Review

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The management of dementia worldwide: A review on policy practices, clinical guidelines, end-of-life care, and challenge along with aging population

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SUMMARY Dementia, with a high incidence rate, fast-developing syndrome and large disease burden, raises challenges to global health and social systems. In this review, in order to elaborate current management and diagnosis statements of dementia, and provide further reference to improve dementia service system, we stated policies, clinical guidelines and management experiences concerning dementia across the world. According to the existing dementia management policies and plans, most countries focus on the following aspects: timely detection of dementia, improvement of service quality, person-centered and integrated dementia services at all stages, dementia awareness and friendliness, and scientific research of dementia. Detection of dementia requires knowledge of medical history and cognitive examination, while dementia diagnosis requires more professional medical examination results. Regarding different types of dementia, multiple international standards are used in practice. The overall goals of dementia treatments include postponing the process of cognitive decline and reducing pain caused by cognitive decline, behavioral and psychological symptoms of dementia (BPSD). Treatments include pharmacotherapy interventions and non-pharmacotherapy interventions. In the end-of-life, palliative care is required to improve the quality of life of people with dementia, and maintain their functions. Challenges exist in reducing the disease burden of dementia in the situation of aging population. There are policy bottlenecks and shortcomings to overcome providing medical care services for people with dementia. We would like to suggest strengthening continuous integrated dementia services, improving community services and management support, encouraging policy and financial support for nursing workers, and better support in the end-of-life.

Keywords dementia, dementia management, clinical practice guideline, international experiences

1. Introduction

The world population suffering from dementia is approximately 50 million, and grows by 10 million per year. The ratio of people with dementia in the elderly population above 65 years old is 5%-8% (*1*). According to World Health Organization (WHO)'s prediction, the global population suffering from dementia will reach 82 million in 2030, and 152 million in 2050. The incidence of dementia increases significantly with aging (Table 1), therefore, incidence of dementia rises along with the increase of average life expectancy. Dementia causes both heavy disease burden and loss of health. In 2019, Alzheimer's disease (AD) and dementia are 25th in the list of disease causes of disability-adjusted life year (DALY), counting 28,352,000 DALYs. In the top 20 disease causes of death, they ranked 7th, causing approximately 1,639,000 deaths, 181% more than the number from the year 2000. Financial burden caused by dementia is also heavy: in 2019, the expenses on dementia worldwide was 1.3 trillion dollars, accounting for 0.76% of worldwide GDP. The direct medical costs were 213.2 billion dollars, 16.2% of total costs; the direct social sector costs were 448.7 billion dollars, 34.2% of total costs; the informal care costs were 651.4 billion dollars, 49.6% of total costs (*1*).

Dementia in the elderly population has a high incidence rate, and a fast developing and heavy disease burden, which brings tremendous pressure on the global health and social systems and needs urgent attention. Currently, treatments for advanced stage dementia are fairly limited. Once the disease develops, it becomes

Table 1. Dementia prevalence and cost in 2019 by WHO region

Regions	Estimated number of people with dementia in 2020 (millions)	Dementia Prevalence in 65+ (%)	Dementia Prevalence in 90+ (%)	Estimated costs of dementia (billion US$)
Worldwide	55.2	6.9	35.9	1,313.4
African Region	1.9	4.4	30.9	15.6
Region of the Americas	10.3	7.9	38.0	364.6
South-East Asia Region	6.5	4.0	21.0	23.9
European Region	14.1	8.5	36.0	438.8
Eastern Mediterranean Region	2.3	5.9	35.0	31.2
Western Pacific Region	20.1	7.6	39.0	439.3

Table 2. Seven-stage model for planning dementia services by WHO

Stages	Dementia services
Pre-diagnosis	• Public awareness, including disease symptoms and where to go for help.
Diagnosis	• Receiving the diagnosis.
Post-diagnostic support	• Information and support for people with dementia and caregivers. • Enable them to make the best use of their current circumstances and plan for the future.
Co-ordination and care management	• Assessing and regularly reassessing the needs of people with dementia. • Arranging care with people with dementia and caregivers.
Community services	• Providing care in homes or community facilities while behavioral and psychological symptoms become more prevalent.
Continuing care	• Continuous care is needed, including hospital care.
End-of-life palliative care	• Special form of continuous care and support when people with dementia are close to the end-of-life.

*The co-ordination and care management stage should apply throughout the whole process of dementia care from diagnosis to palliative care.

progressively worse and cannot be reversed. Therefore, reviewing international experiences will be helpful in understanding the status, diagnosis and treatment of dementia. In this article, we will summarize all aspects of dementia service management, in order to elaborate current status of dementia management and diagnosis, and provide reference to improve the dementia service system.

2. General strategy of dementia

2.1. Dementia services at all stages

Although dementia is currently incurable, disease progression can be delayed and quality of life can be improved through providing targeted medical and nursing care services. From mild symptoms in the early stage to loss of self-care abilities in the advanced stage, people with dementia need the integration of dementia services at family, community, institution and hospital levels, as well as continuous service arrangements covering prevention, treatment, rehabilitation and health care. For the progressive development characteristics of dementia, WHO suggested "Seven-stage model for planning dementia services" (*2*), which divided dementia services into seven stages according to pre-diagnosis, diagnosis and post-diagnosis (Table 2).

2.2. Policy practices of dementia

WHO issued a report "Global action plan on the public health response to dementia 2017-2025" in May, 2017. The first target is to call for 76% of member states (146 countries or territories) to have a strategy tailored to their circumstances by 2025 (*2*). Prior to this, some developed countries have put in place national dementia policies or programs. Some countries have started earlier, such as England (*3*) and France (*4*), which have launched three to four dementia programs. According to statistics, as of May 2021, 34 countries have passed the national level of independent dementia policy or plan, and 31 countries have dementia in existing policy. Most of these policies are included in the overall health and social welfare policy or strategy, 13 countries have separate legislation for dementia, and 42 countries put rights and interests protection of people with dementia into law (*1*).

At present, even in some developed countries, dementia is still a disease that lacks detection, diagnosis, treatment and management. A survey of General Practitioners (GPs) referrals in UK revealed that only 20% of people had cognitive examinations before primary referral to specialist memory services, of which 37% were ultimately diagnosed with dementia (*5*). Therefore, early screening and screening for dementia before diagnosis are crucial. After diagnosis, people with dementia and their families should have access to a continuum of services, both in the community and at the health facility level, which should permeate all aspects of disease management, from diagnosis support to end-of-life care. In order to achieve the ultimate goal of delaying the disease and improving quality of life of people with dementia, some developed countries have introduced

policies to integrate service providers in institutions and services, so that all parties share resources and cooperate to jointly provide people with dementia and their caregivers with distinctive services. As can be seen from established dementia policies or plans, most countries focus on timely detection of dementia, improvement of service quality, people-oriented integration of whole-course services, dementia awareness and community friendliness, and strengthening of dementia research (Table 3, Online Data, *http://www.biosciencetrends.com/action/getSupplementalData.php?ID=93*) (*6-29*).

3. Diagnosis and treatment of dementia

3.1. Diagnosis

Detection of dementia requires medical history and cognitive examination to preliminarily determine the existence, severity and nature of cognitive impairment. Commonly used screening tools include MMSE, MoCA (*30,31*), *etc.* Among them, the sensitivity and specificity of MMSE to distinguish elderly with dementia was more than 80% (*32*), which is of high value for screening dementia. MoCA had better sensitivity and specificity than MMSE in identifying MCI and Mild AD (*33*).

More specialized tests are needed to diagnose dementia. There are a variety of clinical classifications of dementia, including by degenerative/nondegenerative disease, by pathological changes, by development of onset and progression, *etc.* Accordingly the classification by degenerative/nondegenerative disease is divided into degenerative and nondegenerative disease dementia. The former mainly includes AD, dementia with Lewy body (DLB), Parkinson disease with dementia (PDD), Frontotemporal lobar degeneration (FTLD), etc; the latter includes vascular dementia (VaD), Normal pressure hydrocephalus (NPH), and dementia caused by other diseases such as craniocerebral injury, infection, immunity, tumor, poisoning and metabolic diseases (*34*). Of these, AD is the most common dementia, accounting for 50-70% of all types of dementia (*35*). The diagnosis of dementia should be based on medical history combined with neuropsychological and other clinical examinations to confirm mental decline. Currently, there are several commonly used international diagnostic guideline for different classifications of dementia (Table 4) (*36-59*).

Take AD for example, choose the diagnostic algorithm from "Chinese Guidelines for the Diagnosis and treatment of Dementia and Cognitive Impairment 2018 (Section 2): Guidelines for diagnosis and treatment of Alzheimer's disease" to elaborate as below (Figure 1).

3.2. Treatment

The overall goal of treatment in dementia is to delay progressive cognitive decline, and reduce the cognitive decline and associated symptoms. Specific treatment includes pharmacotherapy interventions and non-pharmacotherapy interventions. The former, such as the six medications for AD approved by the US Food and Drug Administration (FDA) (*60*), has a certain relief effect on cognition, memory, thinking and other symptoms. The latter includes cognitive training and activities, music or art therapy, physical exercise, diet, *etc.* It is stated in Japanese guidelines that non-pharmacotherapy interventions should take precedence over pharmacotherapy interventions in the treatment of BPSD.

3.2.1. Pharmacotherapy interventions

Currently, although the medications do not cure the disease, they can delay clinical decline, benefit cognitive function, and help reduce symptoms such as memory loss and confusion (*60*). Cognitive, functional, neuropsychiatric, and behavioral symptoms need to be periodically reassessed during medication use to monitor disease progression and make adjustments.

NICE UK guidelines for comparative analysis of clinical efficacy and pharmacoeconomic aspects of common medications for the treatment of AD – "Donepezil, Galantamine, Rivastigmine and Memantine for the Treatment of Alzheimer's Disease" was first published in 2011 and updated several times in 2014, 2016 and 2018 (*61*), respectively. In 2011, the Chinese Guidelines for the Diagnosis and Treatment of Dementia and Cognitive Impairment (Section 5): Treatment of Dementia (*62*) was released, and a comprehensive update was made in 2018 (*44*), recommended the diagnosis and treatment of AD. The clinical pharmacotherapy guidelines of the UK, US, China and Japan are summarized below (Table 5) (*37,44,60-62*). Cholinesterase inhibitors (ChEIs) are generally recommended for mild to moderate dementia, while Memantine is recommended for severe dementia. The combination of Memantine and Donepezil is recommended for severe AD in three countries except for the UK.

3.2.2. Non-pharmacologic interventions

Non-pharmacologic interventions include cognitive training and activities such as reading, playing chess or canasta, music or art therapy, reminiscence therapy, physical exercise including aerobic exercise (such as walking, swimming) and anaerobic exercise (such as weightlifting), *etc.* These interventions may have a positive impact on cognition and physical function. It is recommended to have more brain-healthy foods (such as nuts, berries, green leafy vegetables, fish) or a Mediterranean diet. However, people with moderate to severe dementia may have difficulty engaging in cognitive functions, they should be limited in physical

Table 4. Diagnostic guidelines of dementia (by degenerative/nondegenerative disease)

Classification	Year	Area	Diagnostic guidelines	Drafted by	Content*
Degenerative dementing disorders					
AD	1984	America	NINCDS-ADRDA (*36*)	National Institute of Neurological and Communicative Disorders and Stroke-Alzheimer Disease and Related Disorders Association, NINCDS-ADRDA	D&T
	2002, 2010, 2017	Asia	Clinical Practice Guideline for Dementia (*37*)	The Japanese Society of Neurology Guideline Executive Committee	D&T+E+P+Pa+F
	2007, 2014	Europe	IWG-1 (*38*), IWG-2 (*39*)	International Working Groups, IWG	D&T+Pa
	2010	Asia	Clinical practice guideline for dementia (*40*)	The Clinical Research Center for Dementia of South Korea (CREDOS)	D&T
	2011, 2018	America	NIA-AA 2011 (*41,42*), NIA-AA 2018 (*43*)	National Institute on Aging-Alzheimer's Association, NIA-AA	D&T+Pa
	2018	Asia	Chinese Guidelines for the Diagnosis and treatment of Dementia and Cognitive Impairment (*44*)	Writing group for the Diagnosis and treatment of Dementia and Cognitive Impairment in China, Cognitive Disorders Professional Committee of Neurology Branch of Chinese Medical Doctor Association	D&T+E+P+Pa
FTLD					
bvFTD	2011	Global consensus	Revised diagnostic criteria for the behavioural variant of fronto-temporal dementia (*45*)	Rascovsky K, *et al.* the international Behavioral Variant FTD Criteria Consortium, FTDC	D&T
PNFA	2011	Global consensus	Classification of primary progressive aphasia and its variants (*46*)	M L Corno-Tempini *et al.*	D&T
DLB	1996, 1999, 2005, 2017	Global consensus	DLB Consortium 2005 revised criteria (*47,48*) Diagnosis and management of dementia with Lewy bodies Fourth consensus report of the DLB Consortium (*49*)	The DLB Consortium	D&T+Pa
PDD	2007	Global consensus	Clinical diagnostic criteria for dementia associated with Parkinson's disease (*50*)	Murat Emre, *et al.*	D&T+E+Pa
Nondegenerative dementing disorders					
VaD	1992	America	Diagnostic criteria for ischemic vascular dementia by Alzheimer's Disease Diagnostic and Treatment Center (ADDTC) (*51*)	Alzheimer's Disease Diagnostic and Treatment Center (ADDTC) in California	D&T
	1993	Global consensus	International Statistical Classification of Diseases and Related Health Problems (ICD-10) (*52*)	WHO	D&T
	1993	America+Europe	NINDS-AIREN diagnostic criteria (*53*)	National Institute of Neurological Disorders and Stroke (NINDS), Association Internationale pour la Recherche et l'Enseignement en Neurosciences (AIREN)	D&T
	1994, 2013	American	Diagnostic and Statistical Manual of Mental Disorders 4th Edition (DSM-4) (*54*), 5th Edition (DSM-5) (*55*)	American Psychiatric Association	D&T
	2011	America	ASA/AHA 2011 criteria (*56*)	American Stroke Association, American Heart Association	D&T+E+P+Pa
	2011, 2019	Asia	Guidelines for the diagnosis and treatment of vascular cognitive impairment (*57,58*)	Writing group of Dementia and Cognitive Impairment, Chinese Society of Neurology	D&T+E+P+Pa
	2014	Global consensus	Diagnostic criteria for vascular cognitive disorders (Vas-Cog criteria) (*59*)	International Society for Vascular Behavioral and Cognitive Disorders (VASCOG)	D&T

*D&T, diagnosis and treatment; E, epidemiology; P, prevention; PA, pathogenesis; F, follow-up.

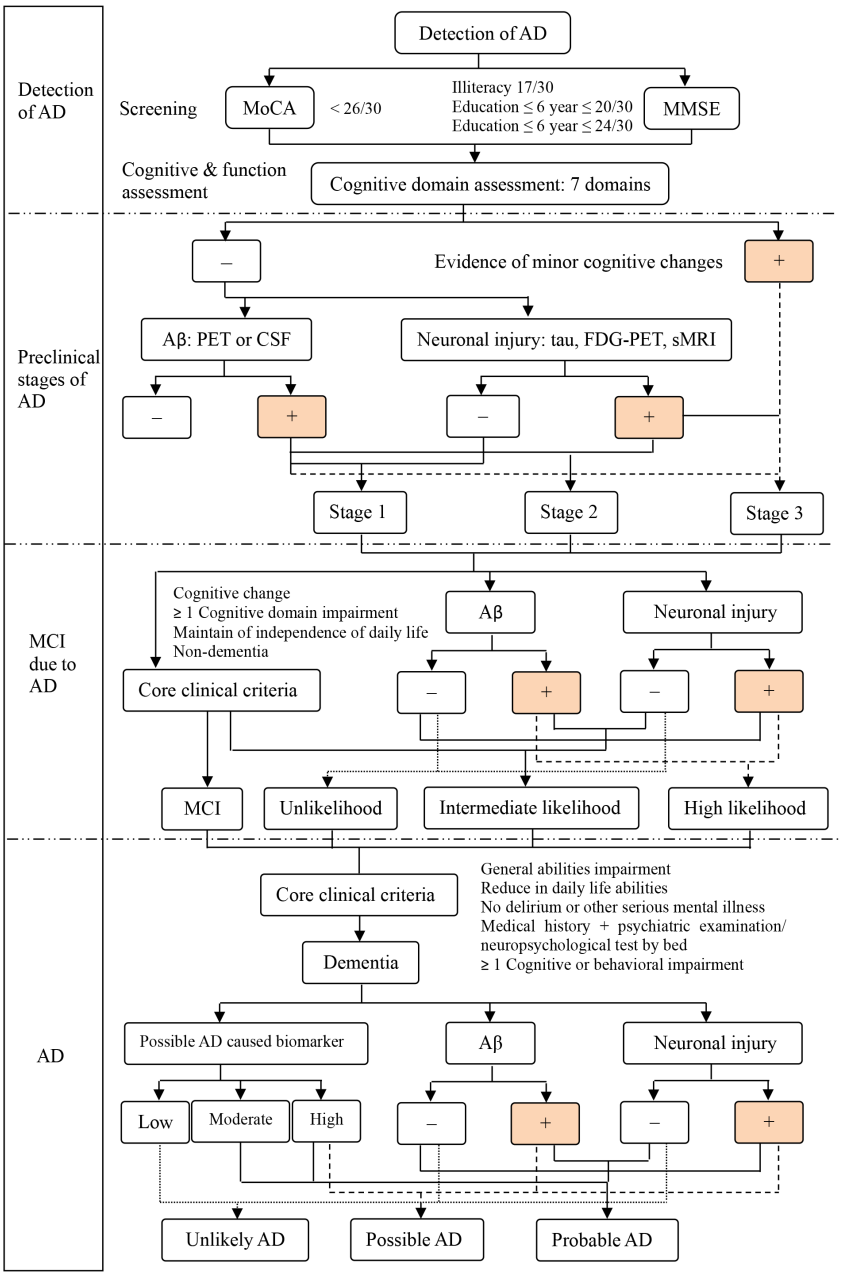

Figure 1. The diagnostic algorithm for AD in Chinese Guidelines for the Diagnosis and treatment of Dementia and Cognitive Impairment 2018. AD, Alzheimer's disease. –: Negative/none/indeterminacy; +: Positive.

and social activities when they can no longer safely and effectively participate.

4. Continuous care in the end-of-life

When people with dementia approach the end of their lives, continuing care is needed because the symptoms of disease are getting worse. The care includes continuing care, that is, providing care to people who can no longer stay at home (such as different forms of support or institutional care), and palliative care to people at the terminal stage of disease (*63*). The European Association for Palliative Care White Paper on the suitability of palliative care for people with dementia states: "Improving quality of life, maintaining function and maximizing comfort are not only the objectives of palliative care, but also applicable to dementia disease progression" (*64*). Attempts have been made in some countries, such as Japan, which revised its National Dementia Plan in January 2015 to support end-of-life care by strengthening social and health collaboration (*65*); Finland also proposed in the "National Memory Programme 2012-2020" to comprehensively evaluate the health and function of people with dementia and provide them with quality palliative care when prolonging life is no longer meaningful (*66*).

The Palliative Care for Older People (PACE) project is a European Union (EU)-funded project that runs

Table 5. Comparison of medications for AD in 4 countries in 2018

Country	Medications	Cost-effectiveness analysis	Polypharmacy
UK (NICE) (*61*)	• Mind to moderate: ChEIs ○ Donepezil, rivastigmine, Galantamine • Severe: NMDA receptor antagonist ○ Memantine	In combination with clinical efficacy and economy, it is recommended that the medication with the lowest price be the best choice among ChEIs	The combination of Memantine + ChEIs is not recommended
US (FDA) (*60*)	• Delay clinical decline: Aducanumab • Treatment of symptoms: √ Cognitive symptoms (memory and thinking) ○ All stages of AD: Donepezil ○ Mind to moderate: Rivastigmine, Galantamine ○ Moderate to severe: Memantine, Memantine + donepezil √ Non-cognitive symptoms (behavioral and psychological): Suvorexant	–	A combination of Memantine + ChEIs – Donepezil may be an option for moderate to severe AD
China (guideline) (*44, 62*)	• Mind to moderate: ChEIs ○ Donepezil, Rivastigmine, Galantamine and Huperzine A • Severe: Memantine • Ancillary drugs: traditional Chinese medicine (Ginkgo biloba extract), Cerebroprotein Hydrolysate	– Mainly based on the clinical efficacy of the medication	• Moderate to severe AD can choose to use Memantine, or Memantine + Donepezil, rivastigmine as combination • The combination of ChEIs + Memantine is especially recommended for severe AD with significant psychobehavioral symptoms
Japan (guideline) (*37*)	• Mind to moderate: ChEIs ○ Donepezil, Galantamine, Rivastigmine • Moderate to severe: NMDA receptor antagonist ○ Memantine, ChEIs + Memantine, Donepezil 5-10 mg	–	ChEIs – Donepezil + Memantine combination for severe AD

*Japan guidelines is in 2017.

from 2014 to 2019. Palliative care in nursing homes and facilities in EU countries was compared from three levels: the macro, medium and micro level (*67*). Macro level includes policy, documents, strategies, guidelines, and legislation. For example, the UK's National End-of-life Care Strategy that was introduced in 2018, specifically proposed the provision of palliative care in nursing homes as places for elderly people to live at the end-of-life; "Patients' Rights and the End-of Life Act" published in France in 2005, clearly states the objectives of palliative care in nursing homes. The medium level includes: *i*) Education and training. For example, Denmark and Germany have improved ability of palliative care in nursing home staff through multidisciplinary training programmes; *ii*) Service pathway, service list and service model. For example, Iceland has introduced the Liverpool Care Pathway into institutions in downtown Reykjavik, and Sweden has adopted palliative registration to ensure the regularity and quality of service utilization; *iii*) Service development studies, such as the Federation Palliative Care Flanders guidelines introduced palliative care in nursing homes; Micro level focuses on the proportion of nursing homes providing palliative care. Austria, Belgium, Ireland, Netherlands, Sweden, Switzerland, and UK have a relatively high proportion of nursing homes directly providing palliative care among the EU countries. The study found that the delay of implementation of palliative care was a common phenomenon in the surveyed EU countries (*68*). Even in countries with a more developed palliative care system, the quality of death and quality of life at the end-of-life in nursing homes were not optimistic (*69*).

5. How to address the challenge of dementia disease burden in the context of aging population

At present, many countries are turning into an aging society in which dementia, a disabled and semi-disabled aging population continually increases. Dementia, as a disease with high prevalence and heavy burden in the elderly population, will face severe challenges in the future. Although the government and people of some countries have made active responses, there are still policy bottlenecks and shortcomings to be overcome in the medical care services for people with dementia due to the relatively high requirements for continuity of services for the disease.

5.1. Continuous, holistic and integrated care

As proposed by Alzheimer's Disease International (ADI), care for people living with dementia need to be "continuous, holistic and integrated" (*70*). Continuous care means that the treatment, care plans and needs support must be continuous throughout the disease

progress; holistic care means treating the whole person instead of single conditions, organ or system, with close attention to unique preferences and values; integrated care means the integration of health and social services across different levels of care provided by different providers (*70*). WHO defines "integrated care" as "the concept of integrating related organizations providing input, service, and management, as well as diagnosis, treatment, care, rehabilitation and health promotion as a whole. Integration is a means to improve service accessibility, quality of service, patient satisfaction and efficiency" (*71*). Based on international experience, integration includes horizontal and vertical integration. Horizontal integration is the integration of different systems within the same level of services, such as health and social services. Vertical integration is the integration among different levels of services, or different professional levels, such as primary, secondary and tertiary health services. Due to the progressive development of dementia, providing continuous, holistic and integrated services will help people with dementia maintain a higher quality of life.

5.2. Community services and administrative support

Currently, long-term care policy for the elderly in many countries and regions advocate the concept of "Aging in Place", which means living at home in the community and getting all kinds of services needed from home (*72,73*). As a vulnerable group, the elderly with dementia have special service needs. Living in their familiar environment makes the elderly feel relaxed, which is conducive to their maintenance of functions, and saves social resources at the same time. In this case, we should focus on grass-roots units and strengthen community services and management. For a high-risk elderly population, we must carry out early screening services and take intervention measures; For people in the middle stage of disease and end-of-life, it is suggested to establish a cross-professional service team to provide physical and life care, and maximize the protection of the physical health and self-care ability of the elderly.

5.3. Caregiver support and financial incentives

Studies show that many caregivers of people with dementia are family members. For instance, in China, care for the elderly with dementia is mainly provided by family members, especially spouses (*74,75*), and their daily caring time lasts up to 11 hours (*76*). Most of the spouses are older people as well, and such a long period of intensive caring is a great burden on their physical and mental health. From international experience, many countries have set up support programs for caregivers, including help hotlines and respite services. First, it is suggested that the priority is to improve caregivers' awareness and knowledge, and provide support. To hold courses, promoting caring methods for dementia, caregivers' self-adjustments and finding appropriate social resources. Second, to set up dementia hotlines and establish mutual assistance organizations to support caregivers. Third, to adopt appropriate economic incentives. For informal caregivers, special funds can make up for their extra time; for formal caregivers, the treatment level can be improved. Fourth, to explore the establishment of respite services.

5.4. Strengthen support for people in end-of-life

WHO indicates, in the terminal stage of dementia, the lack of service comes from two aspects: too much intervention with little effect (tube feeding and laboratory tests, use of restriction measures and intravenous medications), and too little intervention (poor pain control, dehydration and malnutrition, emotional and social neglect) (*77*). There is an urgent need to improve end-of-life care for people with dementia, including interventions for restlessness, constipation and pain, which can improve quality of life, as well as reduce unnecessary tests and costs (*77*). The support for people with dementia in end-of-life includes not only strengthening the content of palliative care (*78*), but also the support for the families (*79*) and education for medical and caregiving personnel (*80*).

6. Conclusion

In this article, we reviewed the policies, clinical guidelines, and management experiences related to dementia services at all stages, including policy practices of dementia from 10 countries, and 10 diagnostic guidelines of dementia published globally from 1984 to 2019. At present, there are many commonly used diagnostic criteria for different types of dementia worldwide, since AD is the most common type of dementia, this article summarized the diagnostic algorithm for AD in Chinese Guidelines for the Diagnosis and treatment of Dementia and Cognitive Impairment 2018, and compared the medications for AD to that in 4 countries, to provide clinicians with up-to-date information.

At present, there are two main problems in the management of dementia: one is in the operational level. Early screening is important because dementia symptoms generally progress in stages and are not curable. However, there are still major deficiencies in the early screening of dementia worldwide, resulting in many people with underlying dementia who are still in need of timely intervention. Second, most people lack scientific understanding and awareness of dementia, and society is not friendly enough for people with dementia to live in. There have been explorations of dementia-friendly communities worldwide, but most of them are scattered in various regions, and the consensus of the whole

society has yet to be formed; the other is at the scientific research level. Current pharmacotherapy interventions for dementia are extremely scarce, and further scientific research is needed.

Dementia is a disease with a high incidence of dementia among the elderly population, a rapid development trend, and a heavy disease with economic burden. It ranks 7th among the top 20 causes of death in the world. Summarizing and comparing policies and clinical guidelines related to dementia services at all stages may help to improve the management of dementia with precision. However, further research is needed to improve dementia management outcomes and help guide physicians to make better decisions in the detection, diagnosis, treatment, and continuous care of dementia in the future.

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