.5%	*Avoid, older adults have increased sensitivity to benzodiazepines and decreased metabolism of long-acting agents; in general, all benzodiazepines increase risk of cognitive impairment, delirium, falls, fractures, and motor vehicle crashes in older adults*
Aspirin for primary prevention of cardiac events	B01AC	85	19.8%	*Use with caution by patients aged ≥80 years*
Non-cyclooxygenase-selective NSAIDs, oral	M01A	71	16.6%	*Avoid chronic use, unless other alternatives are not effective and patient can take gastroprotective agent*

Vasodilators	C01D, C04, C07F	68	15.8%	*Use with caution, may cause syncope*
SSRIs	N06AB	53	12.4%	*Use with caution, may cause SIADH*
Nonbenzodiazepine, benzodiazepine receptor agonist hypnotics	N05CF04 N05CF01 N05CF02 N05CF03	42	9.8%	*Avoid, adverse events in older adults such as delirium, falls, fractures, increased hospitalizations*
Cardiovascular (amiodarone, digoxin, nifedipine with immediate release, doxazosin)	C02CA04 C01AA05 C01AA02 C01AA52 C01AA08 C08CA05 C08GA01 C08CA55 C07FB03 C02CA01 C02LE01 G04CA03 C02AC01 N02CX02 S01EA04 C02LC01 C02LC51 C02AC0 C02AB C02LB C02AA0 C02LA01 C02LA51 C02LA71 C02AA52 C01BA03 C01BD07 C01BD01	21	4.9%	*Amiodarone: avoid as first-line therapy for atrial fibrillation (AF) unless patient as heart failure or left ventricular hypertrophy. Digoxin: avoid as first-line therapy for AF.* *Nifedipine: avoid, potential for hypotension and risk of precipitating myocardial ischemia.* *Doxazosin: avoid as antihypertensive, risk of orthostatic hypotension.*
Association of chronic kidney disease and NSAIDs	M01A	21	4.9%	*Avoid, may increase risk of acute kidney injury and further decline of renal function*

Abbreviations: ATC: Anatomical Therapeutic Chemical (ATC); NSAIDS: Non-steroidal anti-inflammatory drugs; SIADH: syndrome of inappropriate antidiuretic hormone secretion; SSRI: Selective serotonin reuptake inhibitors

Details of all PIM and comparison by sex/gender can be found in the supplementary material (table 1). Combined, number of PIM and proportions of patients with at least one PIM or with different PIM category were comparable between men and women (at least one PIM: 76.2% vs. 77.5%, p=0.760). Looking into medications categories, sex/gender differences were observed. Potentially inappropriate use of medication more frequent in women were antidepressant that should be avoided (4.5% vs. 0%; p=0.010); SSRIs to be used with caution (15.6% vs. 6.9%; p=0.008); and various psychotropic drugs to be avoided in patients with a history of fracture (4.5% vs. 0.6%; p=0.025). PIM more frequent in men were vasodilatators to be used with caution (20.0% vs. 11.2%, p=0.012).

Discussion

Polypharmacy was very common in older patients followed regularly in family medicine in Switzerland, with three out of five patients taking at least five drugs. Three quarters of patients were prescribed at least one PIM according to Beers criteria. The most frequent PIM were PPI prescribed for a duration over 8 weeks, diuretics, benzodiazepines, aspirin for primary prevention of cardiac events, and chronic use of NSAIDS. Prescription patterns markedly differed by sex/gender, and more PIM were found in women, who were prescribed more psychotropic drugs that should be avoided or used with caution with regards to their age and medical condition (fracture). Variation of prescription by physician could be observed for cardiovascular drugs and vitamins.

Polypharmacy and prevalence of PIM

Both prevalence of polypharmacy and prevalence of PIM were comparable to recent data from Switzerland [65], although higher than previous estimates [64, 70, 71]. Participants in our study were older compared to previous studies (over 75 in our study versus over 65 years). Polypharmacy tends to increase with age, and many Beers criteria start to apply systematically at the age of 75 (for example chronic use of NSAIDs, dabigatran or prasugrel) or 80 (aspirin for primary prevention). Our study highlights the high prevalence of benzodiazepines, non-benzodiazepine/benzodiazepine receptor agonist hypnotics, specific cardiovascular drugs, oral non-cyclooxygenase-selective NSAIDS for a chronic use, and SSRIs. There are important differences with previous studies conducted on Swiss patients. For example, aspirin for primary prevention of cardiac events by patients over 80 years and vasodilators were not reported in other claim-based studies, which do no not have access to clinical

information. By contrast, all these items were very common in our patient population, which may explain some of the differences in PIM prevalence [64, 71].

Among at least 75 years old patients followed in family medicine, important differences were observed by sex/gender in prescription patterns. Men received more cardiovascular prevention drugs while women received more mineral supplements and antidepressants, despite similar prevalence of cardiovascular or psychological conditions in men and women. Cardiovascular drugs were also less prescribed in women. While some of these differences may still reflect true diagnosis prevalence differences, further attention should be given to potential under- or over-diagnosis of specific conditions in older patients, based on well-documented medical gender bias [76, 86].

By contrast with previous studies in which older women were prescribed more PIM [69, 73, 74], we did not identify major differences in overall PIM prevalence. However, sex/gender differences were found in the type of PIM that echo the differences found in prescription patterns: women were more likely to have PIM related to antidepressants; and men more likely to have PIM related to vasodilators. Larger studies exploring explanation for increased or different PIM in women hypothesize on multiple biological and social factors. Sex differences in prevalence of conditions may explain discrepancy in drug prescription (therefore risk of PIM), and may imply a different navigation of the health system and the number of health providers involved (increasing the risk of PIM). Social factors include gender bias in diagnosis and treatment for similar conditions, and intersection of gender with other social factors such as education, living conditions, communication modes and health care provider-patient interactions [75, 80].

Limitations of the study

Analysis of potential inappropriateness was based on the Beers criteria only. We included patients that consulted at least twice during the last year, which may have biased the sample towards patients that consult often, and use more medication. Also, physicians participating in the cluster-randomized trial may not be fully representative of all Swiss physicians, although we tried to limit inclusion criteria as much as possible to be in line with the pragmatic nature of trial. Some medical conditions (e.g. tobacco use, obesity) were only counted if listed in the medical file as a diagnosis, they may consequently be underestimated. Creatinine clearance by the patients was not notified when the patients had chronic

kidney disease, which may have led to misclassify some NSAIDS uses as potentially inappropriate. Also, distinction between primary and secondary prevention relied on the cardiovascular diagnoses mentioned in the medical file, which may also have been underreported. Overall, while we acknowledge the potential for misclassification for PIMs that require specific conditions, we believe the quality of the clinical information provided for these patients part of an intervention trial to be better than that of routine health records or claims data. Finally, drug prescription is not equivalent to drug use, as patients may never start the prescribed drug or stop it prematurely. This may have led to the overestimation of polypharmacy but not the estimation of potentially inappropriate prescription considering that a drug not taken is still potentially inappropriately prescribed. .

Clinical implications

This study highlighted existing challenges in medication of older patients in Switzerland in terms of PIM and polypharmacy. Polypharmacy based on the number of medications is not necessarily inappropriate, considering that patients with several diagnoses and comorbidities may require multiple medications that may all be clinically indicated. However, risk of potentially inappropriate medication increase with the number of prescribed drugs. Tools to reduce PIM such as the PRISCUS list [87], Beers criteria [67], STOPP/START criteria [68] exist, but studies showed that family physicians do not necessarily use them because of negative views [88]. Despite being highly aware of PIM and polypharmacy in Pohontsch et al [88], medication considered as potentially inappropriate by physicians did not necessarily match established criteria such as the PRISCUS list.

Interestingly, most PIM involved only a limited number of medication class. In this context, targeted information on the most prevalent PIM categories, for example PPI, diuretics, benzodiazepines, and aspirin for primary prevention (Table 5), could be more efficient than lengthy deprescription lists. Including some deprescription advice in top-5 lists as promoted by the “Choosing wisely” campaign is probably promising, but more efforts are needed for these recommendations to be known to physicians and applied [89]. Furthermore, prescriptions’ habits for specific drugs such as PPI, NSAIDs, benzodiazepine and z-drugs must evolve, to include limited durations of treatment. We highlighted some difference in prescription habits by sex/gender, which suggested a need for physicians to reflect on their potential implicit gender biases in diagnosis and treatment. Indeed, targeted information on the

most prevalent PIM categories, differentiating men and women, could be more efficient than lengthy deprescription lists. Such an approach should be further tested within deprescription trials.

Conclusions

We reported that both polypharmacy and potentially inappropriate prescribing were very common in older patients followed in family medicine in Switzerland. Interestingly, most PIM involved only a limited number of medication classes, and patterns varied by sex/gender. In this context, simple deprescription lists targeting the most frequent inappropriately prescribed drugs according to patient sex/gender could prove more useful than lengthy generic advice to reduce potentially inappropriate prescription.

Compliance with ethical standards:

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the cantonal research committee (CER-VD 2016-00422) and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards..

Informed consent: Informed consent was obtained from all individual participants included in the study.

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Data availability: The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest: David Schnegg, Nicolas Senn, Olivier Bugnon, Joëlle Schwarz, and Yolanda, Mueller declare that they have no conflict of interest.

Paper 2. Performance of a brief geriatric evaluation compared to a comprehensive geriatric assessment for detection of geriatric syndromes in family medicine: a prospective diagnostic study

Running head: brief geriatric evaluation in family medicine

Article category: primary care epidemiology

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Abstract

Background: Geriatric syndromes are rarely detected in family medicine. Within the AGE program (active geriatric evaluation), a brief assessment tool (BAT) designed for family physicians (FP) was developed and its diagnostic performance estimated by comparison to a comprehensive geriatric assessment.

Methods: This prospective diagnostic study was conducted in four primary care sites in Switzerland. Participants were aged at least 70 years old and attending a routine appointment with their physician, without previous documented geriatric assessment. Family physicians used the BAT, followed by a comprehensive (2 hours) geriatric evaluation conducted over the following two months (reference standard). Both the BAT and the full assessment targeted eight geriatric syndromes: cognitive impairment, mood impairment, urinary incontinence, visual impairment, hearing loss, undernutrition, osteoporosis and gait and balance impairment. Diagnostic accuracy of the BAT was estimated in terms of sensitivity, specificity, and predictive values; secondary outcomes were measures of feasibility, in terms of added consultation time and comprehensiveness in applying the BAT items

Results: In the group of 85 patients, 46 (54.1%) were females. The mean age was 78 years (SD 6). The prevalence of each of the geriatric syndromes ranged from 30.0% (malnutrition and cognitive impairment) to 71.0% (visual impairment). Patients suffered from a median number of 3 syndromes (IQR 2 to 4). Sensitivity of the BAT ranged from 25.0% for undernutrition (95%CI 9.8% - 46.7%) to 82.1% for hearing impairment (95%CI 66.5% - 92.5%), while specificity ranged from 45.8% for visual impairment (95%CI 25.6 – 67.2) to 87.7% for undernutrition (76.3% to 94.9%). Finally, most negative predictive values (NPV) were between 73.5% and 84.1%, excluding visual impairment with a NPV of 50.0%. Family physicians reported BAT use as per instructions for 76.7% of the syndromes assessed.

Conclusions: Although the BAT does not replace a comprehensive geriatric assessment, it is a useful and appropriate tool for the FP to screen elderly patients for most geriatric syndromes.

Trial registration: The study was registered on ClinicalTrials.gov on February 20, 2013 (NCT01816087).

Keywords: brief geriatric evaluation, geriatric syndrome, diagnosis, family medicine

Background

Population ageing and increasing numbers of patients with multimorbidity are major challenges faced by health services in Western societies. In this context, the traditional disease-centered model of care is increasingly recognized for its limits when managing elderly multimorbid patients [90, 91]. A key concept in the management of elderly patients is “geriatric syndromes”, which are defined as “multifactorial health conditions that occur when the accumulated effects of impairments in multiple systems render [an older] person vulnerable to situational challenges”[21]. Geriatric syndromes may be due to multiple causes, but the main point is that they can be managed without a full understanding of the underlying pathologies [22]. Furthermore, geriatric syndromes are directly associated with functional decline [23]. Caring for elderly patients by assessing and managing geriatric syndromes, rather than only looking for a specific disease therefore corresponds much better to a patient-centered approach, as it targets the patients’ independence [8], a central determinant of their quality of life [9].

The concept of geriatric syndromes was mostly developed by geriatricians, and syndromes traditionally identified by a comprehensive geriatric assessment performed by trained health professionals [32]. However a large proportion of elderly patients does not benefit from such an assessment as their only contact with the health care system is limited to their family physician (FP)[92]. Indeed, identification of geriatric syndromes is rarely undertaken in a systematic and standardized way by family physicians [43, 93]. The AGE program (for Active Geriatric Evaluation) was set up to develop both a screening tool for detection of geriatric syndromes and a management tool that includes management strategies for each detected syndrome, for use in family medicine. Based on a literature review, eight geriatric syndromes were identified for their particular relevance in family medicine, their association with functional decline, their prevalence, clinical significance, feasibility of screening in family medicine and availability of effective interventions [28]; and include: cognitive impairment, mood impairment, urinary incontinence, visual impairment, hearing loss, undernutrition, osteoporosis and gait and balance impairment. A brief assessment tool was constructed, based on simple validated tests to detect each of these geriatric syndromes [28]. As detailed in our conceptual framework ([28]), screened syndrome should then be confirmed by additional investigations and a management plan be developed, as part of a global evaluation of the patient, which also includes the assessment of functional status, comorbidities and patient preferences within his broader social and spiritual context.

Increasingly, tools for rapid geriatric assessment in primary care are being developed and tested [52, 94], mostly with the objective of identifying frail or vulnerable individuals. By contrast, the aim of the active geriatric evaluation evaluated here is not only to identify patients requiring referral to more specialized geriatric care, but also to promote first-line management by FPs themselves. Most available tools target similar geriatric syndromes [54, 95, 96], although we decided not to include fatigue, frailty and sarcopenia as such in our conceptual framework. While we acknowledge that these are also important concepts in the management of the elderly, particularly for research, their true meaning remains difficult to grasp for FPs, in the lack of a common definition and/or direct operational consequences for the patient.

In the present study, the AGE program aimed to estimate the diagnostic performance of this brief assessment tool compared to a comprehensive clinical geriatric assessment.

Methods

This prospective diagnostic study compared the ability to detect 8 chosen geriatric syndromes by FPs using the brief assessment tool (BAT) and by geriatricians using a comprehensive assessment. Patients were eligible if aged 70 years or older, routinely followed at one of the four recruitment sites, they have a good understanding of French or can come to the consultation with a translator and able to provide informed consent. Patients who had already benefited from a previous geriatric assessment were excluded.

The study was conducted at four sites: (1) the primary care outpatient clinic of the University of Lausanne (Department of ambulatory care and community medicine), (2) a private outpatient clinic in Lausanne and (3,4) two private practices in two villages of the Canton of Vaud, Switzerland. Participating FPs were either family medicine residents, under the supervision of senior registrars, or specialists in general internal medicine. In Switzerland, geriatricians are specialists in general internal medicine, with an additional geriatric subspecialty corresponding to 3 years specific training. Geriatricians may be active in hospitals, rehabilitation centres, or in ambulatory care. Geriatricians involved in the study provided outpatient consultations to patients usually referred by their FP. Potentially eligible patients were identified by the care site administrative staff before a planned

consultation. On the day of the consultation, a study staff-member checked inclusion criteria, provided information on the study, collected informed consent and made a specific appointment with the geriatrician at the family practice within the following two months. The FP then conducted the routine consultation using the BAT. Patients who missed their appointment with the geriatrician received a written reminder to contact the study staff. Geriatricians were unaware of the results of the FP's BAT-based assessment when performing their own assessment. FPs received a written report of the comprehensive geriatric assessment.

The following eight geriatric syndromes were chosen for detection: cognitive impairment, mood impairment, urinary incontinence, visual impairment, hearing loss, undernutrition, osteoporosis and gait and balance impairment. In addition, functional ability was assessed. Details on the BAT are published elsewhere [28]. Tests to assess the syndromes by the BAT and comprehensive geriatric assessment, respectively, are detailed in Table **6**. Use of the BAT was considered complete if the FP completed the specified items for each syndrome.

Table 6. Items of the brief assessment tool and the comprehensive geriatric evaluation, respectively, by geriatric syndrome

	Brief assessment tool by the family physician	**Comprehensive Geriatric assessment by geriatrician**
General		Social context
Functional ability	4 questions about ADL	ADL and IADL
Cognitive impairment	Minicog (3 words and clock test)	History – heterohistory MMSE, clock test, confusional status, ev. additional neuropsychological examinations
Mood impairment	2 questions	GDS
Urinary incontinence	4 questions	Full history, bladder-scan
Gait and balance	Observation / falls during past year	History, falls during past year, Tinetti [97], clinical examination, risk factors, orthostatic hypotension
Visual impairment	Reading the newspaper	Snellen scale, « champ visuel »
Hearing impairment	Whispering test	History, whispering at 30 / 60cm
Undernutrition	Weight loss in past 1 and 6 months	History, weight loss in past 1 and 6 months, MNA score, BMI

Osteoporosis	Height loss, wall-occiput, rib-pelvis	Height loss, wall-occiput, rib-pelvis

Abbreviations:

ADL: Activities of Daily Living [98]

BMI: Body-mass-index

FP: Family physician

GDS: Geriatric Depression Scale [99]

IADL: Instrumental Activities of Daily Living [13]

MMSE: Mini-Mental State Examination [100]

MNA: Mini-Nutritional Assessment

The comprehensive geriatric assessment was the reference test and performed by geriatricians. Comprehensive geriatric assessment is a structured evaluation to identify health-conditions relevant to elderly patients, to determine the functional and social impact of these conditions, to evaluate the patients' resources, needs and preferences and to propose an adapted care plan based on identified needs. Diagnosis of the geriatric syndromes in this assessment is based on validated clinical tests, without systematic use of confirmatory investigations such as MRI or laboratory tests. This broad approach has been shown to reduce morbidity, mortality and the need for institutionalization [101, 102]. While the validity of the screening tests used in the comprehensive geriatric assessment has been established [28], aspects of test reliability have rarely been explored. Therefore, agreement and reliability between geriatricians were previously investigated by the AGE program [51]. Reliability was good to excellent for functional ability, cognitive impairment, hearing impairment, osteoporosis, incontinence (three-way intraclass correlation: $0.6 \leq 3WICC < 0.8$) and mood impairment ($3WICC \geq 0.8$). It was moderate for risk of fall and imbalance ($0.4 \leq 3WICC < 0.6$), and poor for visual impairment and malnutrition ($3WICC < 0.2$). These characteristics were judged sufficient to use it as the reference consultation for detection of geriatric syndromes, except for visual impairment and malnutrition which should be assessed in a setting with access to longitudinal medical records (for objective weight loss assessment for example) [51].

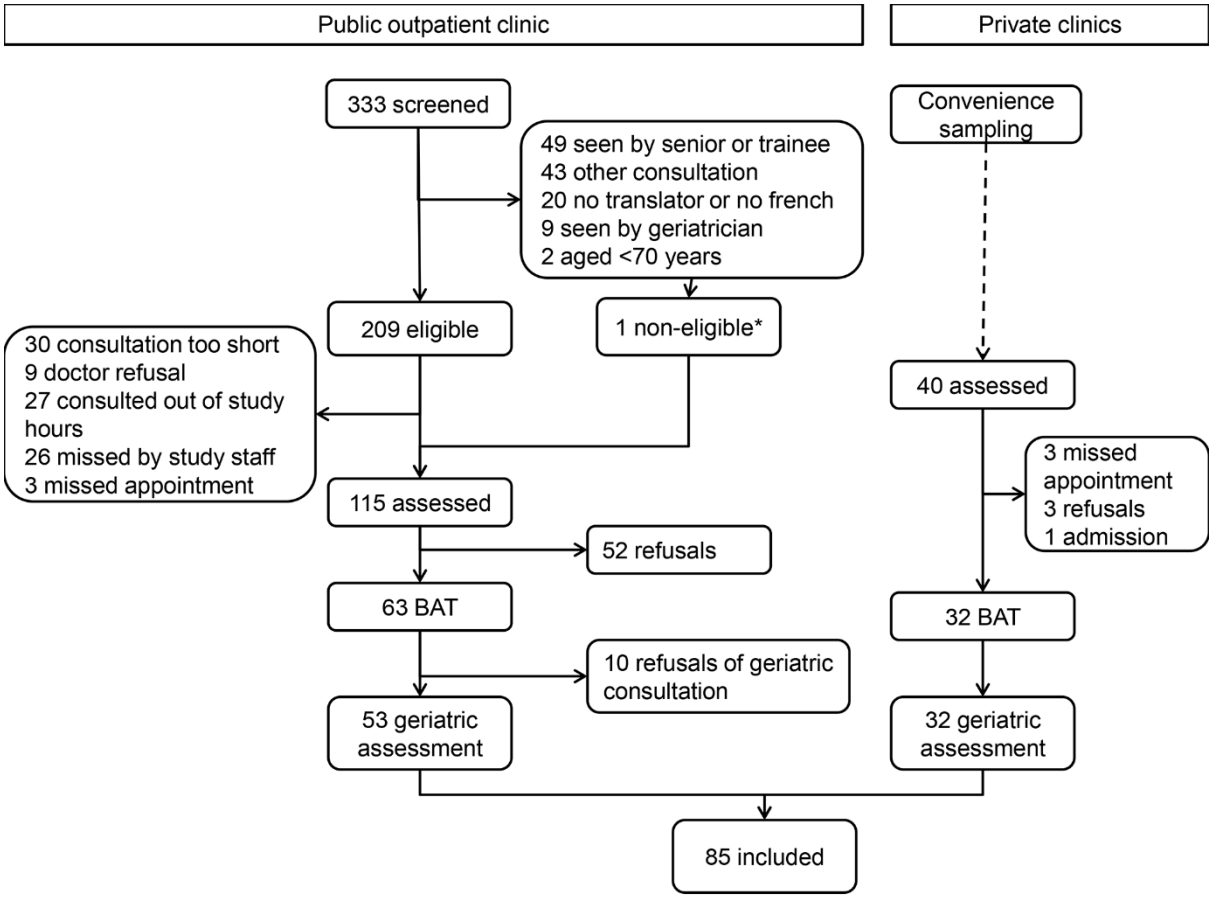
When recording evaluations for each syndrome, the FP's and geriatricians could choose one of three categories, for example absent/possible/present or absent/moderate/severe. Results of each syndrome evaluation were then dichotomized into absent/suspected syndrome, as detailed elsewhere [51]. Patients with intermediate results usually require additional investigations and for this study were considered as a positive result. If evaluation of a specific syndrome was missing in either BAT or

geriatric assessment, the observation were excluded (complete records analysis). Data was collected on standardized paper questionnaires by the FP and geriatrician, single-entered into EpiData v3.1 and analyzed by Stata IC 14.1 (College Station, USA). Basic, instrumental and total activities of daily living, as well as the number of detected geriatric syndromes were described by median, interquartile range, and box plots.

Initial sample size was calculated to estimate an expected sensitivity of 90% with a lower bound of the 95% confidence interval (95CI) being larger than 65% with a 95% probability. This corresponded to 31 individuals with the condition (based on the comprehensive geriatric assessment) and 124 without the condition, if using an estimated prevalence of 20% [103]. Because of slow recruitment, the final sample size was reduced to at least 24 patients with the condition, which was judged to give acceptable precision (lower bound of the 95CI decreased from 65% to 60%).

Figure 6. Patient flow, AGE2 study

BAT = Brief assessment tool; *: One patient assessed under 70 years, who had reached 70 at the time of the geriatric assessment.



Results

Of the 85 patients included between March 2013 and December 2014, 32 (37.7%) were included in private practices and 53 (62.4%) at the University outpatient clinic. The detailed patient flow is available for the latter, whereas in the private practices, patients were selected by convenience by the FP

Figure 6). The main reasons for eligible patients not being included were patient refusals (65, including 55 initial refusals for the entire study and 10 drop-outs who refused the geriatric assessment), not being assessed by the study staff (56), and physicians not able to perform the BAT (39, including 30 because of lack of consultation time to include the BAT*)*. Demographic characteristics were representative of the elderly population in the canton of Vaud [104], and functional status and self-rated health of included patients were comparable with that of community-dwelling Swiss elderly population [105].Patient characteristics are shown in Table 7. There were slightly more females than males included. Mean age was 78 years (SD 6). The 33 patients not born in Switzerland had been living in Switzerland for a mean

of 43 years (SD 16 years). Most patients considered themselves in good or very good health, although more than half of them were considered vulnerable by the geriatrician (Table 7). Proportion of vulnerable or dependant patients was similar between private practices and outpatient clinic (chi^2 p=0.485), although there were more females (68.8% vs. 45.3%; chi^2 p=0.035) and mean age was higher (80 years (SD 7) in private practices vs. 76 years (SD 5) in outpatient clinic; t-test p=0.011).

Table 7. Patient characteristics, AGE2 study (N=85)

	n	%
Gender		
- Female	46	54.1
- Male	39	45.9
Age category (in years)		
- 69 to 74	34	40.0
- 75 to 84	37	43.5
- 85 to 94	14	16.5
Country/region of birth		
- Switzerland	52	61.2
- European region except Switzerland	19	22.4
- Outside European region	14	16.5
Achieved education level (8 missing)		
- Primary school (9 years)	21	27.3
- Secondary school (12 years)	29	37.7
- Superior education (secondary school + at least 3 years)	27	35.1
BMI category (7 missing)		
- Underweight (<18)	2	2.6
- Normal (18 – 25)	28	35.9
- Overweight (25 – 30)	25	32.1
- Obese (>30)	23	29.5

Cardiovacular risk factors		
- Hypertension (3 missing)	57	69.5
- Hypercholesterolemia (4 missing)	47	58.0
- Diabetes (3 missing)	21	25.6
Cardiovascular disease (4 missing)	25	30.9
Respiratory disease (4 missing)	17	21.0
Cancer (3 missing)	7	8.5
Number of different medications (2 missing)		9.4
- 0 to 5	47	56.6
- 6 to 10	24	28.9
- 11 to 15	10	12.1
- > 15	2	2.4
Wearing glasses (4 missing)	69	85.2
Wearing hearing aid (4 missing)	17	21.0
Self-rated health (7 missing)		
- Very good	14	18.0
- Good	42	53.9
- Fair	20	25.6
- Poor	2	2.6
Global evaluation (2 missing)		
- Robust patient	32	38.6
- Vulnerable	45	54.2
- Dependent	6	7.2

The 85 BAT assessments were performed by 46 different FPs, while four geriatricians performed the comprehensive geriatric assessments, a median of 22 days after the FP appointment (IQR 9 – 44 days). Thirteen patients were assessed by the geriatrician more than two months after the FP appointment, but none had encountered a significant health or social problem within these two months that could have significantly affected their overall health status.

Diagnostic performance of the brief assessment tool for detecting each of the eight geriatric syndromes was estimated using positive detection by the geriatrician's comprehensive geriatric assessment as a reference standard (Table 8). Sensitivity ranged from 25.0% for undernutrition (95%CI 9.8% - 46.7%) to 82.1% for hearing impairment (95%CI 66.5% - 92.5%), while specificity ranged from 45.8% for visual impairment (95%CI 25.6 – 67.2) to 87.7% for undernutrition (76.3% to 94.9%). Finally, most negative predictive values (NPV) were between 73.5% and 84.1%, excluding visual impairment with a NPV of 50.0%. Negative likelihood ratios ranged between 0.2 and 0.5.

Table 8. Prevalence of geriatric syndromes and performance of the brief assessment tool compared to geriatricians evaluation

Syndrome	Prevalence (%)	Sensitivity (95%CI)	Specificity (95%CI)	PPV (95%CI)	NPV (95%CI)	LR+ (95%CI)	LR- (95%CI)
Functional loss	14.0	91.7 (61.5 – 99.8)	95.8 (88.1 – 99.1)	78.6 (49.2 – 95.3)	98.6 (92.2 – 100.0)	21.7 (7.1 – 66.5)	0.1 (0.0 – 0.6)
Cognitive impairment	29.8	64.0 (42.5 - 82.0)	67.2 (53.7 - 79.0)	45.7 (28.8 - 63.4)	81.3 (67.4 - 91.1)	2.0 (1.2 – 3.1)	0.5 (0.3 – 0.9)
Mood impairment	37.7	65.6 (46.8 - 81.4)	64.2 (49.8 - 76.9)	52.5 (36.1 - 68.5)	75.6 (60.5 - 87.1)	1.8 (1.2 – 2.8)	0.5 (0.3 – 0.9)
Urinary incontinence	43.5	76.5 (58.8 - 89.3)	85.4 (72.2 - 93.9)	78.8 (61.1 - 91.0)	83.7 (70.3 - 92.7)	5.2 (2.6 – 10.7)	0.3 (0.1 – 0.5)
Gait and balance	34.9	67.9 (47.6 - 84.1)	73.6 (59.7 - 84.7)	57.6 (39.2 - 74.5)	81.3 (67.4 - 91.1)	2.6 (1.5 – 4.3)	0.4 (0.2 – 0.8)
Visual impairment	71.1	81.4 (69.1 - 90.3)	45.8 (25.6 - 67.2)	78.7 (66.3 - 88.1)	50.0 (28.2 - 71.8)	1.5 (1.0 – 2.2)	0.4 (0.2 – 0.8)
Hearing impairment	47.6	82.1 (66.5 - 92.5)	86.0 (72.1 - 94.7)	84.2 (68.7 - 94.0)	84.1 (69.9 - 93.4)	5.9 (2.8 – 12.5)	0.2 (0.1 – 0.4)
Undernutrition	28.9	25.0 (9.8 - 46.7)	87.7 (76.3 - 94.9)	46.2 (19.1 - 74.9)	73.5 (61.4 - 83.5)	2.0 (0.8 – 5.4)	0.9 (0.7 – 7.8)
Osteoporosis	47.5	77.8 (60.8 - 89.9)	65.9 (49.4 - 79.9)	66.7 (50.5 - 80.4)	77.1 (59.9 - 89.6)	2.3 (1.4 – 3.6)	0.3 (0.2 – 0.6)

Brief assessment tool for detection of functional loss and geriatric syndromes was used by family practitioners and compared to geriatricians' evaluation.

PPV : positive predictive value ; NPV : negative predictive value ; LR+ : positive likelihood ratio ; LR- : negative likelihood ratio

According to the comprehensive geriatric assessment, almost all patients (91.2%) presented at least one geriatric syndrome, with a median number of three suspected syndromes per patient (IQR 2 to 4). Prevalence by type of syndrome ranged from 29.8% to 71.1%.The most prevalent geriatric syndrome was vision impairment, followed by hearing loss and osteoporosis. Overall, functional abilities were preserved, with a median of 13 activities of daily living (ADL) performed independently by participants out of a maximum 14 (IQR 12 to 14). Performance of screening for functional disability by four questions only was excellent compared to the detailed 14 items ADL assessment (sensitivity 91.7%, 95%CI 61.5% - 99.8%; specificity 95.8%, 95%CI 88.1% - 99.1%).

Family physicians reported BAT use as per instructions for 76.7% of the syndromes assessed. By syndrome, completeness ranged from 68.3% to 88.0%. The main reasons FPs gave for not completing the assessment were lack of time, that they forgot, or that they judged the assessment unnecessary, either because of the good general condition of the patient or because the condition was already known. When analyzing diagnostic performance restricted to items completed by the FPs there was less than 10% variation in the estimated negative predictive value (NPV) compared to the entire dataset, and none of the differences were statistically significant. In terms of feasibility, it took 20 minutes on average (IQR 15 to 30 min; 4 missing) to perform the BAT. Most FPs (95.2%=79/83, 2 missing) considered the BAT adapted to their needs.

Discussion

The BAT's performance for detecting geriatric syndromes compared to a comprehensive geriatric assessment was satisfactory for most syndromes. Sensitivity was within the prespecified range (95%CI > 60%) for visual impairment, hearing impairment, and osteoporosis. Sensitivity estimates were from 40% to 90% for urinary incontinence, cognitive impairment, mood impairment and gait and balance impairments. Still, the negative predictive values were sufficient to reasonably exclude the considered syndromes. Specificities were above 50% (with the exception of visual impairment), which can be considered a good result, considering these were clinical tests [106], and meant to be used as screening tests that can allow some false positive results as they may be combined with more specific confirmatory tests. Screening with the BAT was feasible in routine FP consultations. Among eligible patients, only a minority were not included because of physician refusal. The time added to the consultation can be a

barrier if not anticipated, but it was manageable for most FPs. They also considered the tool adapted to their needs.

This study is unique in directly comparing performance of a detailed geriatric assessment with a brief assessment by FP. Patients were directly recruited in primary care, the setting for which the BAT has been developed. While the mode of recruitment may have selected frequent users of outpatient care, thereby favoring more vulnerable patients compared to the general population, and although patients included at the University hospital outpatient clinic may not be truly representative of the general family practice, demographic characteristics, functional status and self-rated health of included patients were comparable with that of community-dwelling elderly population of Switzerland.

The main limitations of this study reside in the limited sample size, the imperfectness of the reference standard, and the non-simultaneous assessments by FP and geriatricians. First, our sample size was limited, only allowing us to make a broad estimate of diagnostic performance. In addition, the hypothesis of a 90% sensitivity was too optimistic. Second, the BAT was compared with a comprehensive geriatric assessment, which cannot be considered a perfect gold standard. Indeed, geriatricians' and FPs' perspectives may somewhat differ within the context of a geriatric assessment [94]. Therefore, some misclassification is likely, altering the estimated diagnostic performance of the BAT, especially for items with low intraclass correlation such as undernutrition and visual impairment [107]. For example, if many patients were wrongly classified as undernourished by the geriatrician, this would lead to many "false-negatives" that are actually not truly undernourished, causing an underestimation of the sensitivity of the FP's assessment. Similarly, patients wearing glasses were considered to have light vision impairment, even if their actual visual performance was satisfactory, leading to a low number of patients without visual impairment and therefore an imprecise specificity estimate for visual impairment. Also, the comprehensive geriatric assessment was a one-shot encounter between the geriatrician and an unknown patient, compared to a longitudinal follow-up in the context of family medicine, which may actually have better reliability than the reference for some key measurements such as weight variations over time. Finally, assessments by FP's and geriatricians were not simultaneous and the condition of the patient may have changed in-between. However, time interval between both consultations was limited, and patients who experienced a major life event between the two visits were excluded, limiting the risk of important changes of health status. In addition, previous analyses of the comprehensive geriatric assessment showed a

negligible “visit effect”, corresponding to the proportion of the variance that varies from visit to visit in a single patient, except for mood disorders, where time change explained 4% of the total disagreement[107].

While previous studies often focused on one or a few specific syndromes, often requiring long assessments, the BAT targets eight of them integrated into a single tool, which is more adapted to family practice and, more importantly, to the reality of elderly patients who usually suffer from more than one condition, as also seen here. Indeed, screening for these eight syndromes might encompass most geriatric issues that are directly relevant for the FP when managing their elderly patients. While other tools are now being developed for primary care [54, 94, 95], data on validation and feasibility are still limited. In particular, the clinical utility of this approach, namely whether acting on these geriatric syndromes in the context of family medicine will slow down the functional decline of the patients, still needs to be proven. This next step will be evaluated in a clinical trial comparing the complete active geriatric evaluation, which combines the brief assessment tool with recommendations for further investigations and management options, with usual care by FPs, currently ongoing (ClinicalTrials.gov Identifier: NCT02618291).

Conclusions

Although the BAT does not replace a comprehensive geriatric assessment, it is a useful tool appropriate for the FP. Acknowledging the limitations of both the BAT and the CGA, assessments for visual impairment and undernutrition should be further optimized for the family medicine context. Results of the BAT, considered as other clinical test results as part of a global patient evaluation, can be used to screen for patients who would benefit from additional investigations or a second more in depth assessment by a specialist.

Declarations

Ethics, consent and permissions: The study was conducted in accordance with the Declaration of Helsinki. Patients gave written informed consent. The study was approved on the 19th of October 2012 by the Research Ethics Commission of the Canton of Vaud, Switzerland (number 287/2012), and registered on ClinicalTrials.gov (number NCT01816087).

Consent for publication: Not applicable.

Availability of data and materials: The datasets generated and/or analysed during the current study are not publicly available due to them containing information that could compromise research participant privacy but are available from the corresponding author on reasonable request.

Competing interests All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organization for the submitted work; no financial relationship with any organizations which might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

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Authors' contributions: SM, CB, JC and NS have made substantial contributions to the conception and design of the work (SM, NS, IL, CB, JC) . SN was involved in acquisition of the data. YM has conducted the analysis and all authors have contributed to the interpretation of the data. YM has drafted the manuscript. SM, NS, IL, CB, JC have revised it critically for important intellectual content, and have approved the final version of the manuscript. Each author takes public responsibility for appropriate portions of the content and agrees to be accountable for all aspects of the work.

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training at the Department of Ambulatory Care and Community Medicine, Lausanne, for performing the BAT.

Paper 3. Discussing age-related functional decline in family medicine: a qualitative study that explores both patient and physician perceptions

Keywords: autonomy, functional decline, ageing, screening, geriatric syndromes, primary care.

Key points

- Many aspects related to ageing are considered as 'normal' and non-medical by older people and therefore, often not discussed in routine consultations with the general practitioner
- Screening for geriatric syndromes is perceived as an opportunity to identify and discuss issues considered age-related and more generally, to discuss the meaning of ageing for patients in context
- Qualitative research embedded into an intervention trial brings understanding of potential benefits of geriatric assessment conducted in primary care

Abstract

Background: Evaluating a patient's functional status and screening for geriatric syndromes by GPs is increasingly encouraged. This study aimed to explore how older people and GPs define and perceive autonomy and functional decline, patients' propensity to discuss age-related issues and integration of such topics into routine medical consultations.

Methods: This qualitative study was conducted in Western Switzerland with older people followed in primary care practices and who participated in a trial assessing the effectiveness of a screening and management tool for geriatric syndromes to prevent functional decline. We interviewed 15 participants (patients ≥75 years old) and five GPs about their screening experience. We used semi-structured grids for data collection and an inductive thematic approach for data analysis.

Results: Participants gave several definitions of autonomy, directly depending on their health status and functional limitations. Implementing various coping strategies, participants also expressed contrasted feelings related to functional decline such as fear, inability to accept and resilience. Functional decline was often perceived as normal ageing; participants were therefore not prompt at discussing age-related

issues with their GP. However, screening was perceived positively by both participants and GPs, making addressing sensitive issues and detecting new problems possible.

Conclusions: A geriatric syndrome-screening intervention was well accepted by both patients and physicians. This type of initiative may be an opportunity to address various age-related issues and to inform patients of existing solutions.

Introduction

While being a positive outcome of increasing life expectancy, worldwide population ageing is a phenomenon that challenges health systems globally. Public health systems are responding to the changing demography by adapting services that contribute to helping older people live independently in their own homes as long as possible [108, 109]. Indeed, as developed in the socio-medical model of disablement by Verbrugge and Jette [110], an accumulation of chronic and acute conditions over time can limit individuals in their physical and mental activities and, depending on personal and environmental factors, may lead to loss of independence and disablement. Until recently, health systems tried to address age-related functional decline through health assessments conducted during hospitalization, rehabilitation after hospitalization, or within the context of home-based care [32]. These initiatives usually target individuals already impaired functionally, or at high-risk of becoming so in the very near future. In order to intervene earlier in the disablement process, recent initiatives have aimed at screening for geriatric syndromes and functional decline in primary care settings, integrating assessment of functional status of patients in their usual environment [28, 52-54, 101, 111]. General practitioners (GP) are the main – and sometimes only – contact of the healthy older community-dwellers to the health system. Screening initiatives for geriatric syndromes further respond to the paradigm shift in medicine that evolved from a disease-centred to a patient-centred approach, by taking into account patients' health-needs, goals and preferences [90, 91].

The AGE (Active Geriatric Evaluation) project was started in 2011 aiming to develop a screening and management tool for geriatric syndromes in family medicine (AGE tool) to prevent functional decline and improve quality of life in older patients in Western Switzerland [28, 51, 60]. The tool is currently being

tested in a randomized controlled trial (AGE intervention trial) in which a usual care control arm is being compared to an intervention arm where GPs screen their patients during routine consultations for eight geriatric syndromes (see Table 9), with a targeted care plan for each syndrome detected. We hypothesized that the AGE tool could potentially be at odds with a patient-centred approach because of its standardized and syndrome-based nature and because it changes the routine consultation dynamics (screening initiated by GPs rather than on a patient's expressed demand). Based on this postulate, we integrated a qualitative study into the clinical trial to assess how the screening tool was perceived and accepted by patients and GPs. Our study aimed to explore: (1) how older people and GPs respectively define and perceive autonomy and functional decline; (2) how older people discuss age-related issues with their GP and vice-versa; and (3) how the screening tool fits into the routine medical consultation.

Table 9. Screened geriatric syndromes

Items screened in the active geriatric assessment (AGE) tool
Cognitive impairment
Mood disorder
Urinary incontinence
Gait instability
Vision impairment
Hearing impairment
Malnutrition
Osteoporosis

Methods

Study design

This qualitative study was integrated into the AGE intervention trial (NCT 02618291, funded by the Swiss National Science Foundation). To explore the meaning of functional decline and autonomy in context, we conducted in-depth interviews with patients and GPs from the interventional arm. The ethics commission for research on human beings of the Canton of Vaud validated the study protocol (CER 2016-00422).

Setting and participants

The study took place in Western Switzerland and included patients aged ≥75 years. Throughout the article, patients are referred to as participants, and general practitioners as GPs. We recruited GPs during their training session on the screening tool (AGE trial), inviting them for an interview. We recruited patients of participating GPs (participants) using reasoned sampling for a fair distribution of socio-economic characteristics (age, sex, living place, social situation, education) and functional status. We contacted them by telephone and invited them to be interviewed face to face at home. We discontinued recruitment when sufficient insights into perceptions and acceptability of the screening tool was reached. All GPs and participants signed a written consent form.

Data collection

Data were collected between August 2017 and May 2018. Five GPs accepted to participate and we conducted 15 in-depth interviews with participants in total. Interviews were conducted in French, using a semi-structured grid (**Table 16** - Table 18), containing questions related to perceptions and definitions of autonomy, experiences of functional decline and how the screening topics were discussed during consultations. In public health literature on ageing, autonomy and independence in daily living activities are common terms that tend to overlap but differ. Autonomy refers to self-determination and ability to make choices [Atkinson (1991) and Macmillan (1986) cited in 112] that cannot be dissociated from particular contexts or circumstances. Independence is defined as an individual level of physical functioning and ability to perform activities of daily living (ADL) unaided. Functional decline is understood as progressive limitation in ability to perform ADL. During interviews, the term autonomy was mainly used to foster broader discussions, also because its common meaning in French encompasses concepts of both functional independence and self-determination. All interviews were audio-recorded, transcribed and anonymised.

Data analysis

We analysed data using thematic analysis within a realist paradigm, to explore experiences, meanings and the reality of participants [113]. Data analysis using maxQDA software (VERBI software GmbH, Germany) started during data collection. Open coding started after the first five interviews, and was performed inductively by three researchers in parallel (OV, JS, YM). Emerging codes were discussed and

compared, and categories were redefined jointly by the research team and further explored over the following interviews. On completion of data collection, all interview transcripts were fully openly recoded by OV and discussed with JS. Codes were assembled into categories and compared between participants, in light of their social and health contexts, to explore patterns and trends. Categories were then assembled into themes. The inductive approach allowed identifying categories that had not been predefined and included in the original interview guide. Verbatim used in this article were translated from French into English by OV, checked by an experienced translator and rechecked by authors to ensure meaning was maintained.

Results

Seven women and eight men aged 76 to 88 years were interviewed. Seven of the 15 participants lived in rural areas; six had obtained a tertiary degree, five a professional degree and four a high school education. Most of the participants lived with a partner; five were widowed or single, of which two had a family member that visited or called daily. Nine participants declared themselves fully independent in activities of daily living (ADL), while others needed help for some daily tasks (Table 10). Five GPs aged 37 to 59 were interviewed, mostly men (one woman), mainly from urban primary care practices (one rural).

Table 10. Sample characteristics

ID	Age	Sex	Living Setting	Education	Autonomy level	Living situation	GPs
1	86	F	Semi-urban	Professional degree	Help for at least one activity	Alone	1
2	82	F	Urban	High school	Help for at least one activity	Alone	1
3	76	M	Rural	Tertiary degree	Fully autonomous	With partner	2
4	80	M	Urban	Tertiary degree	Fully autonomous	With partner	5

5	86	M	Urban	Tertiary degree	Help for at least one activity	With partner	5
6	81	M	Urban	Tertiary degree	Fully autonomous	With partner	1
7	85	M	Urban	Professional degree	Help for at least one activity	With partner	3
8	77	M	Urban	Professional degree	Fully autonomous	With partner	1
9	84	M	Rural	Secondary school	Fully autonomous	With partner	2
10	78	F	Rural	Professional degree	Fully autonomous	With partner	4
11	86	F	Urban	No school	Help for at least one activity	With partner	3
12	86	F	Rural	Tertiary degree	Fully autonomous	With partner	2
13	88	M	Rural	Tertiary degree	Help for at least one activity	Alone	6
14	80	F	Urban	Professional degree	Fully autonomous	Alone	4
15	87	F	Rural	High school	Help for at least one activity	Alone	6

Participants' views on autonomy

Asked how they would define autonomy in their daily life, many participants described autonomy in terms of physical ability: ability to take care of one's body (shower, get dressed, etc.) and being mobile. Participants living in rural areas often mentioned mobility linked to the capacity to drive their car. Only a few described autonomy in terms of cognitive ability, while several described autonomy as the ability to do things independently, without help from others. Indeed, definition of autonomy was largely contingent

on functional status, ranging from a feeling of independence and freedom for those having no or few limitations – “to do what I want” - to the ability to perform certain basic tasks independently, for those facing more limitations, - “to do what I can”. For participants experiencing limitations, autonomy was primarily defined by the need to seek support and being dependent on others or not, as illustrated in this quote:

> "So far, though it’s difficult, I’m totally autonomous. I can even put on and take off my own support stockings, which isn’t easy. […] I could count on my wife for help if needed, but for now I can cope." (ID 7)

Participants with greater limitations described their autonomy in terms of residual ability to do things, such as this woman:

> "[To me, autonomy means] that I can get up in the morning, I can get dressed, make my lunch and that I can even dust a little. Well, watch TV too [laughing] and do my crosswords. That’s it really- that I can still do things." (ID 1)

Overall, autonomy was expressed relative to others or to their previous autonomy, with participants often situating their level of autonomy compared to people around them of the same age and mainly to minimise their own limitations:

> “I see differences [in my abilities] yes, but I can’t complain compared to lots of other people of the same age I know.” (ID 3)

Comparison to previous levels of autonomy was often related to ability to travel.

Attitudes towards functional decline

Participants described two types of phenomena hampering autonomy: acute events and ‘slowly setting-in’ issues. Facing an acute event, like a hip fracture, was often considered as transient loss of autonomy; during the interview, they described themselves as autonomous, referring to abilities before the accident. Non-accidental age-related issues were described as an insidiously slow process, a “slow deterioration”. Falls were considered with ambivalence, between an accident with temporary consequences and a slow setting-in change. They caused anxiety because of their often unexplained occurrence and potential recurrence, as expressed by this man:

"I fell not so long ago, I still have the crutches there [showing the hallway]. I don't understand how I managed to fall, because I felt like I was doing everything right but I still fell." (ID 8)

When functional limitations set in, participants use various coping strategies. Those experiencing gait instability explained how they avoided using stairs or going out of the house, how they arranged their living environment to make it safer. Others modified their social habits and goals to avoid risky situations, for example, walking less far to be sure to get back, or avoiding taking public transport alone. These adaptations were expressed as "living more simply" or doing things slower. Having a partner, a nearby family member or acquaintance was judged as facilitating autonomy in this respect. Adaptations could also have a different purpose, as explained by one man who, to avoid worrying his wife, refrained from walking as he used to after an unexplained fall took him to hospital.

Participants experienced feelings of loss of autonomy ranging from fear, difficulty to accept and frustration, to a more resilient attitude. While some expressed experiences and feelings around functional decline candidly, for others it was a sensitive issue, such as for this 78-year-old woman:

"I think the main problem is accepting that you're not the same. All of a sudden, you're restricted, I don't know if it's the same for everyone, but for me that's the hardest. (...). I used to be really enthusiastic. Not anymore. I used to be quite curious, but am less now. I used to travel a lot, but now I don't want to. It's sad, but that's how it is. Quite awful." (ID 10)

Despite describing herself as a very independent, active person, this woman faced changes and limitations that she reported as having a very negative effect on her quality of life as they impacted valued activities such as gardening and pottery. This illustrates the nuance between autonomy defined by caregivers and its meaning for individuals.

Participants also expressed a fear of becoming dependent. Having to rely on help from others was perceived as rather negative, especially when it came to bodily care as expressed by this participant:

"Not being able to wash, not being able to shave... I'd feel like I wasn't a man anymore, (…) I'd be a burden. " (ID 8)

Some participants expressed their greatest fear was to have to leave their home for a nursing home. One man said he would rather “jump off a bridge” than live in an institution. Another explained that her main goal was to continue living at home:

> “Every day that goes by I say to myself: “It's a day less in a home!” (ID 15)

Others, often those still very active, living alone or getting minimal help, considered present or future changes with greater serenity. This participant reported experiencing functional decline with resignation, being grateful about his remaining abilities: "Well, it’s coming very slowly, so you can’t be disappointed" (ID 13). Some also accepted the idea of needing support as a form of adjustment, like this woman: "Well, I helped before, they should help me now ". (ID 14)

Altogether, many participants talked about ageing as a normal process. Loss of strength, mobility and memory were often reported as “normal with age” and coped with. One participant said he would not talk about problems of normal ageing to his GP because “it’s normal to get old and weak” (ID 3). To delay functional decline onset, participants mentioned eating healthily and practicing physical or cognitive activity rather than seeking support from their GP, as explained by this participant: “I keep moving. I think this is the best way for everything. (…). And it's good for the head too huh? Because when the head goes well the rest goes too.” (ID 14)

Distinctions between ‘normal’ and ‘unnatural’ issues actually determined whether participants discussed them or not with the GP, as we describe below.

Discussing age-related issues with the family physician

Regarding initiating a consultation, frail participants had regular visits with their GP for close follow-up, while participants in good health usually organized visits themselves, either for periodic check-ups, when needing referral or for acute health problems. Participants explained how they decided if a visit to the GP was necessary or not. Problems linked to ‘normal ageing’ were usually considered unnecessary, as illustrated by this participant:

> “I go [to my doctor], I tell him what’s wrong but... Sometimes I don’t tell him everything […] I think some of the things I have are because I'm not 20 anymore, so you know, there's no need to... make a fuss. […] If my shoulder hurts now and then, it’s not every day, so I don’t want to go [to

the doctor] every 5 minutes [laughs]. [...] It's not really going to the doctor that bothers me, it's thinking you went for nothing. I feel like I annoy him. Because I'm fine really." (ID 8)

Another reason for not talking about 'normal ageing' issues was the participants' perception of absence of solutions. Memory loss in particular was an example of progressive impairment considered as 'normal' ageing, understood as a problem without medical solution and hence not requiring discussion with the GP:

"I won't mention it [losing my memory] to him. It is getting worse, but I never said it isn't. Would I tell him about it? Well, I probably wouldn't even think of it!" (ID 3)

Most participants said they would discuss functional decline-related issues with their GP, but they do not all have the same inclination to do so. Some participants consider their GP a partner who they like to discuss and co-decide with. This man tells us:

"I personally think a doctor's role is to make you aware of something. He suggests things and I decide." (ID 6)

Many participants – usually with higher education levels – described their GP as someone providing advice about autonomy, but not as the one who could solve the problems. For others however, the GP was a reference for everything related to their health, including autonomy and they expected more than advice: the doctor is the one who "knows". For this participant whose autonomy is threatened, the opportunity to talk about it is even essential:

"It is very important to me. Because that's what allows me to go on, despite ... all the difficulty. So, um, anything that can help my autonomy, I need to be able to talk to him about it." (ID 7)

Perceptions of active screening of ageing issues

Participants' perceptions

When participants were asked what they remembered of the consultation that included the screening tool, it appeared that many of them had not really noticed it and perceived the consultation as usual. Some

however noticed that several unusual questions were asked while the majority found it acceptable, even "normal" because they expected their GP to ask questions about age-related issues.

Among the positive aspects reported by participants (Figure 7), was the fact that the screening moved beyond the regular introductory question "how are you?"

> "Usually, [the doctor] asks if everything is okay and we say yes. And that's it. But perhaps with more specific questions, he'd be able to see that something's not quite right." (ID 3)

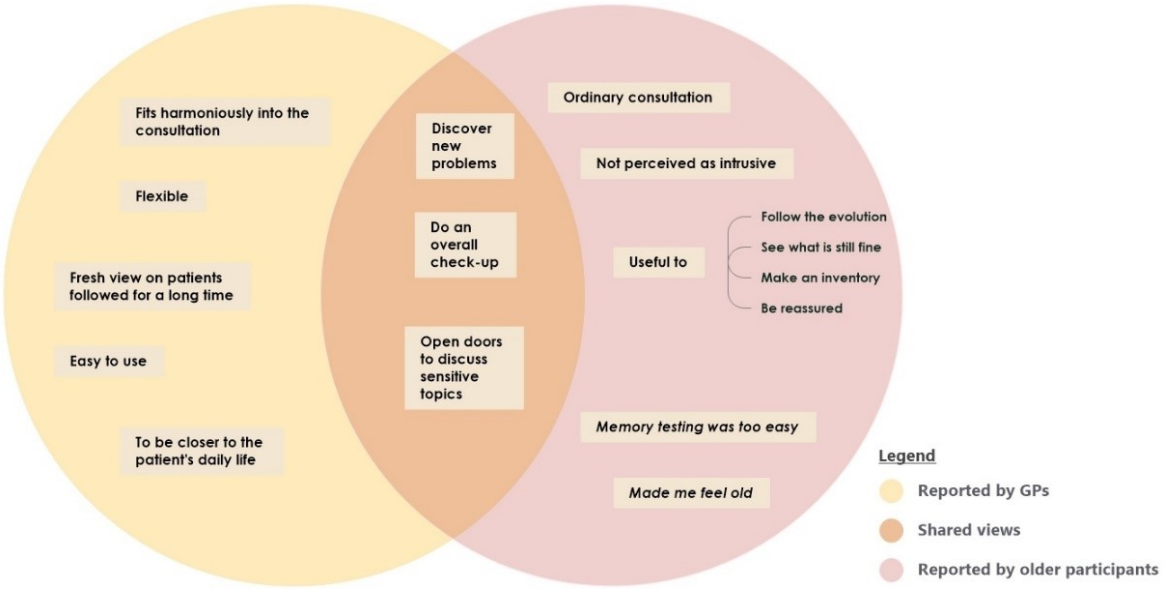

Figure 7. Items reported by older participants and GPs regarding screening of geriatric syndromes with the AGE tool

Asking specific questions was seen as a way to "dig deeper", an opportunity to talk about age-related issues that might have gone unnoticed in a regular consultation. One participant explained that as a result of the screening, he came to acknowledge his mood disorder with his GP:

> "- In the screening, there are questions about sight, audition, memory, nutrition, osteoporosis, gait and mood…
>
> - He seemed to say that I am a bit depressed (…)
>
> - And what did you think about that?
>
> - I was surprised. And then I thought, well it's possible. That's all… (In a low voice)." (ID3)

He further explained that he was not "a positive person by nature", but stressed that he didn't want to go into detail with his GP about it at this point.

Screening was experienced by some as a way to detect unapparent problems and of avoiding unanswered questions:

> “It seems to me the most important thing is that it reassures us. Isn’t it? If we’re reassured we can positively take part in some way to improve the situation.” (ID 7)

Some participants highlighted that screening enhanced a discussion on the overall health situation, including the social environment and autonomy. One participant had the opposite view however, expressing his GP knew very little about his “real” living conditions, so could only partially support him with age-related issues.

Finally, in terms of potential change in the consultation dynamics, as screening was initiated by the GP during a routine visit, participants reported no invasive or paternalist experience. Further, screening did not alter their idea of their health status or age-related representations. Overall, screening was often conducted in a ludic way, with most participants amused by the tests. Only one participant reported being surprised because the screening "made him feel old" (ID 8).

GPs perceptions

GPs expressed that their role encompassed discussing autonomy and quality of life with their older patients, but that in practice most visits were dedicated to acute events or known chronic issue management. Thus, they perceived the screening tool as an opportunity to set aside the known issues and assess the patients globally: “It’s useful to see with a fresh eye patients we’ve known for years and with whom we easily bypass things because we see them ageing progressively (…). So [the tool] is interesting because it provides warnings, allows us to reconsider the global evolution of the patient” (GP4).

All GPs perceived that the standardised tool brought them to discuss topics they seldom routinely explored (such as mood, incontinence, nutrition) and allowed picking-up on new items, such as the GP above who detected a mood disorder in a participant. It also seemed to bring broader discussion on in-context coping strategies. Views on when to use the screening tool differed among GPs: some thought they would use it if they identified signs of functional deterioration; others saw an advantage of systematic screening to

detect such signs. These views were often driven by the financial aspect: some GPs noted that while accepted by the majority of patients, integration of the tool into routine visits was not favoured by a fee-for-service scheme. Screening could be delegated to a (less-costly) medical assistant, but as one GP expressed, the whole purpose would be lost: “Results are not very important. It’s rather the interaction it fosters” (GP2).

Discussion

This research provides an understanding of the experiences and perceptions of older people undergoing active screening of geriatric syndromes by their GP. In our sample of participants in fairly good health and living at home with or without care support, autonomy was described in terms of the ability to do things in daily living and ranged from ability to “freely do what I want”, to “do what I can”, depending on functional status. The term autonomy, used by participants, did not overlap exactly with definitions used in public health; it rarely included the ability to decide for oneself, but encompassed the social environment. Lette et al. [114] made the same observation and hypothesized that ability to make decisions is not part of autonomy until cognitive problems occur. Similarly, Hofman et al. [8] explored the influence of age on health valuations, showing that the “oldest”-olds value functional independence the most and concluded that for clinical decision-making, health valuations by older people and practitioners should be reconciled. Other scholars revealed how attitudes and health in old age was contingent on multiple, cumulated life-course factors such as upbringing and living conditions, sense of internal control, self-esteem and personal traits [115, 116], which could only be partially included and addressed in routine medical consultations.

Our findings show that functional decline was rarely linked to an acute event, but described as a slow and normal ageing-process and as such, did not require medical attention or response. Loss of strength, mobility and memory were experienced as “normal” and coped with in daily life. Such findings were also reported in qualitative studies elsewhere: functional restrictions were often rationalized as normal and non-medical in old age [117, 118]. In that case, screening for geriatric syndromes appeared as an opportunity to discuss specific age-related issues and explore solutions in the medical sphere and beyond. This includes the age-related issues that are managed by patients, for instance through deliberate

restrictions to limit falls, which have the potential to decrease mobility and increase social isolation, thus ultimately autonomy [117, 119].

The AGE tool is a standardised instrument that appears very biomedical and non-personal. However, as our data suggest, the tool was mainly used as a support for voluntary broader discussion and exploration of health status in the specific context of older people. Through active screening, issues considered non-medical by older people could be better integrated and the role of GPs could be re-specified to better address specific psychosocial needs beyond the biomedical sphere. Following the model of disablement of Verbrugge and Jette [110], the AGE tool has great potential for early detection and intervention on the one hand and providing improvements and support tailored more to patient's needs on the other, because it envelopes two essential phases identified in the model: (1) evaluation of personal functional status; and (2) subsequent discussion on solutions and care-plans that comprehend possible strategies to ensure older people's ADL such as "activity accommodations, environmental modifications, psychological coping and external support". This latter phase was not assessed within the timeframe of this study that focussed on the initial evaluation. How screening and management plans can best be inserted timely and financially into routine consultations warrants further investigation. Practices in Switzerland are moving towards less GP-centred to more multidisciplinary teams (including for example nurses, physiotherapists), opening up new opportunities for the care of older people and for the implementation of such screening tools.

Limitations

Our study sample included rather robust participants with a relatively high education level, and we did not explore acceptability and feasibility of screening in a more fragile or less educated population. Our sample was too small to explore the potential influence of social stratification differences, such as gender or education in reality and definitions of autonomy, as found elsewhere [120]. Participants were interviewed only a few days or weeks after the screening consultation and had not yet benefited from the management of any detected syndromes. We hypothesise that the consultation including the care plan is a further opportunity to discuss health status, coping strategies and arrangements in daily living in a shared decision. This needs to be further explored, in addition with the GPs' divergent inclination to use the tool systematically for all their older patients.

Conclusion

While outcomes of the clinical trial will provide evidence of the health improvements of patients benefiting from the AGE screening, this study has established its general acceptability and suggestions for implementation in real settings. Although the AGE tool is a standardized intervention, it opens doors to discuss age-related issues that may go unnoticed or undisclosed because they are perceived as non-medical. It allows GPs and patients to discuss everyday reality regarding autonomy and functional decline beyond the medical sphere and ultimately to co-deciding on support measures such as home-based care to ensure safer and longer home-dwelling.

Conflict of interest

None

Funding

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Paper 4. Standardised brief geriatric evaluation versus routine care for preventing functional decline in primary care: a pragmatic cluster-randomized trial

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Summary

Background: Although active screening and management of geriatric syndromes is increasingly recommended for preventing functional decline in older adults, there is little evidence supporting its systematic use by general practitioners (GPs). **Objective:** To determine whether a systematic geriatric evaluation including a brief assessment of geriatric syndromes and a management plan performed by GPs can prevent functional decline in older patients. **Study design and Analysis:** Controlled, open-label, pragmatic cluster-randomised trial, randomising at the GP level. **Setting:** Forty-two GPs, Switzerland. **Population Studied:** Per GP, on average ten community-dwelling adults at least 75-years-old, routinely followed in the practice. **Intervention:** Yearly assessment of eight geriatric syndromes associated with ad hoc management plans. ***Outcome Measures:*** The main outcome was the proportion of patients losing at least one instrumental activity of daily living (IADL) over two years, compared by a generalised 2-level mixed model with a logit regression. Secondary outcomes were losses in basic ADLs and quality-of-life (WHOQOL-OLD) scores. After complete case analysis, predefined sensitivity analyses were performed with last observation carried forward and considering patients who died or were institutionalized as having lost an IADL. **Results**: 42 GPs recruited 429 participants of mean age 82·5 years (SD 4·8) at inclusion, 63% women. The proportion of patients losing at least one IADL during the course of the study was 43·6% and 47·6% in the intervention and control arms, respectively (p=0·476). Mean reduction in quality-of-life score was -0·12 and 0·74 (p=0·331). There was no difference between arms in any of the outcomes considered. Concerning adhesion to the intervention, 85·7% (186/217) of patients in the intervention arm had at least one assessment and GPs adhered to 43·4% of the recommendations in the management

plans. **Conclusions:** A yearly geriatric evaluation associated with a management plan conducted systematically among community-dwelling, ≥75-year-old patients in GP practices does not lessen functional decline.

Research in context

Evidence before this study

Results of systematic reviews of comprehensive geriatric assessment (CGA) vary depending on the context of the CGA. The 2017 Cochrane review of hospital-based CGA concluded that this type of intervention decreased the likelihood of admission to a nursing home but made little or no difference to dependence. By contrast, in older studies home-based management programs that included CGA were shown to prevent functional decline. A 2020 systematic review of CGA in primary care found only four studies conducted in this setting, showing a mixed impact on clinical outcomes and no effect on functional ability in the only study assessing it.

Brief geriatric evaluation is a shorter version of CGA, directly applicable to primary care. The World Health Organization conducted an extensive review of this domain as part of the 2015 World report on health and aging and development of the Integrated Care for Older PEople (ICOPE) framework and guidelines. Most of the ICOPE recommendations were based on low to moderate quality evidence. Indeed, to our knowledge, none of the geriatric evaluation tools available for primary care have been evaluated as part of an interventional trial.

Added value of this study

This is the first trial investigating intervention in older patients via a brief standardised geriatric evaluation delivered directly by GPs including an annual assessment of functionality and screening for eight geriatric syndromes, combined with management recommendations. This study showed that the intervention did not result in a difference in functional decline of patients compared to usual care after two years.

Implications of all the available evidence

Our findings show that including systematic screening for geriatric syndromes in GP practices is unlikely to have a significant impact on a patient's functionality per se.

Introduction

Population ageing is a major challenge for health systems, confronted with an increase in multimorbid and frail patients. The World Health Organization has defined healthy ageing as the process of developing and maintaining functional ability that enables wellbeing in older age.[10] Therefore, tailoring interventions that prevent functional decline and improve quality of life should be the main objective of care in older patients. Functional ability is often measured via the ability to perform activities of daily living (ADLs) without assistance. The most frequently used scores are the basic ADL score developed by Katz (or Katz index) that comprises six items (bathing, dressing, toileting, transferring, continence, and feeding),[12] and the Lawton instrumental ADL score, which comprises eight items (using the telephone, shopping, food preparation, housekeeping, laundry, mode of transportation, responsibility for own medications, and ability to handle financing).[121] These two scores have been used in numerous studies because of their robust psychometric properties, their sensitivity to change, their simplicity, and the fact that they can be reliably administered over the telephone, [122, 123] although there are still large variations in the use of ADL scores over the 50 years since their conception, regarding choice of items included and the way they are measured.

Geriatric syndromes, corresponding to multifactorial chronical conditions, can impair physical and mental capacities [18, 19, 21] and are thus directly associated with functional decline [23]. If timely recognized, adapted preventive measures and management strategies can be initiated to reduce part of the burden of geriatric syndromes and limit functional decline.[24, 124, 125] Interventions that showed benefit include comprehensive geriatric assessment (CGA), regular home visits, and physical therapy.[24, 39, 124] CGA consists of a “multidisciplinary diagnostic and treatment process that identifies medical, psychosocial, and functional capabilities of older adults to develop a coordinated plan to maximize overall health with ageing”.[32] These assessments are usually performed by specialised geriatric teams in individuals already identified as frail or in the context of rehabilitation. However, the majority of older patients only see their general practitioner (GP) and thereby do not benefit from CGA. Indeed, while GPs perform prevention and management of common chronic conditions adequately, screening, prevention, and management of geriatric syndromes are often incomplete.[42, 43] Several reasons may explain this low rate of early diagnosis of geriatric syndromes in general practice. First, GPs remain mostly unfamiliar with the concept of geriatric syndromes and functionality, chiefly developed by geriatricians. Second, a full CGA is a lengthy process, which hardly fits into a primary care consultation.

In this background, one possible approach is to adapt CGA to the primary care context by making it shorter. Various tools have been designed to this purpose in recent years,[28, 53-55] including WHO's ICOPE screening tool[46] and the active geriatric evaluation tool (AGE tool), developed specifically for this study. Construction of the AGE tool was based on a systematic literature review to select syndromes and tests,[28] validation of the comprehensive assessment by geriatricians as a reference measure of geriatric syndromes,[51] evaluation of the diagnostic performance of the brief assessment tool compared to CGA and the overall feasibility.[60] AGE tool performance was considered satisfactory, with negative predictive values above 80% for most syndromes (ranging from 50 to 98%). Here, we aimed to determine whether AGE, specifically designed for GPs and consisting of a brief assessment of the most relevant geriatric syndromes combined with management recommendations could slow down functional decline in older patients.

Methods

Study design

This study was a controlled, open-label, pragmatic cluster-randomised trial with randomisation at the GP level. It was conducted in forty-two practices in western Switzerland. Ethics approval was obtained from the cantonal ethics committee on May 30th, 2016 (CER-VD n°2016-00422). The PRECIS-2 criteria were used in designing the study to optimize direct applicability to GP practices.The study protocol is available at https://clinicaltrials.gov/ProvidedDocs/91/NCT02618291/Prot_001.pdf.

Participants

We planned to recruit at least 40 GPs (20 per arm) and each GP was expected to recruit ten patients on average. GPs were recruited via postal invitation letters, professional societies' newsletters, or personal contact by email or telephone. Participating GPs had to work at least 20 hours per week as GPs in French-speaking Switzerland. Only one GP per practice could participate to limit contamination. Specialists in geriatrics and GPs that had participated in the validation study of the AGE tool were excluded. Inclusion criteria for patients were, aged at least 75 years at inclusion, living at home, able to understand French, and having visited their GP at least twice in the prior year. Patients having had a geriatric or specialised memory consultation in the three months before inclusion or who were planning to leave the study area or change GP in the next two years were excluded. Participants gave written informed consent.

Setting

Most Swiss GP practices are small-sized self-owned practices (2-4 GPs) with medico-centred teams. Integrated nurse practitioners and social workers are rare. Community-based services such as home-based care, physical or occupational therapy are prescribed by GPs but delivered outside of GP practices.

Randomisation and masking

The randomisation unit was the GP, with GPs assigned on a 1:1 ratio to the intervention or usual care arm. An independent researcher generated a computer-based randomisation list, using uneven block sizes. She then prepared sealed opaque envelopes containing the allocation arm information with a printed number (identification number, ID) on the outside. GPs were allocated to their respective arm on opening the envelope corresponding to their predefined unique ID during training sessions that took place after patient enrolment.

The study staff (research assistant) performing the main outcome measures (telephone interviews), study coordinator and study statistician were blinded to the allocation. GPs, study participants and study assistants who conducted the annual visits to the family practice were un-blinded to the GP's allocation. Specific sections of the eCRF, which revealed allocation were coded in order that blinded staff could not link this data to participant or GP identifiers.

Procedures

The intervention (the AGE tool) consisted of a yearly, brief assessment of four activities of daily living (three IADL and one ADL) and screening for eight geriatric syndromes: cognitive impairment, mood disorder, gait and balance impairment, visual impairment, hearing impairment, urinary incontinence, malnutrition and osteoporosis (Table **11**), followed by proposal of a management plan based on the results of the evaluation.

The recommendations for management were divided into two distinct steps: 1) additional tests following a positive screening to confirm or exclude the diagnosis and 2) specific management attitudes. All suggested attitudes were based on a literature review [28] and geriatrician expertise. Management recommendations were further graded as major and minor. In order to preserve the pragmatic approach of the study, GPs were free to implement the proposed recommendations and attitudes.

Table 11. Active Geriatric Evaluation tool.

Syndrome	Screening	Additional investigation if screening positive (diagnostic confirmation)	Proposed management attitudes
Functionality	Can you dress yourself? Can you prepare your meals alone? Can you do your own shopping? Can you make your payments alone?		
Urinary incontinence	4 questions: Do you have difficulty holding in your urine or feel urge to urinate? Do you sometimes find it difficult to reach the toilet in time? Do you have involuntary urine loss when coughing or on effort? Do you sometimes wear protection pads?	**Complete focused medical history and examination: sensation of emptying, dysuria, pollakiuria, urogynecological problems, urinary retention, prolapse, rectal examination**	**Prescription of urinary protection**
		Voiding calendar (timing of mictions, nycturia)	Consider specialised physiotherapy and rehabilitation
		Urinary dipstick	**Voiding behavioural hygiene**
		Radiological examination for post-miction residue	Consider anticholinergic / alpha-blocker
		Review medication	Refer to gynaecologist / urologist for specialty care / eg surgery
Mood disorder	PHQ-2	**Complete medical history**	**Initiate depression follow-up**
		Perform eventually Geriatric Depression Scale (short form)	Antidepressant drug
		Assess alcohol consumption	**Motivational intervention on alcohol consumption**
Cognitive impairment	Mini-Cog	**Medical history, compare to functional status (ADLs, IADLs)**	**Home care support**
		MMSE or Moka test	**Meet family / network**
		Refer to memory clinic/geriatrician, +/- MRI)	**Consider specific treatment according to diagnosis (hypothyroidism)**

		Lab tests: full blood count, HbA1c, creatinine clearance, ASAT, ALAT, Gamma-GT, Na, K, Ca, vitamin B12, folic acid, TSH	Acetylcholinesterase inhibitors
		Review medication	**Adapt medication**
		Assess driving ability	
Visual impairment	Near vision pocket card	**Complete visual acuity assessment (Snellen chart)**	**Ergotherapist to check indication for auxiliary means**
		Refer to ophthalmologist for full assessment (e.g. cataracts, glaucoma)	
Hearing impairment	Whisper test	**Perform otoscopy (cerumen impaction)**	
		Refer for audiometry	**Prescription of hearing aid**
Gait and balance	History of falls during past year	**Complete medical history and examination: cardiovascular, neurological, osteoarticular, Schellong test** **Examine feet and shoes**	**Home hazard assessment (ergotherapist) & home care support**
	Gait observation	**Refer to specialty care if needed (e.g. neurology)**	**Exercise prescription, physiotherapy, adapted shoes**
		Review medication	**Adapt medication**
		Assess alcohol consumption	**Motivational intervention on alcohol consumption**
		Check calcium and vitamin D	**Consider calcium and vitamin D prescription**
Osteoporosis	History of osteoporotic fracture	Perform osteodensitometry	**Exercise prescription, physiotherapy**
	Height loss since age 25	**Check calcium and vitamin D**	**Consider calcium & Vitamin D supplementation**
	Wall-occiput and rib-pelvis distance		**Consider treatment with bi-phosphonates**
Malnutrition	Weight loss >5% past month or 10% past 6 months	**Perform digestive (including constipation) and dental examination**	**Treat other causes (e.g. Depression)**
		Review medication	**Home care support (e.g. meals, shopping)**
		Assess financial situation	Hyperproteic supplements

In bold: major recommendations.

GPs of the intervention arm received a 2-hour face-to-face training on the AGE tool in small groups from an academic GP and a geriatrician and received a reference book on comprehensive geriatric assessment.[126] Follow-up assessments kept the routine consultation schedule with a final outcome visit recommended after 2 years, plus a 3-month window.

A research assistant conducted annual medical record reviews in the practice, extracting data on the number of consultations and content, laboratory tests, radiological examinations, new diagnosis of chronic conditions (ICPC-2 coded), medications, specialist referrals, emergency consultations, and hospital admissions. In parallel, patient-reported outcomes were assessed by a different research assistant conducting annual telephone interviews.

Outcomes

The primary outcome was the fact of losing independence in at least one instrumental activity of daily living (IADL), over two years. We favoured IADLs because loss of IADLs usually precedes loss of ADLs. According to previous studies that used this outcome in similar populations, avoiding a one point (= one activity) loss out of eight activities (for IADLs) can be considered as a significant and meaningful improvement.[24, 127] We renounced treating outcome as a continuous variable (and comparing the mean difference between the two arms) after preliminary analysis of baseline data showed that most patients had a baseline IADL score of 8 (maximal score).

Secondary outcomes included the fact of losing independence in at least one basic ADL, having a difference in the mean quality-of-life score (WHOQOL-OLD), and in the incidence of hospital admissions, institutionalisations, emergency visits, and outpatient visits. We also compared the clinical output per arm in terms of the number of geriatric syndromes identified and the adopted management strategies, such as medication adaptation, referral to specialty care, or supportive measures. GPs were asked to record any serious adverse events (hospitalisation, death) within 7 days of their occurrence in the eCRF. For each serious adverse event, the following information was collected: time of onset, duration, resolution, action to be taken, assessment of intensity, and relationship to the study intervention. We estimated GPs' adhesion to the intervention at each step of the AGE tool. Quantitative acceptability and feasibility outcomes were pre-specified and combined with qualitative assessment of acceptability and feasibility,

as well as perceptions of autonomy for patients and family GPs; these results are not presented in this paper.

Statistical analysis

In order to estimate the sample size, we assumed that 10% of patients would lose independence in at least one activity (IADL) in the intervention arm and 25% in the control arm. These proportions were based on previous similar trials [24, 124, 125] and longitudinal studies.[19] Using these parameters, we generated cluster data with various combinations of the number of GPs per arm and patients per GP for different levels of intraclass correlation coefficient (ICC). To achieve a power of 90%, 8 patients per GP were sufficient if we had 20 GPs per arm, based on an ICC of 0·10. Taking into account an estimated loss to follow-up of 15%, we increased the number of patients per GP to 8/ (1-0·15) =10, corresponding to a final sample size of 40 GPs with a total of 400 patients.

The primary analysis compared the proportions of patients having lost at least 1 IADL after 2 years between the intervention and control arms using a generalised linear (logistic) mixed effect model, including a random effect for the physician. Secondary analyses pre-specified in the statistical analysis plan, compared the proportions of patients having lost at least 1 ADL or with a mean reduction in WHOQOL-OLD score after 2 years between intervention and control arms using a generalised linear (respectively linear) mixed effect model. We also compared the proportions of patients with hospital admissions, institutionalisations, and emergency visits by arm, the number of routine visits, and the time to institutionalisation or death. All comparisons between treatment arms used mixed models that included a random effect for cluster. We used mixed-effect negative binomial regression to compare the number of GP consultations, of specialist consultations, and of weight measures and mixed effect logistic regression for binary secondary outcomes (patients with at least one emergency consultation, hospital admission, stay in an institution, new chronic condition diagnosis, severe adverse event, communication between GP and home-based care, respectively between GP and family, and presence of polymedication). We adopted survival analysis techniques (Kaplan Meier and log-rank test) to compare time to institutionalisation or death. Longitudinal models including a second random effect for a subject's repeated measures were adopted to estimate the 2-year evolution of mean IADLs and ADLs (two level mixed effect Poisson models) and mean WHOQOL-OLD scores (two level mixed effect linear model).

The analysed population comprised all patients included by the randomised GPs. The primary analysis (intention-to-treat) included all patients with IADLs measured at baseline and after 2 years. The per-protocol population excluded subjects in the intervention arm who received less than two almost complete screenings (at least 7 out of 8 items screened) and for whom GPs followed less than half of the proposed major recommendations. After complete case analysis, pre-specified sensitivity analyses were performed with last observation carried forward and considering patients who died or who were institutionalised as having lost one IADL.

Analyses were conducted in R version 3·5 (R Core Team (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/), and Stata version 16·1 (College Station, USA). A specific data monitoring committee did not oversee the study but rather a steering committee uniting all investigators twice a year reviewed the planned interim analysis. The trial was registered in ClinicalTrials.gov with identifier NCT02618291.

Role of the funding source

The funder of the study had no role in the study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit the data for publication.

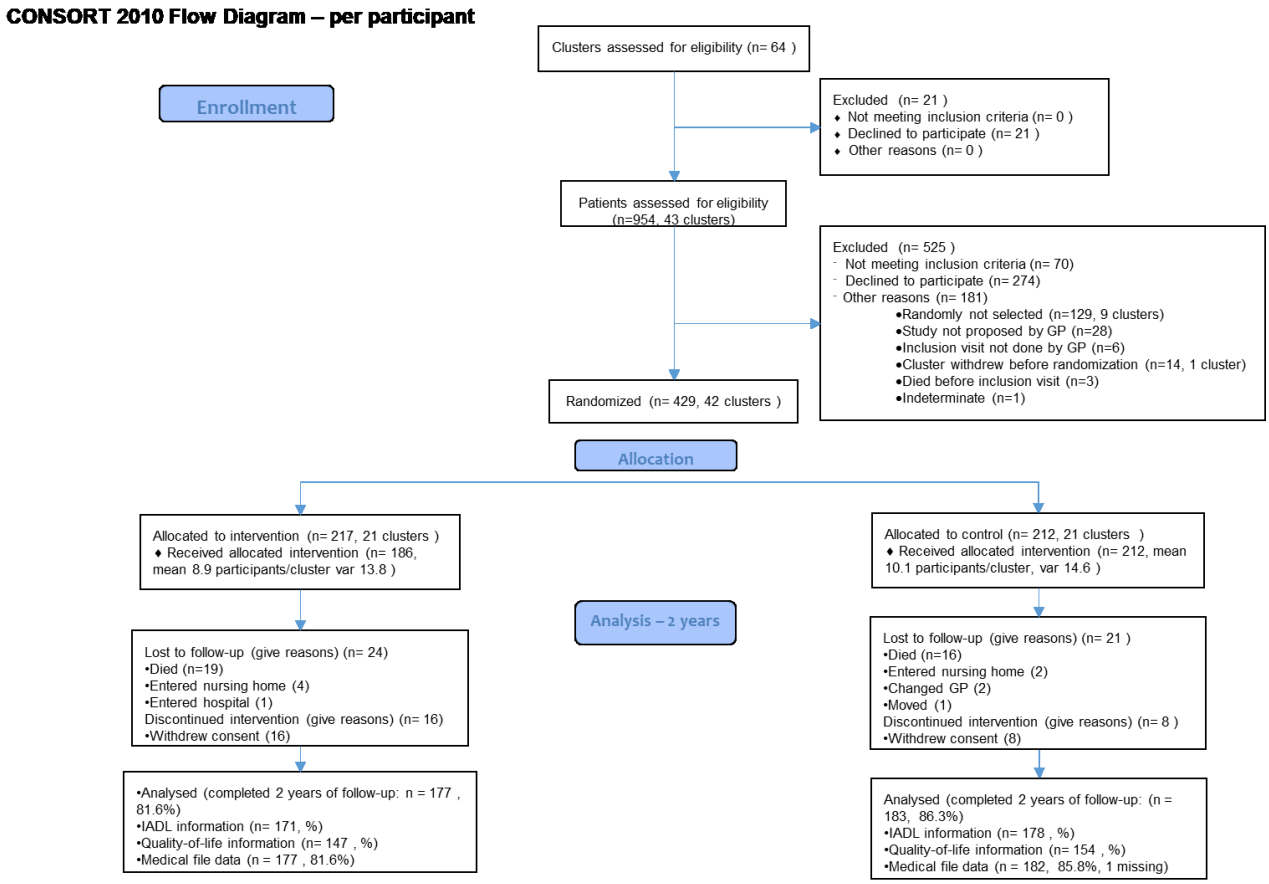

Figure 8. Screening, randomization and follow-up (CONSORT diagram). Var = variance

Results

Out of 954 patients screened for recruitment between the 12th of August 2016 and 15th of November 2017, 429 patients were included by 42 GPs between September 26th, 2016, and January 29th, 2018 (Fig. 1). Sixty-three percent were female and the mean age was 82·5 years (SD 4·8). Baseline socio-demographic and clinical characteristics are shown in Table 12**Table 12**.

Table 12. Baseline characteristics of AGE3 patients

	N missing*	Total (N=429)	Interventio n (N=217)	Control (N=212)	Female (N =269)	Male (N=160)
% Female	0	269 (62·7)	141 (65·0)	128 (60·4)		
Mean age, years at inclusion* (SD)	0	82·5 (4·8)	82·7 (4·7)	82·4 (4·9)	83·0 (4·9)	81·8 (4·5)

Equipment						
Glasses	0	325 (75·8)	184 (84·8)	141 (66·5)	211 (78·4)	114 (71·3)
Hearing aids	3 (10 not worn)	105 (24·5)	53 (24·4)	52 (24·5)	55 (20·5)	50 (31·3)
Urinary protections	2	93 (21·7)	51 (23·5)	42 (19·8)	82 (30·5)	11 (6·9)
Dentures	8	221 (51·5)	110 (50·7)	111 (52·4)	146 (54·3)	75 (46·9)
Driving	1	219 (51·1)	108 (49·8)	111 (52·4)	96 (35·7)	123 (76·9)
Stopped driving	1	99 (23·1)	47 (21·7)	52 (24·5)	71 (26·4)	28 (17·5)
Never drove	1	91 (21·2)	50 (23·0)	41 (19·3)	84 (31·2)	7 (4·4)
Home-based care	**0**	75 (17·5)	38 (17·5)	37 (17·5)	57 (21·2)	18 (11·3)
- Nursing	1	55 (73·3)	28 (73·7)	27 (73·0)	41 (71·9)	14 (77·8)
- Meals	3	19 (25·3)	12 (31·6)	7 (18·9)	14 (24·6)	5 (27·8)
- Domestic help	1	37 (49·3)	17 (44·7)	20 (54·1)	27 (47·4)	10 (55·6)
- Personal hygiene and comfort	2	28 (37·3)	12 (31·6)	16 (43·2)	21 (36·8)	7 (38·9)
- Ergotherapy	2	5 (6·7)	2 (5·3)	3 (8·1)	4 (7·0)	1 (5·6)
- Physiotherapy	1	19 (25·3)	12 (31·6)	7 (18·9)	15 (26·3)	4 (22·2)
Environment						
- Lives on his/her own	1	215 (50·1)	121 (55·8)	94 (44·3)	173 (64·3)	42 (26·3)
- Lives with partner		197 (45·9)	90 (41·5)	107 (50·5)	87 (32·3)	110 (68·8)
- Lives with child/other		16 (3·7)	5 (2·3)	11 (5·2)	8 (3·0)	8 (5·0)
Median number of children (IQR)	1	2 (1 - 2)	2 (1 - 2)	2 (1 - 2)	2 (1 - 2)	2 (1 - 2)

Other caregivers	3	100 (23·3)	55 (25·4)	45 (21·2)	71 (26·4)	29 (18·1)
Median number of chronic conditions (IQR)	0	4 (2 to 6)	4 (2 to 5)	4 (3 to 6)	4 (2 to5)	4 (3 to 6)
Median number of medications (IQR)	0	5 (3 to 7)	5 (3 to 7)	5 (3 to 7·5)	5 (3 to 7)	5 (3 to 7·5)
Previous selected surgeries						
Hip replacement	0	69 (16·1)	34 (15·7)	35 (16·5)	25 (15·6)	44 (16·4)
Knee replacement	0	54 (12·6)	25 (11·5)	29 (13·7)	39 (14·5)	15 (9·4)
Cataract surgery	0	121(28·2)	65 (30·0)	56 (26·4)	83 (30·9)	38 (23·8)

* Missing considered as 0 and included in denominator for proportions

Abbreviations: IQR: Interquartile Range

In the primary analysis, the proportion of patients who lost independence in at least one IADL during the course of the study was estimated at 43·6% and 47·6% in the intervention and control arms, respectively (p=0·476, Figure 9).

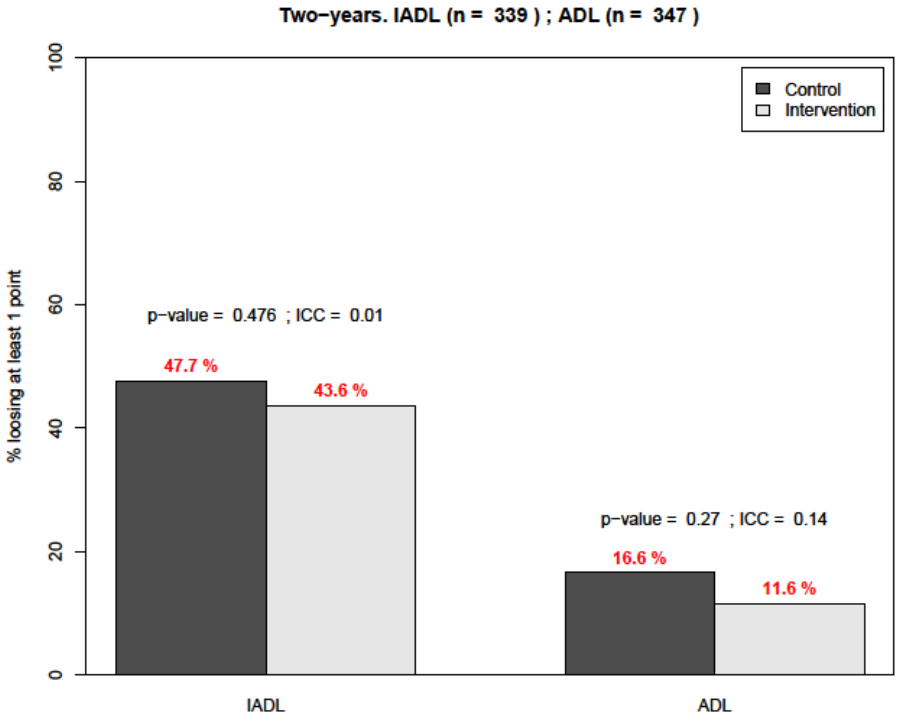

Figure 9. Proportion of patients who lost independence in at least one instrumental or basic activity of daily living between intervention and control arms; AGE3 study

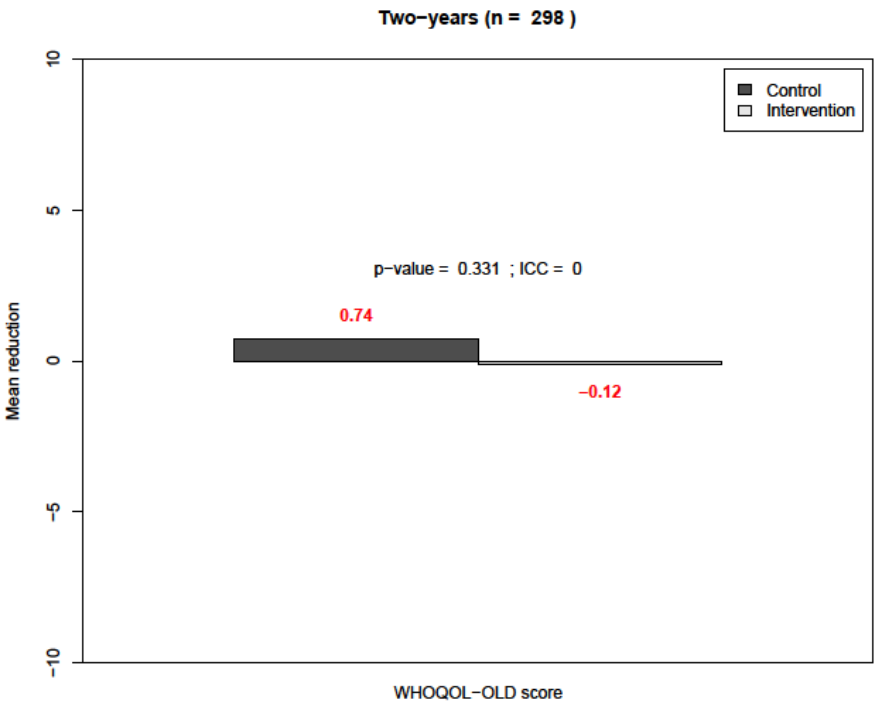

Figure 10. Mean difference in quality of life score (WHOQOL-OL) after two years between intervention and control arms; AGE3 study

In terms of secondary outcomes, the proportion of patients who lost independence in at least one basic ADL was estimated at 11·6% and 16·6% in the intervention and control arms, respectively (p=0·270, Figure 9) and mean reduction in quality-of-life score was -0·12 and 0·74, respectively (p=0·331, Figure 10). There were no differences between study arms for all other secondary outcomes assessed regarding health care use (number of consultations, emergency consultations, hospital admissions or institutional stays), type of health care (number of weight measures and number of specialists involved), or communication with home-based care or families (Table 13). Time to institutionalisation or death was not different between patients receiving AGE or usual care by log rank test (p=0·300). The proportion of patients experiencing severe adverse events was not different between the treatment arms.

Table 13. Secondary and safety outcomes according to treatment arm

	Intervention (N=217)	Control (N=212)	IRR, resp. OR*	95%CI	p-value
GP consultations – Median no. (SD)	15·0 (9·4 – 22.0)	16·0 (10·0 – 22·0)	0·93	0·79 – 1·10	0·395
Weight measures – Median no. (IQR)	3 (1 – 5)	3 (1 – 6)	0·95	0·60 – 1·49	0·815
At least one emergency consultation – No. (%)	39 (18·0)	45 (21·2)	0·58	0·33 – 1·00	0·051
At least one hospital admission – No. (%)	62 (28·6)	46 (21·7)	1·00	0·65 – 1·53	1·000
At least one stay in institution – No. (%)	11 (5·1)	10 (4·7)	0·74	0·42 – 1·29	0·285
At least one new chronic condition° diagnosed – No. (%)	58 (28·9)	57 (28·9)	0·95	0·43 – 2·09	0·889
Polymedication at two years - No. >4 drugs, (%)	115 (65·0)	121 (66·1)	0·94	0·59 – 1·50	0·801
Potentially inappropriate medication – No. (%)§	133 (75·1)	153 (83·6)	0·60	0·30 – 1·19	0·141
Specialists involved in care – Median No. (IQR)	2 (1 – 3)	2 (1 – 3)	0·90	0·72 – 1·13	0·359
Communication with home-based care – No. with at least one contact (%)	54 (26·9)	67 (34·0)	0·70	0·43 – 1·14	0·150

Communication with family – No. with at least one contact (%)	50 (24·9)	43 (21·8)	1·11	0·54 – 2·28	0·772
Occurrence of any severe adverse event – No. (%)	61 (28·1)	67 (31·6)	1·55	0·68 – 3·51	0·295

° Based on a selection of (International Classification for Primary Care - ICPC-2) codes [82]

§ Potentially inappropriate medication according to American Geriatrics Society 2015 Updated Beers criteria[67]

Abbreviations:

GP: General practitioner

IQR: Interquartile Range

*IRR: Incidence Rate Ratio (based on mixed negative binomial regression model, adjusted for cluster effect at GP level)

*OR: Odds Ratio (based on mixed logistic regression model, adjusted for cluster effect at GP level)

SD: Standard Deviation

In the sensitivity analysis, considering death or admission to an institution as having lost at least one IADL increased the number of patients analysed in the complete case analysis from 339 to 381. There was no difference between arms in the proportion of patients having lost at least one IADL (50·0% in intervention and 51·8% in control arms, respectively, p=0·721, ICC=0·00, supplementary material). Longitudinal analysis of IADL and ADL scores for the entire study population and stratified by age and gender can be found in the supplementary material.

Overall, out of 179 patients with a baseline BAT, 119 (66·5%) had a second BAT after one year. GPs adhered to 43·7% of the major items of the management plan and performed at least 50% of the items for 48·2% of patients. Overall adherence in the intervention arm was 61·6% (CI 48·5% - 74·7%, adjusted for cluster). In the per-protocol population, which excluded 118 patients in the intervention arm with low adherence, there were no differences in the proportion of patients having lost at least one IADL (45·7% versus 47·6%, p=0·782, ICC=0·01; supplementary material Figure 12), in the proportion of patients having lost at least one ADL (10·9% vs 16·6%, p=0·274, ICC=0·10), and in the WHOQOL-OLD score after two

years between intervention and control arm.(-0·32 vs 0·71, p=0·363, ICC=0·01; supplementary material Figure 13).

Discussion

Systematic screening for and management of geriatric syndromes in general practice using the active geriatric evaluation (AGE) tool does not slow down functional decline of patients aged 75 years and older over a two-year course compared to routine care. Also, adopting AGE showed no difference in terms of quality-of-life or health care use. The AGE tool screens for most of the items used in similar tools[52] and covers all areas recommended by WHO's ICOPE approach.[46] However, while there are increasing numbers of screening tools available for primary care, the evidence supporting their use is still very scarce. A recent systematic review of comprehensive geriatric assessment in primary care found only four studies conducted in such a setting, [40] showing mixed effect on clinical outcomes and no impact on functional ability in the only study that assessed it.[41] In our study, the intervention was a brief assessment delivered by GPs by contrast with the other trials where geriatric assessment was comprehensive and delivered by geriatricians or specifically trained nurse practitioners. Furthermore, our results differ from those obtained in home-based management programs, which showed a positive effect in preventing functional decline in participants.[24, 38, 39] However, our study population may differ from those in other studies for example, that specifically targeted frail patients,[128] and may have included healthier patients less likely to benefit from the intervention. Indeed, identifying precisely the population which might benefit from intervention is one of the key issues. However, we did observe marked functional decline in our study participants, much higher than anticipated from our sample size assumptions, including a higher proportion of deaths, which convinces us of our choice of targeting 75-year-olds to older individuals.

Our study has several limitations. In terms of risk of bias, one area of concern is bias due to deviation from the intended intervention. Indeed, GPs in the control arm might have been more attentive to geriatric issues of their patients and actually, GPs in the intervention arm did not adhere to all recommendations of the tool, which was consistent with the pragmatic nature of the trial. In terms of external validity, a certain amount of selection is unavoidable when conducting trials that imply a significant investment from participating GPs. Study practices were more likely to be interested in geriatric care and be more up to

date in terms of continuous education. Thus, practices in the control arm may have provided better care than average practices in the area. In addition, Swiss GP practices are very GP-centered. Our study results therefore, may not be valid in different primary care settings where interprofessional teams could have enhanced the impact of the intervention.

Our choice of outcomes could be criticized. First, use of disability criterion in instrumental activities of daily living caused a number of methodological problems (choice of items and categories, ceiling effect, lack of gender-sensitivity).[129] Second, enquiring about quality-of-life using the WHOQOL-OLD was reported as intrusive by many study participants resulting in some study withdrawals or incomplete data. Few clinical chronic care interventions have actually been able to improve patient quality-of-life. For example, the much-talked-about 3D trial, which compared a patient-centered complex care intervention in multimorbid patients failed to demonstrate an effect on health-related quality-of-life after 15 months, although measures of patient-centeredness improved.[130] We did not include such measures in our trial as our intervention did not target centeredness or integrated care per se. However, the qualitative study performed alongside this trial provided some elements in this direction, as the intervention allowed reinforcing the patient-doctor relationship and patient-centeredness.[61] Indeed, using the AGE tool inversed the consultation dynamic, as reported by GPs from the intervention arm. Instead of being patient complaint-driven, the consultation provided an opportunity to discuss actively functionality and activities of daily living in the specific context of the patient and according to their own assessment, weighing, and coping strategies to mitigate functional decline. In fact, discussing functionality and screening for geriatric syndromes was perceived positively by both patients and GPs. It would have been useful to include at least a measure of patient satisfaction or continuity of care, for example the PACIC score used in the 3D trial[131, 132] or the more recently developed, Patient Experience of Integrated Care Scale (PEICS).[133]

In terms of study strengths, this was a methodologically robust trial and use of the PRECIS-2 criteria enhanced its pragmatic nature. In addition, the study provided valuable information on clinical characteristics and health care use of older patients, helping to fill the existing gap between data collected on older individuals at the population level and studies conducted in specialised geriatric centers.

Several reasons may possibly explain the absence of effect of the intervention. First, in contrast to trials targeting underserved populations,[38] usual care in the Swiss context may already be very good, as indicated by the high proportion of patients already equipped with hearing aids or having undergone cataract surgery at baseline. Secondly, the rather moderate intensity of the intervention compared to other similar trials,[40] in line with its pragmatic nature, may have diluted the effect. Indeed, if results of assessment indicated suspicion of one or several geriatric syndromes, it was not systematically confirmed by further investigation and even less often resulted in important clinical interventions. However, the fact that there was also no difference in the per-protocol population does not support the hypothesis of insufficient adhesion. Rather, the qualitative study showed how detected issues were first discussed with patients and reassessed in the frame of how they affected their daily living. As further investigations or interventions were negotiated with patients in the long-term they may not have been captured within the trial's timeframe.

While there is now a substantial body of evidence describing the processes and predictors of functional decline, data is still markedly scarce in terms of interventions able to modify individual life-course trajectories, apart from multimodal exercise training. The question of when and in which population to initiate interventions targeting functional ability is still unsolved. Evidence from the Whitehall II study suggests that prevention of frailty should already begin in midlife.[134] Our qualitative results indicate that the majority of patients are willing to discuss age-related issues with their physician. Despite our negative findings, we believe that GP practices are the right place to accompany individuals in ageing because of their wide population coverage. We hypothesize however, that interprofessional teams, rather than physicians alone, may better suit this accompaniment. How and when to promote this patient-health provider dialogue should be the objective of further research.

The AGE tool was designed to act at the clinical level corresponding to the "micro-level" of the WHO's ICOPE framework.[135] While we believe it is a step in the right direction by providing GPs with an integrated approach instead of targeting individual syndromes, our results show that this is not sufficient and that additional steps are needed. It may have been more efficient to propose physical activity training or pro-cognitive activities to all participants, regardless of assessment results. In addition, a clinical tool by itself appears insufficient for promoting organisational changes leading to a more integrated care

("meso-level"), such as support for coordination of services. At the system (macro) level, policy and regulatory frameworks should be adapted to support integrated care by developing capacities and reforming financing mechanisms. To conclude, encouraging family GPs to screen older patients for geriatric syndromes and to propose management attitudes is not sufficient to slow down functional decline of older patients. System-level changes are needed to promote integrated care that includes patient preferences.

Contributors

SM and NS conceived the intervention. YM, NS and IL designed the study and wrote the study protocol. JS conceived and conducted the qualitative sub-study. IL, YM and JS analysed the data. YM and NS led the site work, including recruitment and supervision of data collection. YM wrote the first draft of the manuscript. All authors discussed the results and contributed to the final manuscript. All authors have seen and approved of the final text.

Declaration of interests

All authors declare no conflicts of interests.

Acknowledgments

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Characteristics of Swiss older patients followed in family medicine

Analysis of the characteristics of the study population of the AGE3 trial provide interesting information about community-dwelling older Swiss, in terms of patterns of health care use, prevalence of chronic conditions, and medication. Reflecting on those results can help to identify areas for improvements in the management of Swiss older patients.

Although AGE3 patients were not supposed to be representative of all Swiss 75+ individuals, their clinical and functional characteristics are close to characteristics of community-dwelling older adults living in Switzerland. Compared with data of the Swiss Health survey [3], our study population reported similar proportion of limitation in IADL (46.4% of AGE3 patients, compared with 28.4% in 65-79 years old and 60.5% in 80+ population-based data). However, AGE3 patients reported a much higher level of limitations in basic activities of daily living, which can probably by explained by the sensitive questioning about urinary incontinence used in our study, differing from self-reported limitations. Over two years, IADL scores decreased both in men and women, with a higher proportion of individuals losing at least one IADL than expected (more than 40% in both intervention and control group, compared to 10%, respectively 25% in our assumptions used for sample size estimation). Decrease in ADL was closer to data previously reported in Lausanne in the Lc65+ cohort [136].

Patients aged 75 and more followed in family medicine were seen frequently by their FP (more than eight visits per year on average in our results), confirming the central role of FP in their care. However, specialists such as cardiologists, orthopaedists or ophtalmologists aere regularly involved, and a high proportion of patients had benefited previously from surgical interventions which can potentially improve functional ability, such as cataract surgery (28.2%) or hip or knee replacement (16.1% and 12.6%, respectively). Indeed, Switzerland scores highest on hip replacement rates among OECD countries [137].

Polypharmacy is very common, present in more than half older patients, and with three quarters of them being prescribed potentially inappropriate medication. Besides, among patients aged ≥ 75 years followed in family medicine, important differences in prescription patterns were observed by sex/gender. Men

received more cardiovascular prevention drugs, whereas women received more mineral supplements and antidepressants, despite a similar prevalence of cardiovascular or psychological conditions in men and women. Cardiovascular drugs were also less prescribed in women.

The prevalence of both polypharmacy and PIM was comparable to findings from recent data from Switzerland [65], but higher than previous estimates [64, 70, 71] that were based on claims data and usually focusing on younger age groups (65+). Some differences in prescription by sex/gender may reflect true diagnosis prevalence differences. However, further attention should be given to potential under- or overdiagnosis of specific conditions in older patients, based on well-documented medical gender bias [76]. In contrast with previous studies in which older women were prescribed more PIMs [69, 73, 74], we did not identify major differences in overall PIM prevalence. However, the sex/gender differences we found in the type of PIMs echo the differences found in prescription patterns: women were more likely to have PIMs related to antidepressants, and men were more likely to have PIMs related to vasodilators. It will be interesting to compare our results with the ongoing OPTICA cluster-randomised trial that aims at improving medication appropriateness among Swiss multimorbid older patients [138].

Overall, if we extrapolate the results from AGE3 patients, most older individuals living in western Switzerland have regular and close consultations with their family physician. Their medical follow-up is characterized by frequent referrals to specialists, including for surgery, and they are prescribed many drugs for various chronic conditions, including for some geriatric syndromes such as mood disorders or osteoporosis. Most patients live independently at home, and only a minority uses home-based care.

Performance of the AGE tool

The AGE2 study compared the diagnostic performance of a brief assessment tool for geriatric syndromes (BAT) compared with a comprehensive geriatric assessment (CGA). We showed that the brief assessment tool (screening component of the AGE tool) was useful and appropriate to screen older patients for most geriatric syndromes. The study helped to finetune the assessment tool, especially in terms of instructions given to physicians (for example assessing vision with glasses on, as we are more interested in actual function than potential underlying disease).

We tested whether an intervention combining systematic screening for geriatric syndromes using the BAT with a management plan (referred to as “active geriatric evaluation (AGE) tool”) deployed in family medicine could limit functional decline of at least 75 years old patients over a two-years’ course, compared to routine care. The AGE3 cluster-randomised trial included 42 family physicians and 429 patients. We found no difference in incident disability between patients of the intervention arm compared to control arm. Also, it made no difference in terms of quality-of-life and health care utilization.

Several mechanisms can possibly explain the absence of effect of the intervention. Its rather moderate intensity compared with other similar trials [139], in line with its pragmatic nature, may have diluted its effect. Indeed, result of the assessment was often to suspect one or several geriatric syndromes, but this was not systematically confirmed and even less often resulted in important management interventions. Indeed, many conditions were already diagnosed at the time the study started, for example visual or hearing disorders, mood disorders, or osteoporosis. By contrast with trials targeting underserved populations [38], usual care in the Swiss context may already be very good, as indicated by the high proportion of patients already equipped with hearing aid or having undergone cataract surgery at baseline, or already taking antidepressant or drugs for osteoporosis. Therefore, for these patients, screening did not result in any new investigations or interventions. Also, physicians were reluctant to proceed with the full list of recommendations of the management plan, as seen in the low proportion of adherence for specific items in sections such as urinary incontinence or gait imbalance. However, the fact that there was also no difference in the per-protocol population does not support the hypothesis of insufficient adherence.

The AGE tool screens for most of the items used in similar tools [52], and covers all areas recommended by WHO’s ICOPE approach [46]. However, while there are increasing number of screening tools available for primary care, the evidence supporting their use is still very scarce. A recent systematic review of comprehensive geriatric assessment in primary care found only four studies conducted in such a setting [40], with mixed impact on clinical outcomes and no impact on functional ability in the only study assessing it [41]. In our study, the intervention was a brief assessment delivered by physicians, by contrast with the other trials where geriatric assessment were comprehensive and delivered by geriatricians or specifically trained nurse practitioners. Furthermore, our results contrast with those obtained in home-based

management programs, which have shown an impact to prevent functional decline in participants [24, 38, 39]. Also, our study population may have been less selected than that of other studies, for example targeting frail patients [128].

Our qualitative evaluation provides some additional hypotheses to explain this absence of effect. While our trial provided no evidence in favour of earlier geriatric evaluation, qualitative feedback from physicians involved in the trial was that the tools provided were judged mostly useful, but to be used on an individual basis and not systematically starting from a predefined age. FPs reported mixed views about whether the AGE tool modified their clinical practice, and they could not say whether it induced a long-lasting change. Some FPs reported that sometimes the tool detected new issues, but that they did not necessarily act upon them.

Strengths and limitations

There are few clinical data available in Switzerland describing the characteristics of older patients seen in primary care. Our study helps to fill the existing gap between data collected at population level (Swiss Health surveys, Lc65+ cohort) and studies conducted in specialized geriatric centres, by providing valuable information on clinical characteristics and health care use of older patients.

The AGE3 trial can be considered a well-conducted methodologically sound trial, which concluded the rigourous development process of the AGE tool. In terms of risk of biases, the only area for some concern was bias due to deviation from the intended intervention. Indeed, physicians in the control arm might have been more attentive to geriatric issues in their patients, and physicians in the intervention arm did not adhere to all recommendations from the tool, which was in fact consistent with the pragmatic nature of the trial. Otherwise, there were low risk of biases arising from the randomization process, from the timing of identification and recruitment of individual participants in relation to timing of randomization, due to missing outcome data, in measurement of the outcome and in selection of the reported result [140, 141].

In terms of external validity, some amount of selection is unavoidable when conducting this type of trials that implies a significant investment from participating physicians. Practice recruitment was influenced by

preexisting personal relationships with the investigators, thereby selecting practices more likely to be involved in teaching for example. Such practices may be more up to date in terms of continuous education than others. Also, the topic of the trial was known at the time of recruitment, and practices more interested in geriatric care may have been selected, even if we excluded physicians with a complementary title in geriatrics. Practices in the control arm may have provided better care than the average practice in the area. In terms of physicians' socio-demographical characteristics, women were slightly more represented compared to national statistics (42.9% in AGE3 compared with 36.6% (364/984) women active in 2017 in the ambulatory sector, specialists in general internal medicine or practicing physicians, in the cantons of Vaud, Neuchâtel, Fribourg[142]); AGE3 physicians were also slightly younger (48.2 years old compared with 54.8 years in the ambulatory sector in Switzerland in 2017, including specialists), and there were more specialists in general internal medicine (90.4% vs 77.8%). We cannot exclude that the AGE intervention may have worked if deployed in an unbiased sample of practices, although we believe that this is unlikely, especially considering that adherence to the intervention would have been probably much lower.

Finally, the choice of our outcomes can be criticised. First, disability in activities of daily living is not gender-neutral, as many of the surveyed activities are not equally distributed between men and women [129]. Second, enquiring about quality-of-life using the WHOQOL-OLD was felt as intrusive by many study participants, resulting in study withdrawals or incomplete data. In addition, there is little evidence that a clinical intervention can profoundly impact people's quality of life, outside of acute events such as accidents. Indeed, clinicians believe they play in their central role in people's lives, but wellbeing depends on many other domains than absence of disease [143]. Few chronic care clinical interventions have actually been able to improve patients' quality-of-life. For example, the much talked about 3D trial that compared a patient-centered complex care intervention in multimorbid patients failed to demonstrate an impact on health-related quality-of-life after 15 months, although measures of patient-centeredness improved [130]. Unfortunately we did not include such measures in our trial, as our intervention did not target centeredness or integrated care per se. However, it would have been useful to include at least a measure of patient satisfaction or continuity of care, for example the PACIC score used in the 3D trial [131, 132] or the more recently developed the Patient Experience of Integrated Care Scale (PEICS)[133].

Whom to target to prevent functional decline?

Identifying precisely the population who should benefit of interventions to slow down functional decline is one of the key issues. We did observe marked functional decline in our study participants, much higher than anticipated in our sample size assumptions, which confirms us in our choice of selecting over 75 years old individuals. The AGE3 trial was an attempt to detect geriatric syndromes earlier than when people become clients of home-based services. We could not show an effect of such a strategy. Evidence from the Whitehall II study suggests that prevention of frailty should already start at midlife [134]. Multiple studies have shown the importance of social determinants in shaping life trajectories, including functional trajectories. But when to act on them most efficiently is still unknown.

On one hand, we could argue that optimizing "functionality" should be every individual's lifelong concern. On the other hand, living one's life only to prevent functional decline at the end of it does not constitute a very appealing perspective, and individuals may have other more pressing concerns. So, when is the ticking point? When is it best to intervene? When should family physicians start to enquire about functionality and when are patients willing to discuss age-related topics? Our qualitative results indicate that 75+ patients are willing to discuss age-related issues with their physician, even though they may not by themselves initiate a conversation on this topic. Also, cohort studies indicate that more recent birth cohorts become more health-conscious than previous ones [144]. Attitudes towards aging and functional decline may also evolve over time. How and when to promote this patient-physician dialogue should be the objective of further research.

We believe that family practices are the right place to accompany individuals towards ageing. One of the specificities of family medicine is the long duration of patient follow-up, as physicians age along their patients. One could say that by definition family physicians use a life-course perspective. However, insights to ageing gained from sociological and epidemiological approaches have not yet been translated into better patient care. Construction of physicians' identity still relies very much upon the biomedical model and curing diseases. If we want physicians to address functionality, other aspects such as social

determinants of health, community health, management of chronic conditions and multimorbidity should be much more emphasized during their training.

How to prevent functional decline – towards integrated care?

While there is now a substantial body of evidence describing the process and predictors of functional decline, the evidence is still markedly scarce in terms of interventions able to modify individual life-course trajectories, apart from multimodal exercise training. Such evidence is needed to convince public health actors to invest in practice organization and system-level changes. Various initiatives aiming at influencing social determinants of health have been explored, such as prescribing housing [145] or social contact [146], but outcomes so far have been poor [147, 148]. The main critic that can be made against this approach is the oversimplistic belief that every problem can be solved by a medical prescription.

The AGE tool was designed to act at a clinical level, corresponding to the “micro-level” of WHO’s ICOPE framework [135]. While we believe it is a step in the right direction, by providing physicians with an integrated approach instead of targeting individual syndromes, our results show that this is not sufficient, and that additional steps are needed. Physicians can coordinate care plans and liaise with other actors such as home-based care, specialists, and social workers. But this requires integrating assessments done by others such as interRAI assessment done by home-based care [149] and medication reviews done by pharmacist, taking the time to sit together to discuss care plans and priorities, liaising with specialists to discuss next steps, and discussing all this with patients and families. In the current organization of Swiss family medicine, this seems hardly feasible.

Actions at “meso-level” are required, which include promotion of interdisciplinary family medicine teams and promotion of care coordination. Lessons learned from studies of various declinations of the Chronic Care Model could be applied to management of older patients [150-153]. Indeed, health care in Switzerland is still predominantly physician-centered. Family medicine practice could be reinforced by nurses, who could conduct geriatric assessments or integrate the ones done elsewhere, discuss care plans with the physician, patient and families to agree on priorities, and actively follow the steps of the plan. Motivating patients to change behaviour, for example increasing physical exercise, accepting to stop

unnecessary medication, or joining a social event, all this takes time which physicians rarely have. Case management interventions have shown their benefit particularly when associated with multidisciplinary care plans [153, 154]. Better care coordination includes discussing treatment option together with FP and specialist when patients are referred. Indeed, geriatric interventions based on multidisciplinary team such as the GRACE model developed by the Veteran's Administration seemed to be able to show better uptake [155].

At "macro-level", there are a number of financial and structural barriers to coordinated care in Switzerland. Financial mechanisms should be developed for nurses to work in family practices, be it by fee-for-service or as a capitation model. One could imagine a fixed fee for each patient aged 65 and older registered to a family practice, meant to pay for the coordination work but which could also including specific preventive activities targeting older individuals. Also, reimbursement policies for auxiliary materials such as hearing aids or orthopaedic devices are complex in Switzerland, which limit access to devices. In addition, shared or pooled funding approaches should be developed for health and social services in Switzerland, in line with WHO's ICOPE framework [135]. Promoting multidisciplinary teams also questions the size of Swiss medical practices. Indeed, hiring a nurse or a social worker may not be efficient for a practice housing only 2 or 3 physicians.

Conclusion

To conclude, encouraging family physicians to screen older patients for geriatric syndromes and proposing management attitudes is not sufficient to limit their functional decline. We recommend to further explore the advantages of using family practices as entry points for geriatric evaluation, but to accompany the process by practice and system-level changes that favour interprofessional teams and coordinated care.

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Supplementary material:

Paper 1. Drug Prescription in Older Swiss Men and Women Followed in Family Medicine.

Table 14. Potentially inappropriate medication in older adults included in AGE3 study, by sex/gender, based on American Geriatrics Society 2015 Beers Criteria Update

Category	n patients % (N=429)		Women (N=269) %		Men (N=160) %		p	Drugs	ATC code or class	n prescriptions % (N=429)	
Medications that should be avoided in most older adults											
Gastrointestinal	100	23.1 %	61	22.7 %	39	24.4 %	0.687				
								Proton-pump inhibitors >8wks*	A02BC	99	23.1%
								Metoclopramide	A03FA01	6	1.4 %
Benzodiazepines	92	21.5 %	61	22.7 %	31	19.4 %	0.420				
								Lorazepam	N05BA06N05BA56	43	10.0%
								Oxazepam	N05BA04	25	5.8%
								Alprazolam	N05BA12	7	1.6%
								Clorazepate	N05BA05	6	1.4%
								Triazolam	N05CD05	5	1.2%
								Clonazepam	N03AE01	4	0.9%
								Flurazepam	N05CD01	3	0.7%
								Temazepam	N05CD07	1	0.2%
								Diazepam	N05BA01N05BA17	1	0.2%
Non-cyclooxygenase-selective NSAIDs, oral	71	16.6	49	18.2 %	22	13.8 %	0.229				
								Ibuprofen	M01AE01	39	9.1%
								Diclofenac	M01AB05	14	3.3%
								Naproxen	M01AE02 M01AE52 M01AE56	10	2.3%
								Mefenamic acid	M01AG01	5	1.2%
								Etodolac	M01AB08	3	0.7%
								Piroxicam	M01AC01	1	0.2%
Nonbenzodiazepine, benzodiazepine receptor agonist hypnotics	42	9.8%	24	8.9%	18	11.3 %	0.433				
								Zolpidem	N05CF02	37	8.6%
								Zopiclone	N05CF01	6	1.4%

Cardiovascular	21	4.9%	9	3.4%	12	7.5 %	0.054				
								Amiodarone	C01BD01	15	3.5%
								Digoxin	C01AA05	4	0.9%
								Nifedipine, immediate release	C08CA05	3	0.7%
								Doxazosin		1	0.2%
Anticholinergics	9	2.1%	4	1.5%	5	3.1 %	0.252				
								Scopolamine	A03BB01	5	1.2%
								Hydroxyzine	N05BB01	3	0.7%
								Diphenhydramine	R06AA02	1	0.2%
Antithrombotics	0	0.0%									
Anti-infective	2	0.5%	0	0.0%	2	0.7 %	1.000	Long-term nitrofurantoin	J01XE01	2	0.5%
Antidepressants	11	2.6%	11	4.1%	0	0.0 %	0.010	Paroxetine	N06AB05	7	1.6%
								Amitriptyline	N06AA09	2	0.5%
								Doxepin (>6mg/d)	N06AA12	1	0.2%
								Trimipramine	N06AA06	1	0.2%
Barbiturates	0	0.0%									
Antipsychotics								8 patients (1.9%), rationale impossible to assess			
Endocrine	1	0.2%	0	0.0%	1	0.4 %	1.000	Estradiol	G03CA03	1	0.2%
Subtotal	240	55.9 %	152	56.5 %	88	55.0 %	0.761				
Condition (ICPC-2 code)	Medications that should be avoided with specific disease or syndrome because they could worsen the condition.										
Chronic kidney disease (any creatinine clearance; specific variable “renal insufficiency”))	21	4.9%	16	6.0%	5	3.1 %	0.199	NSAIDs	M01A	21	4.9%
Heart failure (k77)	19	4.4%	9	3.5%	10	6.3 %	0.157	NSAIDs	M01A	17	4.0%
								Diltiazem	C08DB01	1	0.2%
								Verapamil	C08DA01	1	0.2%
History of fractures (a29, l72, l73, l74, l75, l76)	13	3.0%	12	4.5%	1	0.6 %	0.025	Benzodiazepines	N05BA, N05CD	8	1.9%
								Nonbenzodiazepine, benzodiazepine receptor agonist hypnotics	N05CF	3	0.7%
								Anticonvulsants	N03	2	0.5%
								Tricyclic antidepressants	N06AA	2	0.5%
								Opioids	N02A	1	0.2%
								SSRIs	N06AB	1	0.2%

Chronic seizures or epilepsy (n88)	1	0.2%	1	0.4%	0	0.0 %	1.000	Olanzapine	N05AH03	1	0.2%
Delirium, insomnia (p71)	0										
Dementia or cognitive impairment (p70)	1	0.2%	1	0.4%	0	0.0 %	1.000	Antipsychotic	N05AH	1	0.2%
Parkinson's disease (n87)	1	0.2%	1	0.4%	0	0.0 %	1.000	Antipsychotic	N05AH	1	0.2%
Gastric or duodenal ulcer (d85, d86)	0										
Lower urinary tract symptoms, benign prostatic hyperplasia (u05, u07, u08, u13, y85)	0										
Subtotal	52	12.1 %	36	13.4 %	16	10.0 %	0.299				
Medications that should be used with caution by older adults											
Diuretics	122	28.4 %	72	26.8 %	50	31.3 %	0.319	Use with caution, may cause SIADH	C03		
Aspirin for primary prevention of cardiac events in 80+ years old	85	19.8 %	49	18.2 %	36	22.5 %	0.282	Use with caution by patients aged ≥80 years	B01AC		
Vasodilatators	62	14.5 %	30	11.2 %	32	20.0 %	0.012	Use with caution, may cause syncope	C01D, C04, C07F		
SSRIs	53	12.4 %	42	15.6 %	11	6.9 %	0.008	Use with caution, may cause SIADH	N06AB		
Serotonin and norepinephrine reuptake inhibotrs (SNRI)	12	2.8%	8	3.0%	4	2.5 %	0.773	Use with caution, may cause SIADH	N06AX16, N06AX21, N06AX17, N06AX23		
Mirtazapine	11	2.6%	6	2.2%	5	3.1 %	0.571	Use with caution, may cause SIADH	N06AX11		
Antipsychotics	10	2.3%	7	2.6%	3	1.9 %	0.629	Use with caution, may cause SIADH	N05A		
Tricyclic antidepressants	5	1.2%	5	1.9%	0	0.0 %	0.083	Use with caution, may cause SIADH	N06AA N06CA		
Dabigatran	1	0.2%	1	0.4%	0	0.0 %	1.000	Use with caution if >75 years or chronic kidney disease	B01AE07		
Carbamazepine	1	0.2%	0	0.0%	1	0.4 %	1.000	Use with caution, may cause SIADH	N03AF01		
Subtotal	**245**	**57.1 %**	**154**	**57.3 %**	**91**	**56.9 %**	**0.940**				
Total	**329**	**76.7 %**	**205**	**76.2 %**	**124**	**77.5 %**	**0.760**				
Subtotal drug-drug interactions at risk by older patients	**26**	**6.1%**	**13**	**4.8%**	**13**	**8.1 %**	**0.209**				

Subtotal using drugs while having a reduced creatinine clearance	**23**	**5.4%**	**15**	**5.6%**	**8**	**5.0 %**	**1.000**				

***** IPP : includes 17 patients on NSAIDs, 13 on cortocosteroids and 1 patient on both
One patient can receive more than one drug of single category (for example amiodarone and digoxine in “cardiovascular”)
Abbreviations: ATC: Anatomical Therapeutic Chemical (ATC); ICPC: International Classificaiton of Primary Care; NSAIDS: Non-steroidal anti-inflammatory drugs; SIADH: syndrome of inappropriate antidiuretic hormone secretion; SSRI: Selective serotonin reuptake inhibitors

Table 15. Cross-tabulation of brief assessment tool results, by result of comprehensive geriatric assessment

	Geriatrician		
Family practitioner			
Functional dependency (N=83)	Little	Moderate	Important
- Little	68	1	0
- Moderate	3	7	2
- Important	0	1	1
Cognitive disorder (N=83)	None	Possible	Certain
- None	39	8	1
- Possible	18	9	1
- Certain	1	1	5
Clock test (N=78)	Normal	Limit	Pathologic
- Normal	58	3	4
- Limit	4	0	0
- Pathologic	4	1	4
Mood disorder (N=85)	None	Possible	Certain
- None	34	7	4
- Possible	14	5	6
- Certain	5	6	4
Walking disorder (N=84)	None	Light	Severe
- None	37	5	0
- Light	19	11	2
- Severe	1	5	4
Falls during past year (N=81)	No	Yes	
- No	48	8	
- Yes	8	17	
Risk of falls (N=81)	Low	Moderate	High
- Low	39	8	1
- Moderate	11	9	4
- High	3	4	2
Osteoporosis (N=77)	No	Yes	
- No	27	8	
- Yes	14	28	
Undernutrition (N=81)	Absent	At risk	Present
- Absent	50	18	0
- At risk	5	3	1
- Present	2	0	2
Visual impairment (N=83)	None	Light	Severe
- None	11	11	0

- Light	13	38	5
- Severe	0	2	3
Hearing impairment (N=82)	None	Light	Severe
- None	37	6	1
- Light	6	17	3
- Severe	0	7	5
Urinary incontinence, any type (N=82)	Absent	Present	
- Absent	41	8	
- Present	7	26	

Paper 3. Discussing age-related functional decline in family medicine: a qualitative study that explores both patient and physician perceptions

Supplementary material

1. Patient interview guide
2. Physician interview guide
3. Consultation observation guide
4. Analysis of patient interviews (themes, categories and illustrating quotes)
5. Analysis of physician interviews (themes, categories and illustrating quotes)

Table 16. AGE qualitative study: patient's interview guide

The grid was adapted throughout the beginning of the study. This is the adapted version.

Date : _ _ / _ _ / _ _ _ _ Patient ID : _ _ _ _

Aim	Themes identified in literature / Hypothesis		Questions	Further questions
Introduction			○ We propose you to participate in this study because you are one of the patients included in the trial evaluating the management of age-related diseases ○ This interview is confidential; you can decide to stop it at any time or not to discuss some topics if you do not want to. ○ Do you have any questions before we start?	
Patient's perception of the intervention	*Relevance of the intervention from the patient's point of view* *Feelings about the issues raised or questions asked during the intervention*		○ How did you feel during the visit? ○ What do you think about talking about autonomy with your GP? ○ What do you think about the topics discussed during the visit? ○ Did you have enough time in the consultation to discuss these topics? ○ How much do you think your doctor can help you with these topics / questions? ○ Why do you think screening is done? ○ What role should your doctor have in dealing with problems that occur with age?	○ Have any questions made you feel uncomfortable? ○ Did you find the questions relevant? ○ In your opinion, are there other important aspects of your autonomy in everyday life that you did not mention during the interview?
Explore the patient's representations of his own autonomy	*Autonomy is not perceived in the same way by the patient as by the caregiver* *Autonomy goals*		○ What does it mean for you to be autonomous / autonomy? ○ What are your current goals of autonomy?	○ How important is your autonomy?
Factors limiting ou facilitating autonomy	• *Relatives / social network* • *Financial status* • *Family doctor* • *Place of residence* • *Level of education*		○ How would you describe your degree of autonomy in your everyday life? ○ What factors / events could affect your autonomy?	○ Is the place in which you live related to your degree of autonomy? How ? ○ Have you ever had to give up some types of care for financial reasons?

			○ What factors / events could enhance your autonomy? ○ Do you anticipate problems that may occur with age?	○ How does the environment influence the autonomy of a patient?
Patient autonomy regarding their health choices	*Loss of independence in health choices with age?* *Role of family and doctor in health decisions*		○ Do you think being autonomous in choices related to your health? ○ What connection do you see between your health and your independence? ○ What influence do your relatives / doctor have on your health choices?	

Table 17. AGE qualitative study: GP interview guide

The grid was adapted throughout the beginning of the study. This is the adapted version.

Aim	Themes identified in literature/ Hypothesis		Questions	Further questions	Memos
Introduction			○ We propose you to participate in this sub-study as one of the physicians included in the "intervention" arm of the AGE study. ○ This interview is confidential ○ Do you have any questions before we start		
GP' perception of the intervention	*Usefulness / relevance of the intervention from the GP's point of view*		○ What feeling do you have after using the brief geriatric assessment tool? ○ What utility do you see there? ○ How did screening become part of the consultation? ○ What do you think about the topics discussed during the consultation? ○ When is the right time to do the screening? ○ What benefit can you get from this kind of approach as a GP? ○ How do your patients welcome the screening? ○ How much do you think it is your role to address these issues? ○ If the AGE tool was validated, would you use it? How?	○ Did you have a problem with having to address some of the questions? ○ Did you find the questions relevant? ○ In your opinion, are there other important aspects of autonomy in everyday life that were not addressed during the interview? ○ Have you discussed aspects that you would not have addressed otherwise? ○ Have you discovered new problems in your patients that you did not suspect?	

Explore the doctor's representations of the autonomy of his patients	• *Autonomy is not perceived in the same way by the GP as by the patient*		○ How do you define the autonomy of your patients? ○ Does your definition vary according to the patient? ○ How important is it to address this issue during consultations?	○ Do you spontaneously address this issue in consultation?	
Factors limiting ou facilitating autonomy	• *Relatives / social network* • *Financial status* • *Family doctor* • *Place of residence* • *Level of education*		○ What factors / events could affect your patient's autonomy? ○ What factors / events could enhance your patient's autonomy?	○ Is there a relation between the place in which your patients live and their degree of autonomy? How? ○ Have you ever had to give up some types of care because your patient could not afford it? ○ How does a patient' social network and environment influence his/her autonomy ?	
Patient autonomy regarding their health choices	• *Loss of independence in health choices with age?* • *Role of family and doctor in health decisions*		○ Do you think you influence your patients in their health choices? How? ○ What connection do you see between the health status of your patients and their degree of autonomy?	○	

Table 18. AGE qualitative study: consultation observation guide

Date : _ _ / _ _ / _ _ _ _		**Patient ID : _ _ _ _**	
Themes		**Questions**	
Consultation framework		○ What is the purpose of the consultation? ○ Which steps emerge from the consultation? ○ How long is the consultation? ○ How long did each step take ○ How long for the AGE tool? ○ How long for the care plan? ○ Who took part in the consultation?	
Active geriatric evaluation (AGE tool)		○ How does the GP introduce the AGE tool? ○ In which order does he/she introduce the items? ○ Is the AGE tool used as a block or split into several consultations? ○ Are all items discussed? ○ If some items are not discussed, is that purposeful? ○ If some items are not discussed, does the GP inform the patient? ○ Are some topics explored more thoroughly than others? Which ones? ○ Are other topics than those contained in the AGE tool addressed? Which ones? ○ Does the GP delegate a part of the AGE tool?	
Care plan		○ Is the care plan discussed during the consultation? ○ If not, does the GP inform that the items highlighted through the AGE tool will be discussed in another consultation?	
Interactions		○ What is the attitude of the GP? ○ How does the patient react to the items discussed? ○ How much time is devoted to the discussion? ○ How much time is devoted to the information? ○ How are the atmosphere and dynamics of the consultation overall?	

Table 19. AGE qualitative study: Analysis of patient interviews

Themes	Categories and illustrating codes	Illustrating verbatim
Participant's view on autonomy	**Physical ability/ability to be mobile/to drive** Code: car guaranteeing autonomy	*"I'm worried about it (…) - not dramatically, because I'm expecting it - but I'll have to see how I can stay independent if I cannot drive anymore." (ID 13)*
	Ability to perform tasks independently "To do things myself" Code : Autonomy : do it yourself	*« I once hired a lady to clean a little, but otherwise I like to do it myself. I do not like to stay uh ... unless it hurts badly. Otherwise I always like to do it myself. » (ID 2)* *"For me, the main thing is that I can do as much as possible alone." (ID 15)* *« Well it's still important even if we still have a companion - we're lucky to be two - but it's important to be able to do things alone. » (ID 5)*
	Ability to perform tasks independently "To do what I want" Code: being autonomous is doing what I want	*« I see that I can do what I want. That I must not ask someone. That I am free to choose what I want, to go out when I want, to work when I want. » (ID 10)*
	Need to seek support Code: perception of one's level of autonomy	*"There are some things I can't do anymore. Like, someone comes to help me with the housework, just mopping and vacuuming, the rest I do myself. My daughter does the washing now because I'm struggling hanging it […]. That's the two things that changed for me. The rest I can manage." (ID 14)*

	Help from the spouse Code: help from the spouse if necessary	*"So far, though it's difficult, I'm totally autonomous. I can even put on and take off my own support stockings, which isn't easy. […] I could count on my wife for help if needed, but for now I can cope." (ID 7)*
	Residual abilities Code : important abilities to maintain	*"[To me, autonomy means] that I can get up in the morning, I can get dressed, make my lunch, and that I can even dust a little. Well, watch TV too [laughing] and do my crosswords. That's it really- that I can still do things." (ID 1)*
	Comparison: to others Code: comparison to others	*"I see differences (in my abilities) yes, but I can't complain compared to lots of other people the same age I know." (ID 3)*
	Comparison : ability to travel Code : the hardest part is to accept the problems that arise	*"What I regret is that we do not talk enough about it. It is to observe this sudden decrease ... I do not know if it is for everyone like that. I used to be very enthusiastic. I am not at all anymore. I used to be very curious, I am less curious now. I used to travel a lot, I liked to travel, I do not like it anymore. And I regret it, but it's like that. I do not like it anymore and I think it's awful." (ID 10)*
Attitudes toward functional decline	**Perception of decline: acute vs slow events** Code: slow deterioration	*« I would say it is when you have a rupture, because I tend to go to the doctor when there is a problem. A brutal problem that happen.... More difficult are the slower elements that ... slow degradation. It would be less likely to do so (consult your doctor). » (ID 3)*
	Perception of decline: ambivalence with falls Code: go to the GP when one cannot walk anymore	*"I fell not long ago, the crutches are still there. I don't understand how I managed to fall, because I felt like I did everything right but I still fell." (ID 8)*

	Perception of decline: feeling of shame Code : unexplained fall, feeling of shame	*"C: you're not going for walks around anymore because you're afraid to fall again ...?* *P: I would like it but ...* *C: to avoid worrying your wife?* *P: that's it, so we're going together now. We like it, I like to go with her [silence]. I get a little worried because I do not know how I fell. Because I stopped, I looked left, right, there was a small wall but ... I looked well. I have the feeling of having taken the step. Did I hook with the other foot, I do not know. (...) And well they said: "we call the doctor!" The only thing I could say is ... I said no! because I felt like I was an idiot [laughing] (…)* *I did not see the utility of the call. I got up and that was it. And after that, it went well! [to laugh].* *C: hum hum. But then you would have no problem talking to the doctor about it when you saw him the next time?* *P: no no, no no. Well, he has to ask questions sometimes because ... I do not speak like that. (...). Well, I do not know, I do not know how others do it, but if I fall and after a day or two I have nothing, I'm not going to talk about it, what's the point?* *C: yes* *P: I'm probably wrong, but hey it's like that, I'm like that. " (ID 8)*
Attitudes toward functional decline	**Coping strategies** Codes: - « We live very simply » - Walk less far to be able to come back	*"I do not do a lot of things anymore. We do not go for miles, we do not hike, we used to, but we do not any more. So… we live more simply." (ID 8)* *"I know what I can do. In the past I was a good walker, I could walk 8-9h in a row. But now when I'm doing 2.5-3h it's over. So I'm not going far because we have to be able to return." (ID 8)*

	Acceptation Code : the hardest part is to accept the problems that arise	*"I think the main problem is accepting that you're not the same any more. All of a sudden, you're limited, I don't know if it's like that for everyone, but for me that's the hardest. (...). I used to be really enthusiastic. Not anymore. I used to be quite curious, I am less now. I travelled a lot, but now I don't want to. It's sad, but that's how it is. I think it's awful." (ID 10)*
	Valued activities Code : consequences of autonomy loss – self-esteem	*"Not being able to wash, not being able to shave... I'd feel like I'm not a man anymore, (…) I'd be a burden. " (ID 8)*
Attitudes toward functional decline	**Valued activities** Code : "If you take that away, I'm lost"	*"Getting washed, getting dressed. Those sorts of things. If I can't do that, I'd be lost. Stuff like that bothers me a lot." (ID 2)*
	Fear of becoming dependent Code: important abilities to maintain	*"Every day that goes by I tell myself: "It's a day less in a home!" (ID 15)*
	Acceptability Code : aging is like a blooming flower	"*Well, it's coming very slowly, so you can't be disappointed" (ID 13)*

	Acceptability Code : I helped before, they help me now	*"Well, I helped before, they should help me now ". (ID 14)*
	Normality of ageing Code : it's normal to get old	*"It's normal to get old and weak" (ID 3)*
	Delay functional decline onset Code: move to stay in shape and to keep your head	*"I am moving. I think this is the best way for everything. Whether for the legs, for the arms, for everything, you have to move. And it's good for the head too huh? Because when the head goes well the rest goes too, huh? That's my opinion, now everyone can think differently." (ID 14)*
Discussing age-related issues with the GP	**No need to talk about normal ageing** Code: Sometimes I do not tell him everything	*"I go [to my doctor], I tell him what's wrong but... Sometimes I don't tell him everything (…) I think I have some things because I'm not 20 anymore, so you know, there's no need to... make a fuss. (…) If my shoulder hurts now and then, it's not every day, so I don't want to go [to the doctor] every 5 minutes [laughs]. I already feel like I've gone too often in the last 20 years. [...] It's not really going to the doctor that bothers me, it's thinking you went for nothing. I feel like I annoy him. Because I'm fine really. " (ID 8)*

	Not talking about problems that don't have solutions Code : To hide age-related problems to the GP Code : To talk about memory problems to the GP	*"I won't mention it [losing my memory] to him. It is getting worse, but I never said it isn't. Would I tell him about it? Well, I probably wouldn't remember to!" (ID 3)*
	GP is a partner Code : The doctor suggests, I decide	*"I personally think a doctor's role is to make you aware of something. He suggests things and I decide." (ID 6)*
	GP helps because he *knows* Code : speak with the GP to improve autonomy Code : important to talk about autonomy with the GP	*"It is very important to me. Because that's what allows me to go on, despite ... all the difficulty. So, um, anything that can help my autonomy, I need to be able to talk to him about it." (ID 7)*
Active screening of issues by the GP	**Ask specific questions to go further** Code: screening to detect problems	*"Usually, [the doctor] asks if everything is okay and we say yes. And so it's good, we're fine then. But perhaps with more specific questions, he'd be able to see that something's not quite right." (ID 3)*
	Avoid unanswered questions Codes : - screening to reassure oneself - screening to improve knowledge and health	*"It seems to me the most important thing is that it reassures us. Isn't it? If we're reassured we can positively take part in some way to improve the situation." (ID 7)*
	GP knows very little about real living conditions	*"I do not think he can do anything. He will give me medicine if I tell him that something is wrong. Good. Apart from that, he can give me some advice maybe. But he does not know how one lives (...). " (ID 3)*

	Code: the doctor does not know how one lives	
	Effect of screening on health perception Code : "These questions bring me the idea that I am old"	*"made him feel old" (ID 8).*
	Effect of screening on health perception: not perceived as a paternalist experience	*I : To what extend do you think it's the role of your GP to ask you questions about autonomy, about [list of screening items]?* *P: I think it's his role, because he's my doctor! It's his role to treat me, so it's normal that he asks questions* *I: Including all these things about independence and dependence?* *P: Yes!* *I: To get dressed, to wash, things like this?* *P: Yes. If he judges that I have problems, that I'm ill, that there are things I can't… together we can discuss. I tell him how I feel, and he says how he judges that. I think it's his role to know. A friend doesn't need to know, but he must know. Of course he is not God, but he's the doctor. He tries to help us, as much as possible. (ID 3)*

Table 20. AGE qualitative study: Analysis of general practitioners interviews

Themes	Categories and illustrating codes	Illustrating verbatim
Role of GPs	**The role of GPs is to address autonomy**	*"The advantage I see is that it [the screening tool] gives you a different outlook on patients. You can leave the usual biomedical professional structure, so to speak and get a more global practical assessment of a person. It brings out problems we might not have thought of, or that often get pushed into the backseat in ordinary consultations where we generally focus on acute issues occurring since the last consultation or small accidents which, in a way, tend to mask the general underlying trends of a person's evolution". (M003)*
	Role beyond primary care, into social lives of patients	*I: Do you think it's your role to discuss aspects related to everyday autonomy with your patients?* *GP: I think it can, yes, as a GP. Because in the end, sometimes, we can a bit like social workers… we do everything! (M005)*
	In practice, consultation occupied with management of acute events or known chronic issues	*With some patients, we never have time to talk about other things than their acute problems, or their known chronic issues. It takes up all the time in the consultation. There is no time to naturally start discussing… (M001)*

	GP is someone you can talk about your problems with	*This is a place where you can come and talk about yourself and your problems. I think talking with your GP is a bit like talking to yourself in a different way, a way to put things down on the table in front of yourself… and it helps raising awareness about some things that are happening to us… (M003)*
	Difficult to know how people live, in terms of socioeconomic and autonomy conditions	*Sometimes we discover things when we visit patients at home, when they are no longer to get to us. And then, often, we realise we were completely off in the way we imagined [their environment]. And we then discover that indeed, they have a dog, and the dog can't be taken outside, and it relieves itself. And that the patient needs help to prepare his meals… But it's true, very often we don't know what it really happening at home. Because we haven't paid too much attention to the question, that's often why. (M004)*
	People don't disturb the doctor "for nothing", especially in rural areas	*I have patients that follows a mode of "do not disturb"… at least older patients that live in rural areas, they don't want to disturb their doctor for nothing (M005)*
	Some solutions exist on how to alleviate some issues, but they are less perceivable compared to deterioration	*Sometimes, we do a sort of check-up, comparing with the situation 3 or 6 months ago. If they see that there has been an improvement because it was worse before, then they will comply [with our recommendations]. A better compliance. But improvements are not necessarily more spectacular compared to deterioration. They may not see the benefit of the treatment, and*

		they will stop. A good example is antidepressants. (M004)
Exploring, discussing decline with older patients	**Investigation when you see some signs of issues**	*With patients that don't spontaneously speak of their problems, we won't necessarily start exploring when everything is fine. Then, when they start showing signs of dependence, then we'll explore. (M004)*
	Decline is progressive in older people, difficult to identify it **Some patients don't want to see/acknowledge their functional decline**	*Often, there is a progressive decline of functions. So often we don't notice that we are losing hearing or sight acuity, or gait, or memory capacity… And it is this progressivity, the fact that it's so insidious, that makes us notice too late, when decompensation has happened. There is also the fact that sometimes we don't want to see, we want to put on blinders. And it's true that such tests (AGE tool) allow quantifying things easily and raise awareness on some things that are consciously or unconsciously masked. (M004).*
	Exploring and maintaining quality of life of older patients, rather than screening and investigations	*In older patients, what I rather do, is to sort out their medicines and I stop all that can be stopped. That's a central question. Seeing the life expectancy they have, what is more important? Do we really need to investigate, try to find illnesses? Or should we rather try to make them as well as possible, maintain them autonomous as long as possible, ensure they suffer as little as possible, and especially that they don't suffer from side effects of treatments? That's really the question… typically I will be less strict on*

		hypertension treatment, same thing with diabetes, I would be less strict. (M001)
Active geriatric evaluation (AGE tool)	**Discovering new things**	*This screening doesn't disturb the consultation, and it's not unpleasant because it allows signalling two or three little things. Often, it signals things we were already aware of, so it arrives like hailstorm after harvesting. But sometimes, for example on topics like mood, all of a sudden it allows bringing awareness on things that would have never been brought up spontaneously in consultation. (M002)*
	New things that may not be pertinent for the patient, may not be a "medical issue".	*What is weaker [about the AGE tool] is the urinary item, because it's very sensitive, so it signals an issue very easily, more than every other patient, and in the end, patients integrate this issue, or adapts to it, and they don'' necessarily want to make it a medical issue. Often they tell me "Yes, find, but leave me alone with it!", and we don't discuss this further (M002)*
	Too normative, too standardized? **Keep the patient and his/her demands at the centre**	*We need to be careful, because we're under big pressure from many sides : university medicine, pharma industry, some norms, some lobbies… I think for example of the Alzheimer lobby, they tell us to explore, screen, prevent, advance directives, etc. But finally, in the end, by trying to empower, we infantilise people, if we do it too normatively. So I tend to say we need to remain open, and we need to always adapt to the*

		response, to what we perceive from the patient's requests. Because in the end, demand must take precedence over needs. (M002)
	Not all patients want to prevent things in older age	*Knowing that, as life expectancy diminishes, long-term preventive measures no longer make sense. You've seen that patient [during observation], he didn't want to take his statin, the drug to lower his cholesterol. Of course, if you look objectively, he needs to bring his cholesterol down because of his cardiac insufficiency. He does have risk factors. But we've discussed it several times and he doesn't want to take it. He says: "I'm old, that's fine" (M002)*
	Being proactive (screening) and reality of patients	*People set limits to proactivity, and many people refuse to be managed, supported because they say « no, it's not that bad, and I'm not there yet, I don't want to discuss it now » (M003)*
	Using standardized tools is useful, but at low dosage	*Clearly, in practice, for long-term follow-up, there are no check-lists. We see the patient, we listen to the patient, we ask "how are you?" We discuss 1-2 points, but there is nothing standardised. We're not very keen, as doctors, on standardising everything. But it's true that, once in a while, to have a scale to put into perspective with our clinical impression is rather welcome. Only if it doesn't become overwhelming and it doesn't become the primary support of all consultations that's fine. Otherwise the profession would lose all interest! (M002)*

Paper 4. Standardised brief geriatric evaluation versus routine care to prevent functional decline in primary care: a pragmatic cluster-randomised trial

1. Missing outcome: considering death or admission into an institution as having lost at least one ADL

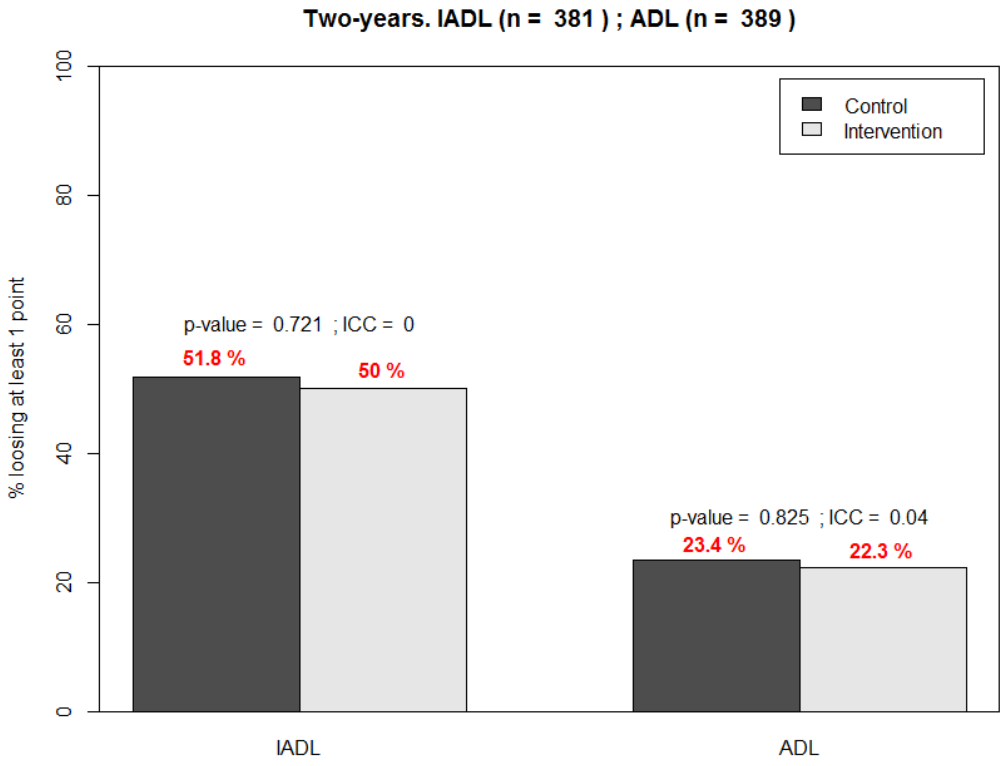

Figure 11. Comparison of the proportion of patients who lost at least one IADL, one ADL, respectively between the intervention and control arms, considering death or admission to an institution as having lost at least one ADL

2. Per-protocol population

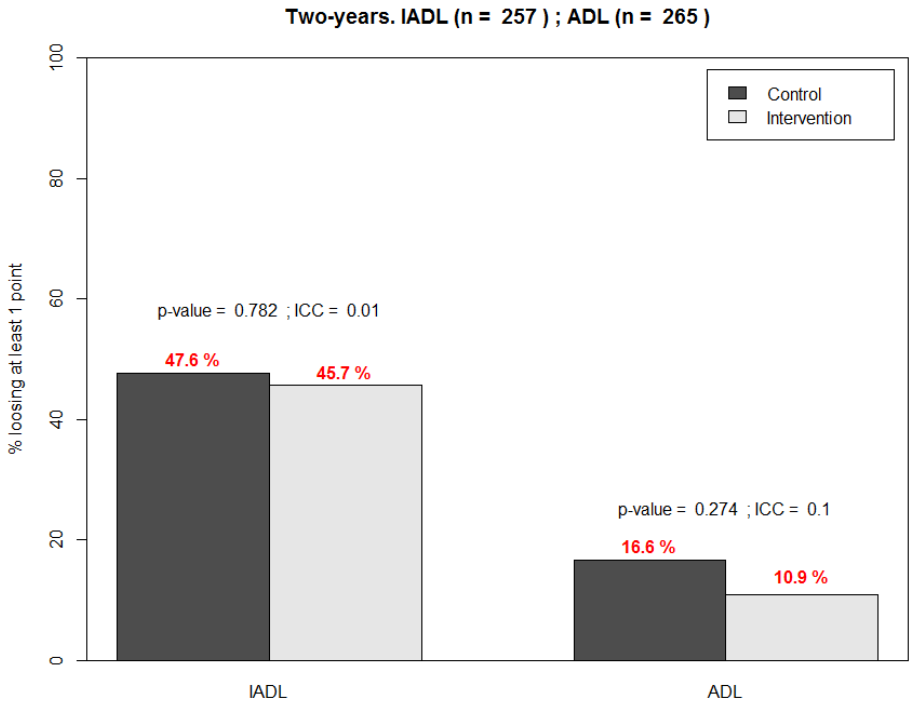

Figure 12. Comparison of the proportion of patients who lost at least one IADL, one ADL, respectively between intervention and control arms per-protocol populations

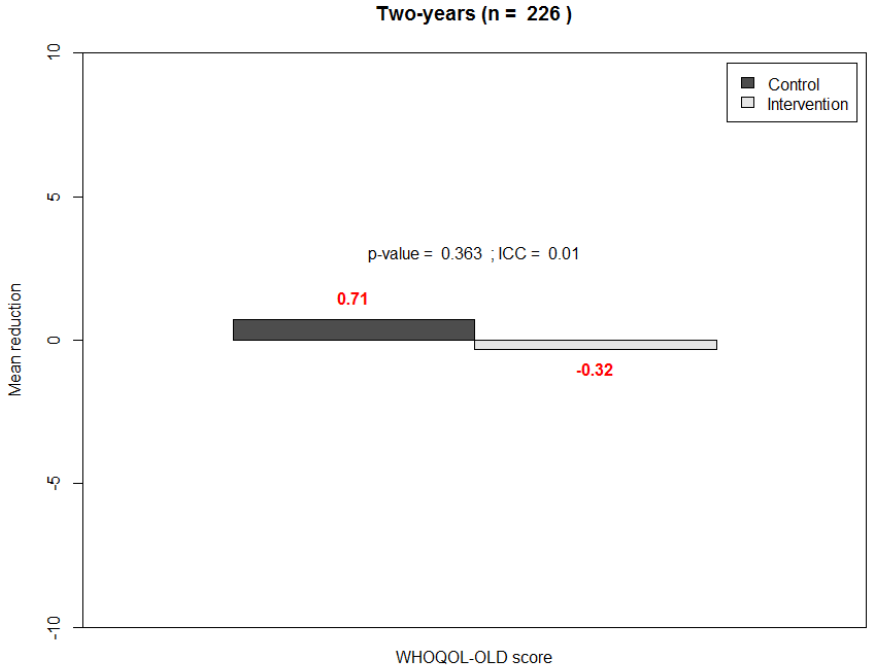

Figure 13. Reduction in WHOQOL-OLD score between intervention and control arm, per-protocol population

3. Longitudinal analysis

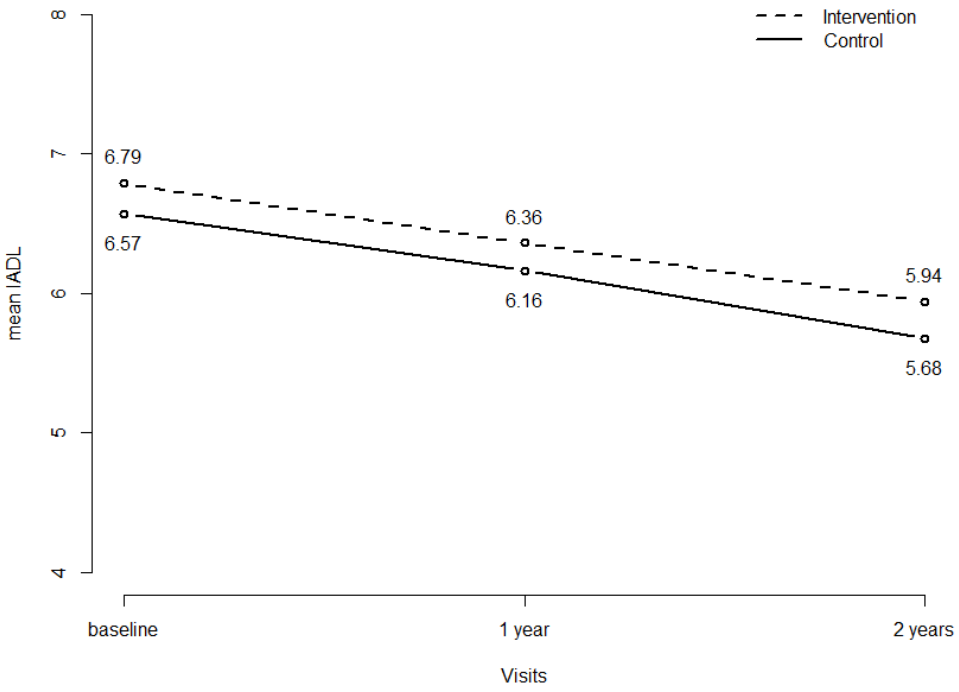

Figure 14. Evolution of independence in instrumental activities of daily living at baseline and after one and two years, between intervention and control arm; AGE3 study.

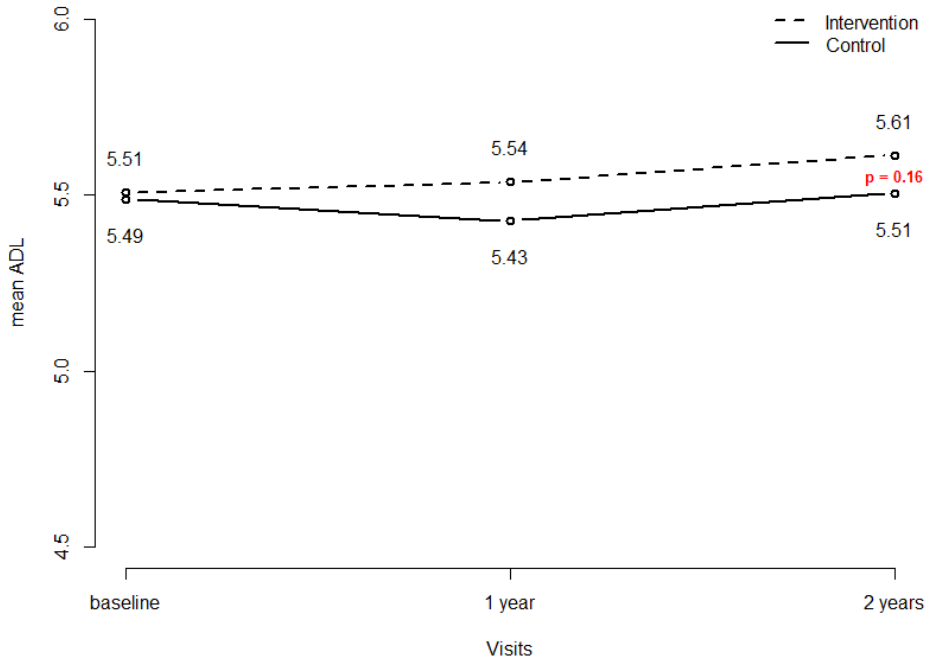

Figure 15. Evolution of independence in basic activities of daily living at baseline and after one and two years, between intervention and control arm; AGE3 study

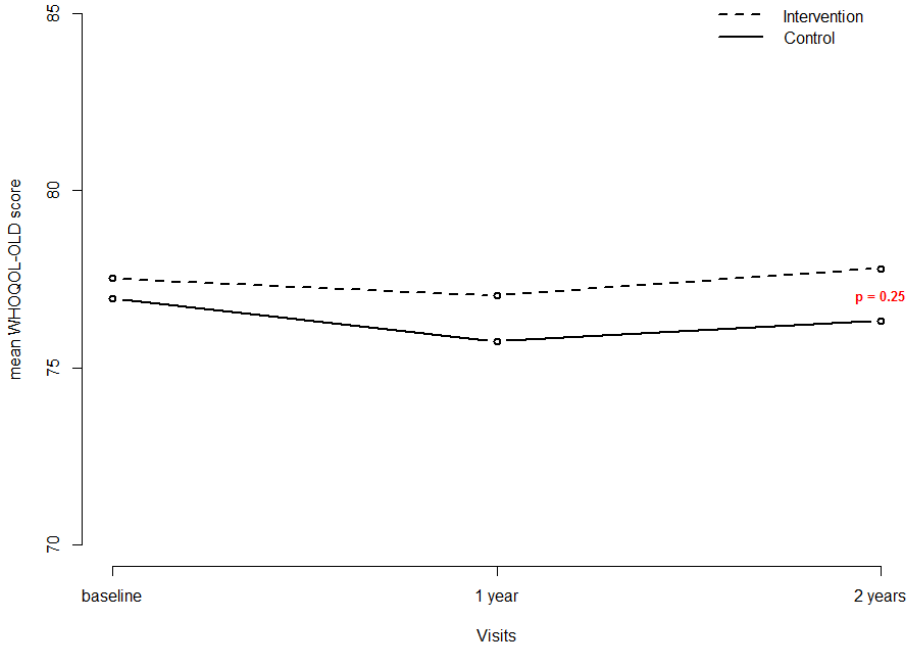

Figure 16. Evolution of quality-of-life score (WHOQOL-OLD) at baseline and after one and two years between intervention and control arm; AGE3 study

4. Longitudinal analysis stratitied by age and gender

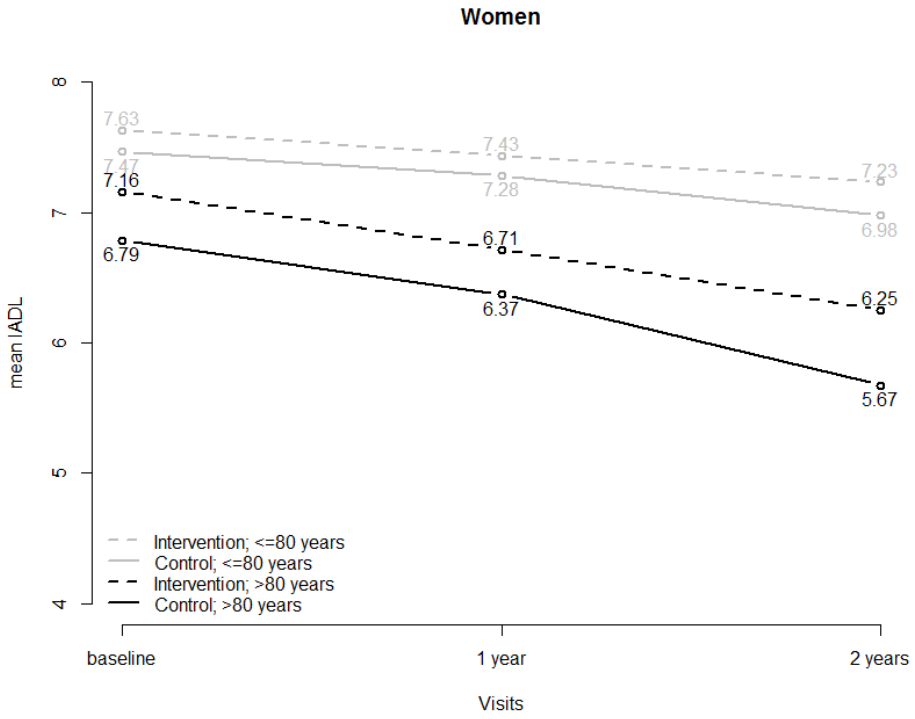

Figure 17. Evolution of independence in instrumental activities of daily living at baseline and after one and two years among women, by age category, between intervention and control arm; AGE3 study.

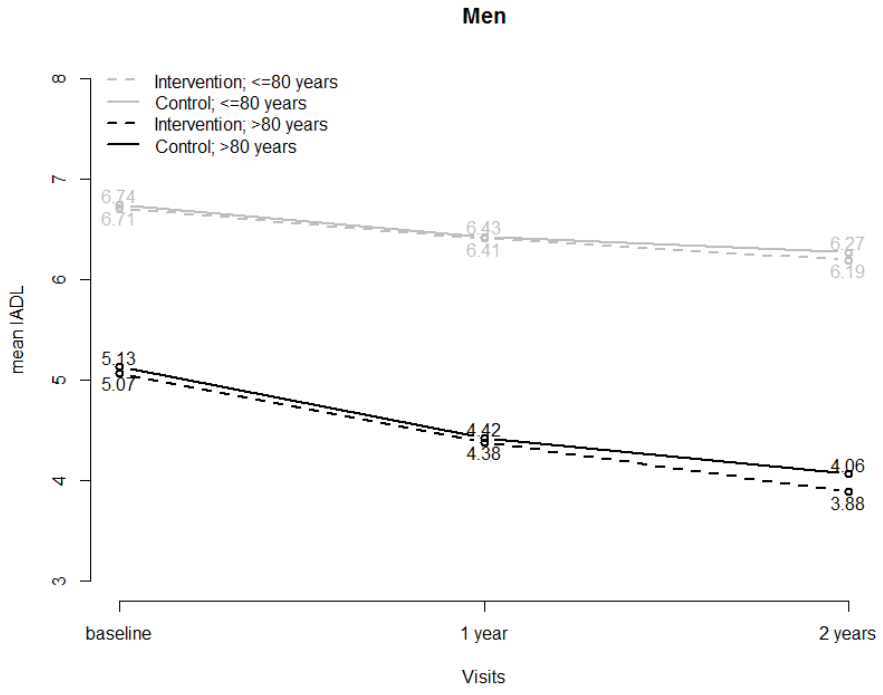

Figure 18. Evolution of independence in instrumental activities of daily living at baseline and after one and two years among men, by age category, between intervention and control arm; AGE3 study.

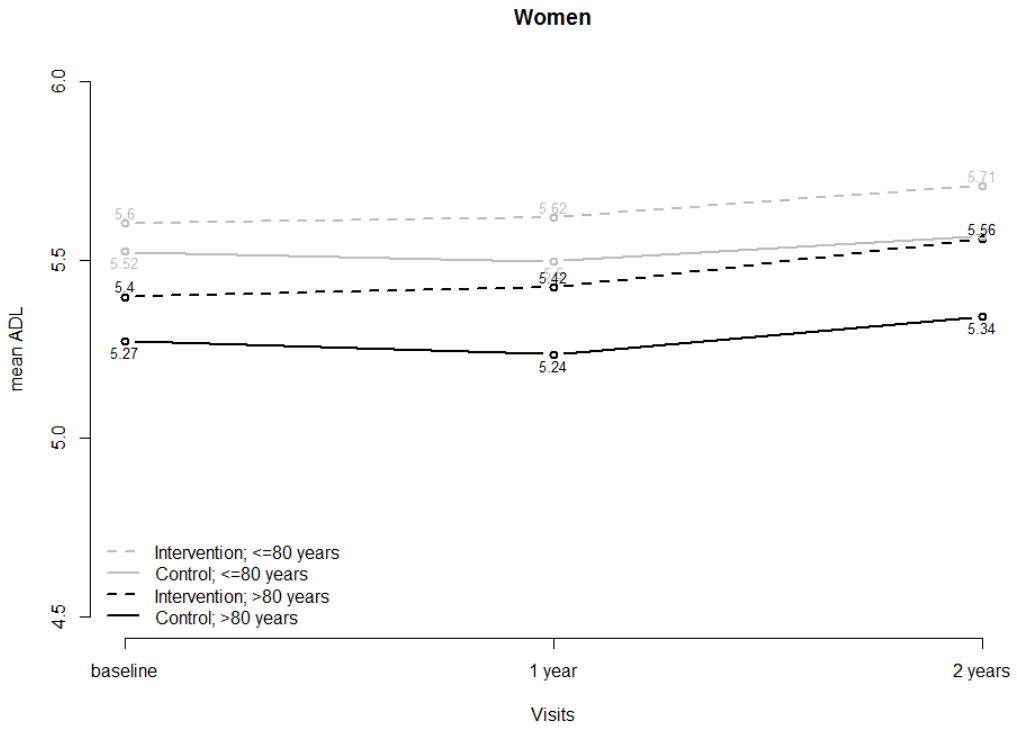

Figure 19. Evolution of independence in basic activities of daily living at baseline and after one and two years among women, by age category, between intervention and control arm; AGE3 study.

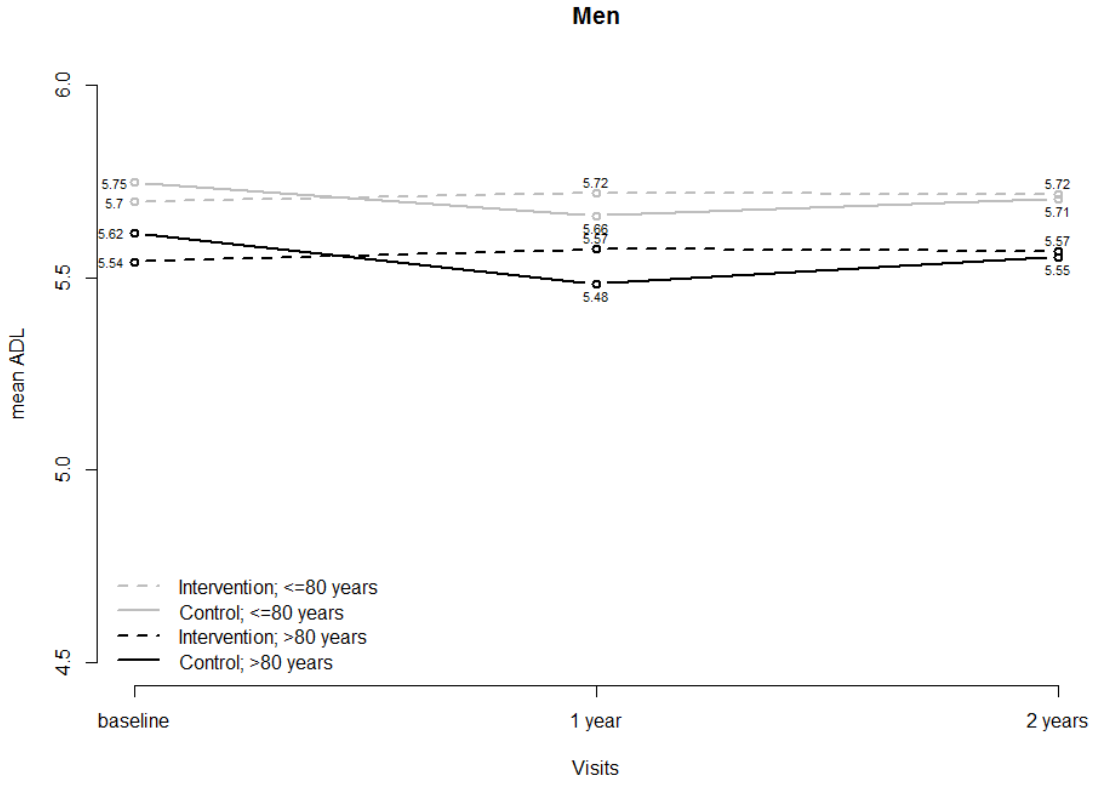

Figure 20. Evolution of independence in basic activities of daily living at baseline and after one and two years among men, by age category, between intervention and control arm; AGE3 study.

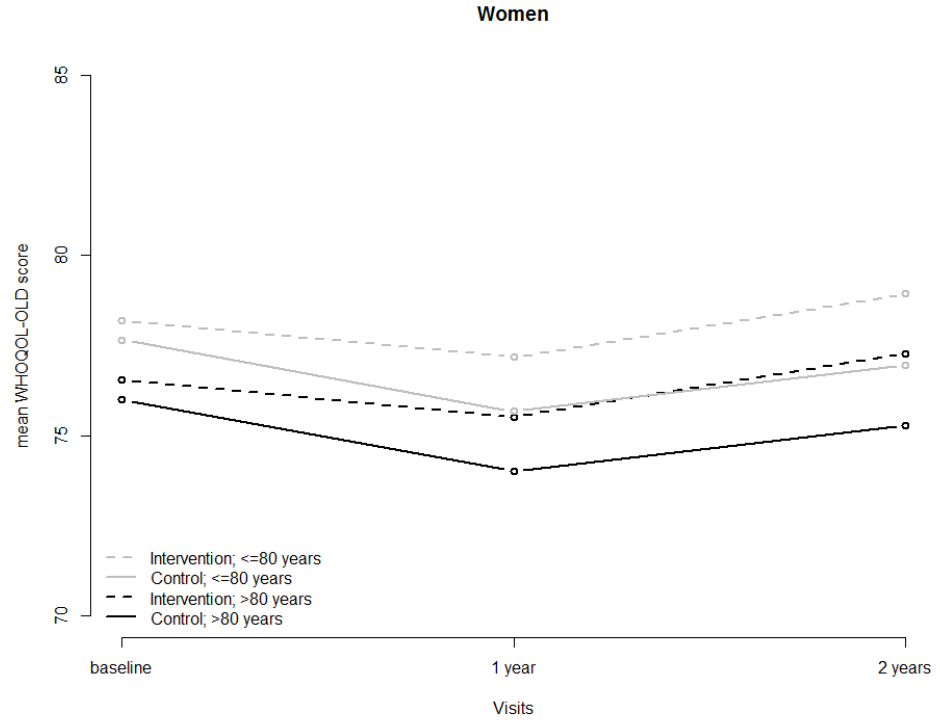

Figure 21. Evolution of quality-of-life WHOQOL-OLD score at baseline and after one and two years among women, by age category, between intervention and control arm; AGE3 study.

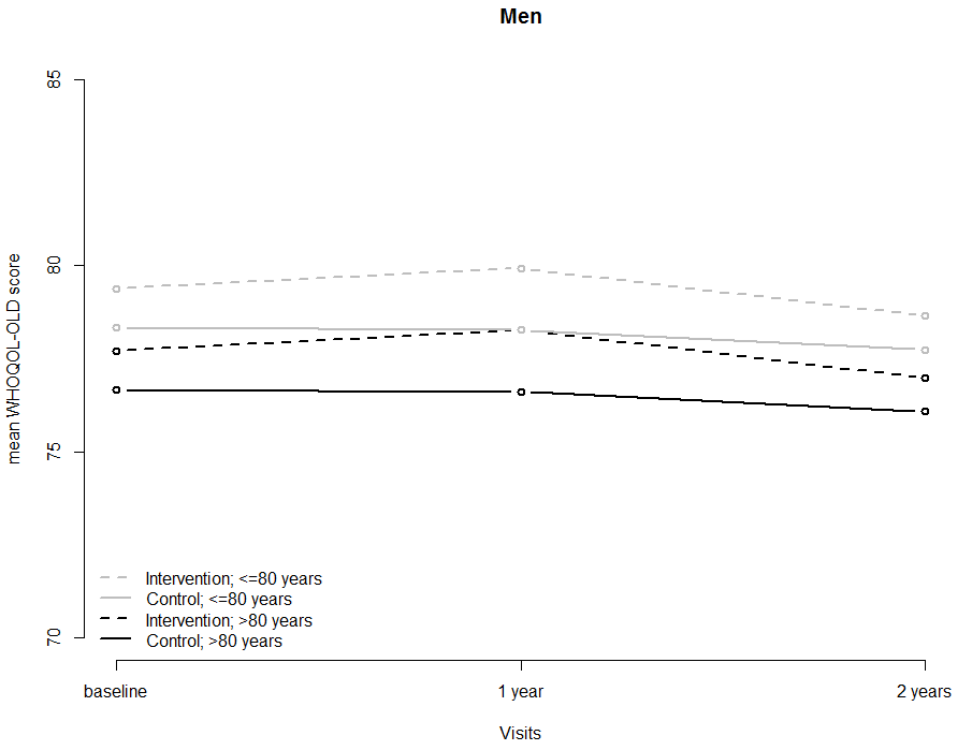

Figure 22. Evolution of quality-of-life WHOQOL-OLD score at baseline and after one and two years among men, by age category, between intervention and control arm; AGE3 study.