ABSTRACT

Background/Purpose: The clinical efficacy of community-based dementia-friendly integrated care services has not been well-established in the literature. Therefore, this study aims to assess the potential clinical benefits of these services in terms of enhancing cognitive performance and reducing family care burden.

Methods: Participants seeking medical attention for cognitive-related issues or dementia between 2018 and 2022 were included in the study. The investigation was divided into two phases: Phase 1 evaluated the efficacy of the integrated care network in preventing cognitive declines in individuals with mild cognitive impairment, while Phase 2 assessed the temporal evolution of family care burden for participants engaged in the integrated care network.

Results: Phase 1 included 298 participants, and those involved in the integrated care network demonstrated significantly higher improvement in Mini-Mental State Examination (MMSE) scores compared to the usual care group. Phase 2, which comprised 235 participants undergoing integrated care, showed a significant increase in family care burden. In Phase 1, those in the dementia-friendly integrated care network showed significantly higher improvement in MMSE scores compared to the usual care group (0.7 ± 1.5 vs. 0.0 ± 2.4, \( p = 0.011 \)). In the subgroup analysis, oldest old subjects with mild cognitive impairment experienced reduced burden compared to the dementia group (-6.4 ± 12.4 vs. 4.2 ± 10.9, \( p = 0.036 \)). Phase 2 demonstrated a significant increase in Zarit Burden Interview scores (3.5 ± 11.1, \( p < 0.001 \)) among participants undergoing integrated care.

Conclusion: The study highlights the notable benefits of a community-based dementia-friendly integrated care network in improving cognitive performance and alleviating family care burden, underscoring the significance of this approach in dementia care, while further prospective intervention studies are needed to confirm its clinical benefits for individuals with cognitive impairment or dementia.
1. INTRODUCTION

Dementia is a progressive neurodegenerative disorder characterized by cognitive decline, memory loss, and impaired daily functioning. With an aging population worldwide, the prevalence of dementia has been steadily rising, posing significant challenges to healthcare systems and societies as a whole. Globally, dementia has become a major public health issue. According to the World Health Organization, an estimated 50 million people were living with dementia in 2020, and this number is projected to triple by 2050. As life expectancy increases and birth rates decline, the burden of dementia care places enormous strain on healthcare resources and caregiving networks. Moreover, the economic impact of dementia is staggering, with the cost of care and support for those affected reaching hundreds of billions of dollars annually. Despite the high case burden of dementia in most developed countries, the incidence of dementia has been successfully reversed, attributed to the success of education, better health literacy, improved cardiovascular risk management, and various other public health triumphs.

In Taiwan, like many other countries, dementia poses a growing healthcare challenge. As one of the fastest-aging countries in the world, Taiwan’s older population is expanding rapidly. This demographic shift is accompanied by an increased incidence of dementia, and there is an urgent need for effective policies and strategies to address this issue. With the burden of dementia care falling on families and caregivers, there is a rising demand for support services, respite care, and training programs to equip caregivers with the necessary skills and knowledge. Additionally, early diagnosis and intervention are crucial for managing dementia effectively. Encouraging research is being conducted to identify biomarkers and potential therapeutic targets for dementia treatment. Nonetheless, challenges remain in translating these discoveries into practical clinical applications and ensuring equitable access to diagnostic tools and treatment options across different regions, especially in low-resource settings. Furthermore, stigma and awareness surrounding dementia are significant hurdles to overcome. There is a pressing need for public education and awareness campaigns to dispel misconceptions about dementia and promote early detection. Moreover, research into preventive measures and lifestyle interventions that may reduce the risk of developing dementia is essential to mitigate its impact on individuals and society.

As of now, a definitive cure for dementia remains elusive, despite the approval of Aducanumab by the US FDA for Alzheimer’s disease treatment. Dementia continues to be an irreversible condition, emphasizing the critical role of prevention through multi-domain interventions and comprehensive care services. While some individuals with dementia may necessitate institutional care, the vast majority of older individuals with cognitive impairment or dementia require community-based and home-based care services. A high-quality dementia care service encompasses the collaboration of physicians, other healthcare professionals, social services, and community support. A dementia-friendly community can significantly aid older individuals with cognitive impairment or dementia to lead fulfilling lives within the community, thereby optimizing their quality of life and alleviating the caregiving burden on families. However, achieving a comprehensive and dementia-friendly integrated care network necessitates the seamless integration of health, social, and community services and resources. Hence, this study aims to investigate the clinical efficacy of a dementia-friendly integrated care network supported by the community hospital in terms of preventing cognitive declines and reducing the burden of care experienced by families.

2. METHODS

2.1. Dementia-Friendly Integrated Care Network

Taipei Municipal Gan-Dau Hospital serves as a community hospital offering comprehensive care for both acute and chronic conditions to all residents within the community. The hospital’s primary objective is to address the healthcare needs of the community, focusing on health promotion, management of chronic conditions, and various long-term care services. Notably, dementia care has emerged as a top priority, encompassing both outpatient and inpatient care led by dementia specialists. This initiative has naturally extended to provide care and support services in homes and communities, aiming to ensure high-quality care while reducing the burden on families.

The program also incorporates a community-based dementia care management center where individuals with cognitive impairment or dementia can register and access relevant care and support services. Moreover, the service network facilitates community volunteers and community shops to acquire essential knowledge about dementia, thereby enabling them to support older individuals with cognitive impairment or dementia to lead independent lives within the community they are familiar with. In response to the community’s demands, Taipei Municipal Gan-Dau Hospital initiated the establishment of a community dementia support center known as the “School for Intelligence Enhancement.” This center aims to offer knowledge and skill training to family caregivers, along with multidomain interventions designed to slow the progression of cognitive decline in registered clients. Additionally, the center actively organizes educational activities open to all community residents to promote dementia literacy, as well as cognitive performance assessment.
Furthermore, in collaboration with the local police, the center provides a service to collect and archive fingerprints of older individuals with cognitive impairment and dementia. This initiative ensures that pertinent identification information is readily available for their safety and security.

### 2.1.1. Gan-dau healthy longevity plan

In 2021, Taipei Municipal Gan-Dau Hospital launched the Gan-Dau Healthy Longevity Plan, encompassing a range of integrated care services in both outpatient and inpatient settings. The plan also incorporates the TIGER (Taiwan Integrated Geriatric Care Study), which is a multidomain intervention program aimed at preventing functional decline and enhancing multimorbidity management. The TIGER program accepts referrals from the hospital or the community for participation in healthy aging activities. Moreover, the healthcare plan embraces extensive integration of digital technologies in patient care, long-term care, and case management. These technologies are leveraged to optimize healthcare delivery and enhance patient outcomes, aligning with the hospital’s commitment to promoting healthy longevity and well-being in the community.\(^{17,18}\)

### 2.1.2. Participants

This study is a retrospective investigation with the principal objective of appraising and analyzing the clinical effectiveness of a dementia-friendly integrated care network in mitigating cognitive decline and alleviating the burden of dementia care experienced by family caregivers. The study is structured into two distinct phases. During Phase 1, older adults with dementia were intentionally excluded from the analysis to specifically examine the efficacy of the dementia-friendly integrated care network services in preventing cognitive declines among individuals with mild cognitive impairment. In contrast, Phase 2 of the study aimed to evaluate the temporal evolution of family care burden among participants who were engaged in the dementia-friendly integrated care network throughout the study period.

The data encompassed all patients who sought medical attention at Taipei Municipal Gan-Dau Hospital between 2018 and 2022 for cognitive-related issues or dementia. These data were subsequently integrated with the dataset of participants engaged in the dementia-friendly integrated care network, serving as the basis for subsequent analytical endeavors. Phase 1 of the study entailed the exclusion of data associated with individuals diagnosed with dementia, as well as cases marked by data incompleteness. These exclusions were made to ensure the integrity of the data for further rigorous analysis. Conversely, Phase 2 focused exclusively on participants who had availed themselves of the services offered by the dementia-friendly integrated care network, thereby facilitating an assessment of the attendant burden faced by their respective families. The entire study has been approved by the Institutional Review Board of Taipei Veterans General Hospital.

### 2.2. Cognitive Assess and Family Care Burden

In this investigation, cognitive performance was evaluated utilizing the Chinese version of the Mini-Mental State Examination (MMSE)\(^{19}\), administered by proficient psychologists affiliated with Taipei Municipal Gan-Dau Hospital. Additionally, the family care burden was gauged through implementation of the Chinese version of the Zarit Burden Interview (ZBI)\(^{20}\), facilitated by adept dementia care managers operating within the framework of the dementia-friendly integrated care network.

### 2.3. Statistical Analysis

In this research endeavor, numerical variables were represented in the form of mean ± standard deviation, while categorical variables were conveyed as numerical counts and corresponding proportions. Descriptive characteristics were assessed using the student t test for comparison. To ascertain the associations between dementia-friendly integrated care network services and alterations in the MMSE during Phase 1, a multivariable linear regression analysis was employed. In Phase 2, changes in care burden (ZBI) before and after integrated care were appraised using the paired t test. Furthermore, the discrepancy in changes of care burden between individuals with mild cognitive impairment and those with dementia was examined among the oldest old adults (aged ≥80 years) through the application of the student t test as the sub-group analysis. A two-sided p value <0.05 were considered statistically significant. All analyses were performed with the SAS statistical package, version 9.4 (SAS Institute, Inc., Cary, NC, USA).
Table 2, on the other hand, stands as a testament to the meticulous analytical approach of the study, elucidating the ramifications of the multivariable linear regression analysis. The findings therein provide compelling evidence of a meaningful connection between active involvement in the dementia-friendly integrated care network services and the consequent improvements in MMSE scores. Subsequently, during Phase 2, the investigation focused on a renewed cohort of 235 participants, all of whom underwent integrated care. The examination yielded intriguing results, revealing an overall increase in the ZBI scores by an average of $3.5 \pm 11.1$, a change deemed statistically significant with a $p$-value of less than 0.001. Remarkably, this elevation in care burden was universally observed across all three age groups over time. Among the participants aged below 65 years, the mean change in ZBI score was a mere $0.1 \pm 17.9$, which interestingly did not exhibit statistical significance ($p = 0.977$). However, in contrast, participants aged 65–79 years demonstrated a noteworthy increase in ZBI scores, with a mean change of $3.6 \pm 9.8$ ($p < 0.001$). Similarly, the oldest old adults, aged ≥80 years, experienced a substantial rise in ZBI scores, with a mean change of $3.8 \pm 11.1$ ($p < 0.001$).

Furthermore, a captivating aspect of the investigation emerged within the realm of the ≥80 age group. Here, a compelling observation surfaced, demonstrating that integrated care had a differential impact on the burden experienced by participants with mild cognitive impairment versus those with dementia. Specifically, the mild cognitive impairment group experienced a reduction in care burden, with a mean change in ZBI score of $-6.4 \pm 12.4$, whereas the dementia group experienced a moderate increase, with a mean change of $4.2 \pm 10.9$. This noteworthy discrepancy reached statistical significance with a $p$-value of 0.036.

### 4. DISCUSSION

This study showcases the remarkable impact of a dementia-friendly integrated care network on enhancing cognitive performance in older individuals with mild cognitive impairment, while concurrently alleviating the burden of care experienced by families of older people with dementia. The outcomes unveil a wide array of benefits, spanning across the cognitive performance spectrum, thus optimizing cognitive function, burden of care, and facilitating aging in place for older people. Recent studies have provided compelling evidence regarding the efficacy of dementia care models in influencing cognitive performance and alleviating the burden of care on families.21,23 Results of these investigations have shed light on the transformative potential of community-based integrated care networks for individuals with dementia.

Dementia-friendly integrated care models lead to considerable enhancements in cognitive declines among older adults by employing a comprehensive approach that addresses diverse aspects of cognitive deterioration and offers personalized strategies for cognitive preservation.25 Dementia-friendly communities aim to support individuals with cognitive impairment or dementia, enhancing their well-being and cognitive functioning, with recent research showing promising outcomes for older people's cognitive performance.26,27 Dementia-friendly communities combat stigma and promote social inclusion by providing tailored cognitive assessments, stimulation programs, engagement activities, and memory support groups for older individuals with cognitive impairment or dementia. This comprehensive approach fosters cognitive well-being and a sense of belonging, further supported by dementia-aware community members, including shopkeepers, public service personnel, and neighbors. Older individuals with cognitive impairment are more likely to encounter understanding and patient responses in their daily interactions, reducing stress and anxiety that can otherwise negatively impact...
cognitive abilities.\textsuperscript{28,29} Regular participation in stimulating activities and being part of a supportive social network has been associated with better memory retention, problem-solving skills, and overall cognitive function.\textsuperscript{30,31}

A meta-analysis of 45 longitudinal studies with 58,939 individuals aged 18 to 108 years demonstrated a significant decline in MMSE scores with increasing age, particularly in individuals aged 84 years and above, leading to the recommendation to limit MMSE usage to higher age categories in aging general populations. Additionally, in a cohort of 698 individuals with mild cognitive impairment, a threshold of 0.6/year accurately identified dementia converters with 82% accuracy based on MMSE score decline.\textsuperscript{33} In a population-based older cohort study, the annual conversion rate of mild cognitive impairment to Alzheimer’s disease was 8.5% per 100 person-years, and the overall rate of progression to any form of dementia was 16.1% per 100 person-years, suggesting that mild cognitive impairment is an unstable and heterogeneous condition, with approximately 40% of subjects returning to normal cognitive status.\textsuperscript{34} A Cochrane review collecting 11 heterogeneous studies (1569 patients) with mild cognitive impairment followed for conversion to dementia, found limited support for the use of the MMSE as a stand-alone single-administration test in identifying mild cognitive impairment patients at risk of developing dementia.\textsuperscript{35} Despite its limitations in capturing the heterogeneity of mild cognitive impairment and accurately predicting conversion to dementia, the MMSE continues to be a commonly utilized neuropsychological assessment tool for evaluating cognitive performance. Generally, as individuals age or progress toward dementia, MMSE scores tend to decline over time at varying rates. As a neurodegenerative disorder, dementia exhibits a progressively increasing clinical course and care burden over time, as demonstrated in a previous study.\textsuperscript{36} However, a recent meta-analysis revealed the presence of a significant knowledge gap in understanding the intricacies of dementia care burden, including limitations in the assessment instruments employed.\textsuperscript{37} A previous study has underscored the crucial mediating function of the social network in the correlation between caregiving intensity and care burden among older individuals with dementia.\textsuperscript{38} In a comprehensive multicenter longitudinal study, the Prospective Dementia Registry of the Austrian Alzheimer Society, caregiver burden in individuals caring for older adults with dementia was thoroughly examined. They used a comparable care burden assessment instrument to our investigation, showing a baseline ZBI score of 16. However, over two years, the care burden increased to 22, a significant 37.5% rise, higher than the corresponding increment observed in our study (31.3%).\textsuperscript{39} Both studies exhibit comparability in terms of their baseline ZBI scores, care services, and follow-up procedures. However, the present investigation demonstrated a relatively reduced increment in family care burden when compared to the Australian study.

Mild cognitive impairment, referred to as the pre-dementia state, is recognized as a focal point for dementia prevention. Nonetheless, the significant conversion rate to dementia and limited responsiveness to interventions raise questions regarding its potential reversibility. However, within the context of this study, we observed notable improvements in MMSE scores among older individuals with mild cognitive impairment who received care through the dementia-friendly integrated care network. Prior research has indicated that well-organized dementia care services may ameliorate behavioral and psychiatric symptoms while enhancing cognitive performance.\textsuperscript{41,42} Nevertheless, these benefits may necessitate specialized settings, such as day care or dementia care units, as opposed to home-based care. Our earlier investigations have demonstrated the superiority of day care services in terms of dementia care quality compared to institutional care.\textsuperscript{23} Additionally, specially designed dementia care units have proven more effective than unsupported home care services in mitigating MMSE declines.\textsuperscript{22} The findings from our studies have unequivocally demonstrated that a multidomain intervention yields substantial improvements in cognitive performance among older individuals experiencing subjective cognitive declines.\textsuperscript{42,44} This underscores the critical significance of extending dementia preventive interventions to an earlier stage, preceding even the onset of mild cognitive impairment.

Despite substantial research efforts invested in this study, several limitations should be acknowledged. Firstly, the retrospective cohort design inherently leads to data incompleteness and potential selection bias during the study period. Nonetheless, the introduction of the dementia-friendly integrated care network has helped ascertain service models and case inclusion/exclusion criteria, partially mitigating the potential selection bias. Secondly, the absence of data on dementia-related biomarkers hinders the confirmation of diagnoses. However, the diagnostic process of dementia typically includes thorough examination of biochemical markers, ensuring standardized care plans. Thirdly, the lack of a control group limits the ability to confirm clinical efficacy and generalize the findings. Nevertheless, this study is a rare implementation of a dementia-friendly integrated care network in communities, and it substantiates the clinical benefits, which remains a major strength of this investigation.

5. CONCLUSION

In conclusion, the implementation of the community-based dementia-friendly integrated care network
resulted in significant improvements in cognitive performance among older individuals with mild cognitive impairment and reduced family care burden among older individuals with dementia. However, to confirm the observed clinical efficacy from real-world practice, further prospective or intervention studies are warranted.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

REFERENCES


