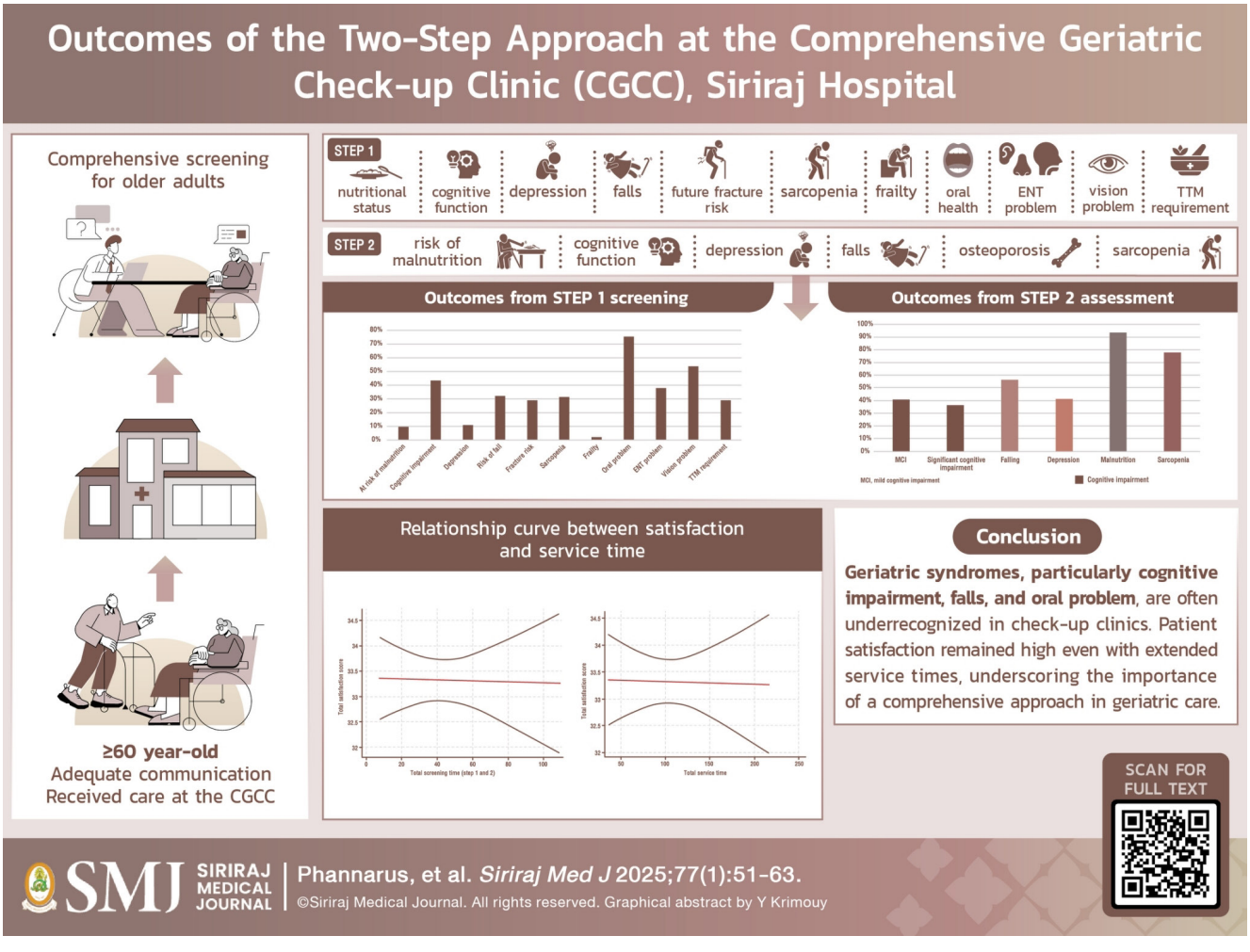
Prevalence of Geriatric Syndromes and Satisfaction of Service in Older People Receiving Annual Health Screening at the Check-up Clinic, Siriraj Hospital

Harisd Phannarus, M.D.[1], Supakorn Chansaengpetch, M.D.[1], Tirathat Virojskulchai, M.D.[1], Napaporn Pengsorn, B.N.S.[2], Pensri Chaopanitwet, B.N.S.[2], Usa Vannachavee, M.N.S.[2], Jirawit Wong-ekkabut, M.Sc.[1], Ananya Treewisoot, B.Sc.[1], Sunun Thanasamut, B.N.S.[2], Angkana Jongsawadipatana, M.Sc.[3], Weerasak Muangpaisan, M.D.[1,4,*]

[1]Department of Preventive and Social Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand, [2]Department of Nursing, Siriraj Hospital, Mahidol University, Bangkok, Thailand, [3]Department of Research, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand, [4]Siriraj Academic Center of Geriatric Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand.



*Corresponding author: Weerasak Muangpaisan
E-mail: drweerasak@gmail.com
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ORCID ID:http://orcid.org/0000-0001-5863-3597
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ABSTRACT

Objective: To assess the prevalence of geriatric syndromes (GSs) and evaluate service satisfaction among older patients attending a comprehensive geriatric check-up clinic (CGCC) at Siriraj Hospital.

Materials and Methods: A cross-sectional study was conducted at the CGCC from December 2021 to November 2022. Participants aged 60 years and older were screened using a two-step approach; short screening by a standard questionnaire followed by an in-depth assessment. GSs were identified through standardized tools, and patient satisfaction was assessed using a structured questionnaire.

Results: Of 159 participants, 67.9% were women, with a mean age of 66.6 ± 6 years. In step 1, 43.7% showed cognitive impairment, 29.1% had a risk of falls, and 76% reported oral health issues. Step 2 confirmed cognitive impairment in 40.6%, malnutrition risk in 93.3%, and sarcopenia in 78%. The mean satisfaction score was 33.3 ± 2.5 out of 35 points. Total service time averaged 104.2 ± 36.9 minutes.

Conclusion: In a health check-up clinic where GSs are often under-recognized, GSs, particularly cognitive impairment, fall risk, and oral health issues, are prevalent. Despite extended service times, patient satisfaction remained high, highlighting the importance of comprehensive screening in geriatric care.

Keywords: Geriatric syndromes; cognitive impairment; comprehensive geriatric assessment; patient satisfaction; health screening (Siriraj Med J 2025; 77: 51-63)

INTRODUCTION

Geriatric syndromes (GSs) comprise a well-defined cluster of conditions that have a significant impact on the health of older individuals. These conditions are influenced by age-related physiological changes, functional stressors, and identifiable chronic diseases, resulting in a multifaceted process of organ system impairment.[1,2] Owing to their substantial impact on the older population, GSs have emerged as a pivotal concern within the field of geriatric care. This burden includes a variety of challenges, including increased disability rates, elevated hospitalization rates, and prolonged lengths of stay in health care facilities.[3-5] GSs are defined and captured under the mnemonic "7Is": inappetence, instability, intellectual impairment, incontinence, immobility, insomnia, and iatrogenesis. In the outpatient setting, a range of screening tools tailored to these specific conditions are employed, contingent upon the nuances of the health care system and the preparedness of health care personnel.[1] The prevalence of GSs reported in previous studies ranged from 36% to 75.3%.[4-6] These results demonstrate the necessity of addressing GSs as a crucial aspect of geriatric health care management.

Thailand, classified as an upper middle-income country, has a life expectancy of approximately 84 and 79 years for females and males, respectively.[7] The demographic landscape reveals a significant shift, with the proportion of individuals aged 60 years and older in Thailand reaching a considerable 20% of the population by 2023.[8,9] However, clinical practices focused on GSs are relatively rare.[5] In addition, the number of GS diagnoses remains inconclusive, with considerable variability observed across different health care providers and regions. This variability highlights the absence of standardized approaches for addressing GSs. While the Thai Ministry of Public Health has introduced screening guidelines for various geriatric issues in the older population[10], implementation difficulties persist. Inadequate infrastructure and a lack of specialists in certain regions make it difficult for health care professionals to comply with these guidelines. This highlights the disparities and complexities surrounding the integration of geriatric care protocols, leading to efforts to bridge the gap between policy and practical execution.

In the context of geriatric care at Siriraj Hospital, notable advancements were realized with the establishment of the comprehensive geriatric check-up clinic (CGCC) in 2021. This initiative was undertaken with the primary purpose of enhancing the quality of care and facilitating the early detection of GSs in a general health check-up clinic. The clinic provides a platform for comprehensive geriatric assessment (CGA) for individuals aged 60 years and older. This assessment protocol is intended to incorporate a holistic evaluation of physical, mental, social, and functional aspects. The outcome of this thorough assessment subsequently guides the diagnostic process, allowing the identification of health-related conditions requiring specialized care.

Despite the substantial range of studies, to our knowledge, investigations into the prevalence of GSs

and the consequential health care utilization resulting from GS screening in a check-up clinic within a tertiary care facility in Thailand are lacking. The present study assumes significance by focusing on the demographics of older outpatients who have undergone geriatric screening. The objectives of this study were to determine the prevalence of GSs, examine the practical implications of screening outcomes by assessing their influence on medical consultations, and assess the level of satisfaction among older outpatients attending Siriraj Hospital's comprehensive check-up clinic.

MATERIALS AND METHODS

Study design and participants

This was a cross-sectional study in which participants were recruited from the CGCC specified for older people at Siriraj Hospital, which was developed in 2020. The study cohort comprised individuals aged 60 years and older who were undergoing a new protocol of comprehensive geriatric screening and assessment within the check-up clinic of the Department of Preventive and Social Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, Thailand. The recruitment phase spanned from December 2021 to November 2022. The eligibility criteria for enrollment were as follows: 1) subjects who were 60 years of age or older; 2) subjects who received comprehensive geriatric screening services at the CGCC at Siriraj Hospital; and 3) subjects who did not have communication problems. The exclusion criteria were as follows: 1) older individuals who had not undergone a full battery of comprehensive geriatric screening; and 2) older individuals or representatives who declined to participate in the study. All participants provided written informed consent.

The sample size for this study was determined via Cochran's formula[11] with a 95% confidence level. Previous studies reported that the prevalence of undetected GSs was 6.7% in geriatric clinics and 2.5% in community-dwelling populations. However, as no data were available for the check-up clinic population, we estimated a prevalence of 5% for the calculation. The allowable margin of error was set at 4%, with a corresponding z score of 1.96 at the 95% confidence level. The minimum sample size was 115 participants. To account for an estimated 20% rate of missing data, the final targeted sample size was adjusted to 138 participants. The study protocol was approved by the Siriraj Research Ethics Committee (COA No. Si 218/2565).

CGCC services and measurements

The CGCC was established in 2020 with the primary objective of conducting a comprehensive evaluation of GSs and aging-associated problems in the older population. This specialized facility provides a comprehensive array of services designed to identify and address a spectrum of concerns through systematically organized flow management (Fig 1). The scope of evaluation included malnutrition, cognitive impairment, depression, fall and fracture risks, sarcopenia, frailty, oral health problems, frailty, hearing and visual problems, and a general health assessment stratified by distinct age groups. The assessment embraced a multifaceted approach, integrating thorough patient history-taking, a physical examination, and multiple questionnaire-based assessments focusing on each age-related concern. The majority of questionnaires employed in this service were derived from standardized instruments or were based on screening guidelines from the Ministry of Public Health, Thailand.[10] Some of these were subsequently tailored to specific contexts and constraints of health care services, particularly limitations inherent to the service duration allocated for each patient. The selection of questions ensured practicality and administrative efficiency.

In accordance with the CGCC framework, the screening process was conducted in two steps (Fig 1). During the whole process, the service team administered a comprehensive evaluation focusing on general physical, mental, and social conditions through a structured set of screening questionnaires. These questionnaires encompassed the following key domains:

1) Malnutrition risk assessment: The first step of the malnutrition risk assessment involved the application of an adapted version of the SPENT Nutrition Screening tool.[12] This tool was modified by a panel of experts to enhance its applicability in identifying individuals at high risk for malnutrition. It comprises three questions targeting key indicators of nutritional risk: recent appetite loss, unintentional weight loss of 3 kg or more within the past three months, and body mass index (BMI) values either below 18.5 kg/m^2 or equal to or greater than 30 kg/m^2. A positive response to any of these questions triggered a more comprehensive evaluation in the second stage of screening. In step 2, the Mini-Nutritional Assessment short-form (MNA-SF)[13,14] was employed. The MNA-SF, a widely validated tool, provides a total score of up to 30 points, categorizing individuals into three nutritional statuses: normal nutritional status (24–30 points), at risk of malnutrition (17–23.5 points), and malnourished (<17 points).[13]

2) Cognitive function evaluation: The assessment of cognitive function incorporated both self-reported cognitive-related questions and an adapted version of the

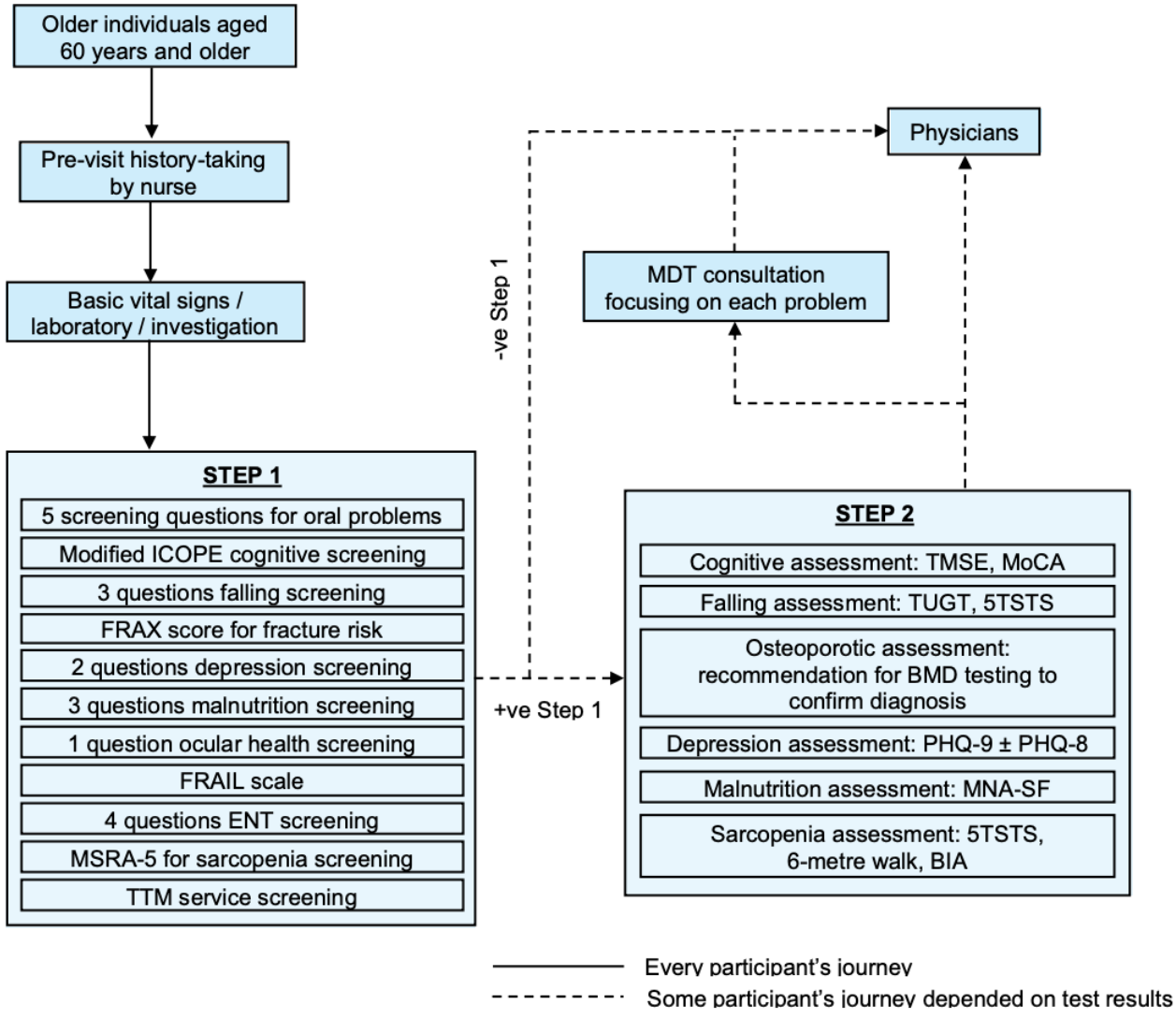


Fig 1. Flow chart of the comprehensive geriatric screening of participants.
Abbreviations: BIA, bioelectrical impedance analysis; BMD, bone mineral density; CGCC, Comprehensive geriatric check-up clinic; ENT, ear nose throat; FRAX, Fracture risk assessment tool; ICOPE, Integrated care for older people; MDT, Multidisciplinary team; MNA-SF, mini-nutritional assessment short-form; MoCA, Montreal cognitive assessment; MSRA, Mini sarcopenia risk assessment; PHQ, patient health questionnaire; TMSE Thai mental stale examination; TUGT, timed up and go test; 5TSTS, five-times-sit-to-stand test

Integrated Care for Older People (ICOPE) framework.[15] The self-reported cognitive assessment encompassed key indicators, including any recent memory loss, functional deficits, and changes in behavior or emotional state. In the adapted version of the ICOPE cognitive screening, the assessment focused on two specific cognitive domains: word recall (three common words) and orientation (date, month, year and place). The positive indicators of the respondents were subsequently assessed using the Thai Mental State Examination (TMSE)[16] and the Montreal Cognitive Assessment (MoCA)[17] in the second step, which were tailored to their educational background. Both the TMSE and MoCA are standardized cognitive assessments, with a total possible score of 30 points. For the TMSE, a cutoff score of 23/24 was employed to identify cognitive impairment[16], whereas for the MoCA, a cutoff score of 24/25 was used to determine mild cognitive impairment (MCI).[17]

3) Depression screening: The depression screening instrument, which was originally validated for the Thai population[18], consists of two questions suggesting depressive symptoms in the past 2 weeks and was designed to identify individuals at high risk for depression. Respondents who provided affirmative responses to at least one of these questions were flagged for further evaluation. High-risk individuals were subsequently assessed via the Patient Health Questionnaire (PHQ-9), a widely recognized instrument for determining the severity of depression.[19]

In cases where the PHQ-9 score exceeded 7 points, the PHQ-8 was employed to evaluate the risk of suicidal ideation, offering an additional layer of insight.[20]

4) Fall risk screening: The fall risk screening tool employed is a tool developed by the Centers of Disease Control and Prevention (CDC) and Stopping Elderly Accidents, Deaths & Injuries (STEADI).[21] This screening tool consists of three essential questions aimed at identifying individuals at high risk for falls. The questions focused on key risk factors, including a history of falls within the past year, a subjective feeling of instability, and a fear of falling. An affirmative response to any of these screening questions triggered a comprehensive fall risk evaluation. The subsequent assessments included the timed up and go test (TUG)[22] and the five-times-sit-to-stand test (5TSTS)[23] in step 2. These objective measures are well-established methods in clinical practice for evaluating mobility and lower limb strength, both of which are indicators of fall risk. Participants identified as high risk on the basis of these tests were initially checked for any reversible conditions and provided fall prevention. For those at high risk, further evaluation was carried out by referral to a specialist, enabling in-depth investigation of the underlying causes and the development of individualized, targeted preventive interventions.

5) Fracture risk assessment: The Fracture Risk Assessment Tool (FRAX)[24] was employed to estimate the risk of major osteoporotic and hip fractures. This tool provides a quantitative measure of fracture risk, with the outcomes indicating the likelihood of fractures at critical sites such as the hip and other major osteoporotic regions. In cases where the calculated fracture risk exceeded thresholds of ≥3% for hip fractures and ≥20% for major osteoporotic fractures, participants were advised to schedule appointments for bone mineral density (BMD) testing to obtain a definite diagnosis.[25]

6) Sarcopenia screening: The modified version of the Mini-Sarcopenia Risk Assessment (MSRA-5)[26], a five-question screening tool, was employed to assess the risk of sarcopenia. A cumulative score of 30 or below signifies a positive result for sarcopenia.[26] Individuals with a positive screening result underwent further evaluations, including the 5TSTS, handgrip strength, and bioelectrical impedance analysis (BIA), to classify them as having normal, sarcopenia, or severe sarcopenia.[27]

7) Frailty identification: The FRAIL scale[28], consisting of five questions, was used to identify frail individuals. Those with three or more affirmative responses were categorized as frail and underwent additional assessments to determine the underlying causes of frailty.

8) Oral health assessment: A battery of five questions aimed at detecting oral health issues, including 1) the presence of pain, 2) pus or bleeding when brushing the teeth, 3) the use of dentures, 4) the presence of cavitated dental lesions or food impaction, and 5) a lack of scaling within 12 months. If a respondent answered yes to Question 1) or 2) or had malnutrition and answer yes to Question 3), 4), or 5), they were referred to a dental clinic for further evaluation. If the responses were yes to 3), 4), or 5) with no malnutrition, they received an appointment to see a dentist.

9) Ear, nose, and throat (ENT) assessment: This screening included questions related to dizziness, hearing difficulties, and swallowing problems. A positive response in any of these areas indicated a high risk for ENT issues, and the respondent was referred to a specialist.

10) Ocular health screening: Participants were asked about their ophthalmologist visits within the past year. Individuals who had not seen an ophthalmologist were referred for further evaluation.

11) Traditional Thai medicine (TTM) services: Respondents were screened for symptoms that aligned with the treatments available through TTM services. Those who met the criteria were referred for TTM services.

Each of these domains provides a targeted approach to screening, enabling early identification of potential health issues and facilitating timely referrals for appropriate interventions.

Data collection

A research assistant approached each participant enrolled in the CGCC to obtain informed consent prior to data collection. The data collection was conducted by members of the clinic, particularly nurses or other health care personnel, and was seamlessly embedded into the CGCC's routine services. A comprehensive dataset was constructed, which included various demographic and health-related details recorded in case record forms. Initially, demographic information such as age, sex, level of education, income, smoking status, and physical activity level was collected. Basic health information, including weight, height, blood pressure, and the presence of underlying diseases, was subsequently recorded. The participants then completed the first step of the screening process via the CGCC's screening instrument. For those who tested positive in the first step of the screening process, a second step of more in-depth assessment followed. Upon completion of the entire check-up process, patient satisfaction with the services provided was assessed via a structured satisfaction questionnaire. Additionally, the time spent on each service was recorded to facilitate a comprehensive evaluation of the quality of care delivered

at the CGCC. The satisfaction survey consisted of seven questions, with a total score of 35 points. Each question was rated on a five-point Likert scale ranging from 5 (very satisfied) to 1 (very dissatisfied).

Statistical analyses

SPSS version 18.0 (SPSS Inc., PASW Statistics for Windows, Chicago, IL, USA) was used for the statistical analysis. Continuous variables are presented as the means, medians, and standard deviations (SDs). Independent t tests, Pearson correlations, Mann–Whitney U tests, and Wilcoxon signed-rank tests were used to analyze continuous data on the basis of the data distribution. Moreover, categorical outcomes are presented as frequencies and percentages. The chi-square test, or Fisher's exact test, was used to compare categorical data. Univariate and multivariate linear regression analyses were used to evaluate the associations between variables. The odds ratios and adjusted odds ratios with 95% confidence intervals are reported. A p value less than 0.05 indicated statistical significance.

RESULTS

Demographic characteristics

The baseline characteristics of the participants are presented in Table 1. A total of 159 participants were included in the study, with a mean age of 66.6±6 years. Women represented 67.9% of the participants. The mean body mass index (BMI) was 22.7±3.4 kg/m^2, and the mean waist circumference was 88.7±7.1 cm for males and 84±9 cm for females. More than half of the participants (56%) had attained at least a bachelor's degree. In terms of health status, 56% had at least one underlying condition, including hyperlipidemia (11.3%) and insomnia (9.4%). Additionally, 39% of the participants reported taking at least one medication regularly. Over half of the participants (52.2%) exercised at least five times per month, and 79.3% had received the COVID-19 vaccine, with 54.1% receiving the influenza vaccine.

Outcomes of the comprehensive screening (step 1)

In the first step of the screening process, oral health problems were the most commonly identified issue, affecting 76% of the participants, followed by ocular problems at 53.8%. Cognitive impairment was detected in 43.7% of the participants, while 29.1% were identified as being at risk of falls. Future fracture risk, as assessed via the FRAX score, was observed in 29.1% of the participants, with an average risk of 3.1±3.9% for hip fractures and 8.6±5.7% for major osteoporotic fractures. Depression and malnutrition were less prevalent, affecting 10.8% and 9.5% of the participants, respectively. Frailty was reported in 1.9% of participants on the basis of the FRAIL scale. ENT problems and sarcopenia were identified in 38% and 31.4% of the participants, respectively. These findings are detailed in Table 2.

Outcomes of the comprehensive screening (step 2)

The participants who tested positive in step 1 underwent further assessment in step 2, and the results are summarized in Table 3. Cognitive impairment, categorized as mild cognitive impairment (MCI) or more significant impairment, was confirmed in 40.6% and 36.2% of those tested, respectively. The average scores for the TMSE, MoCA, and MoCA-B were 22.5±5.8, 20.9±4.3, and 17.1±4.9, respectively. With respect to fall risk, 56.5% of the participants in step 2 tested positive, with an average time of 10.8±2.8 seconds for the TUG test and 15.2±4.7 seconds for the 5TSTS test. Depression was confirmed in 41.2% of the participants, with an average PHQ-9 score of 5.8±3.5. Among those screened for malnutrition, 93.3% were confirmed to be at risk of malnutrition, with an average MNA-SF score of 22±4. Sarcopenia was confirmed in 78% of the participants, with an average 5TSTS time of 15.2±7.6 seconds. Handgrip strength for the dominant hand averaged 30±6.4 kg for males and 19.6±3.4 kg for females.

Service quality and satisfaction

The participants reported a high level of satisfaction with the CGCC services, with an average satisfaction score of 33.3±2.5 out of a possible 35 points. The average time required to complete the baseline characteristics was 8.1±3.8 minutes, while the comprehensive screening process took an average of 34.6±19.9 minutes. The total service time, including waiting time and physical examination by a physician, averaged 104.2±36.9 minutes. These results are presented in Table 4.

Relationship between satisfaction and service time

Fig 2 illustrates the relationships between the total satisfaction score and various service-related times during the CGCC service, including the total screening time, waiting time and total service time. No significant relationships were found between these time metrics and the satisfaction scores. The graphs presented nonlinear relationships, indicating that extended screening and waiting times were associated with a decline in patient satisfaction. The fitted values and 95% confidence intervals (CIs) for these relationships are depicted in the figures.

TABLE 1. Demographic characteristics of CGCC participants (n = 159).

Characteristics	Values
Age, years±SD	66.6±6
Women, n (%)	108 (67.9)
BMI, kg/m^2±SD	22.7±3.4
Waist circumference, cm±SD	
Male	88.7±7.1
Female	84±9
MAP, mmHg±SD	90.7±11.6
Education attainment, n (%)	
<Bachelor's degree	70 (44)
≥Bachelor's degree	89 (56)
Having carers, n (%)	68 (42.8)
Having ≥ 1 underlying disease, n (%)	89 (56)
Hyperlipidemia	18 (11.3)
Insomnia	15 (9.4)
Cataract/Glaucoma	15 (9.4)
Hypertension	11 (6.9)
Having ≥ 1 medication, n (%)	62 (39)
Current smoker, n (%)	3 (1.9)
Current drinker, n (%)	8 (5)
Exercise status, n (%)	
1-4 times/month	42 (26.4)
≥5 time/month	83 (52.2)
Received ≥ 1 vaccination, n (%)	157 (98.7)
COVID-19 vaccine	126 (79.3)
Influenza	86 (54.1)

Abbreviations: BMI, body mass index; CGCC, comprehensive geriatric check-up clinic; cm, centimetre; MAP, mean arterial pressure; mmHG, millimetres of mercury; SD, standard deviation

DISCUSSION

This study provides new evidence on the effectiveness of a two-step comprehensive screening process for older populations, presenting the prevalence of GSs identified in step 1, followed by more detailed assessments in step 2 at a health check-up clinic in a tertiary care unit. This study also highlights the satisfaction scores, time spent on services, and relationships among these variables, offering insights into the operational efficiency of the check-up clinic.

The application of standardized screening tools constitutes a fundamental component of the CGCC service. The tools applied throughout the two-step screening process exhibit varying levels of sensitivity and specificity, reflecting their applicability across different GSs. In the initial step of the screening process (step 1), depression was assessed via the Thai version of the two-question screening questionnaire, which has been shown to have high sensitivity (96.5%) and specificity (85.1%) in detecting depressive symptoms.[18]

TABLE 2. Participant outcomes from the comprehensive screening (step 1).

Positive screening in Step 1	Values
At risk of malnutrition, n (%)	15 (9.4)
Cognitive impairment, n (%)	69 (43.4)
Depression, n (%)	17 (10.7)
Falling, n (%)	51 (32.1)
Fracture risk	
FRAX results, n (%)	
Positive	46 (28.9)
FRAX score, %±SD	
Hip site	3.1±3.9
Major site	8.6±5.7
Sarcopenia, n (%)	50 (31.4)
Frailty, n (%)	3 (1.9)
Oral problem, n (%)	120 (75.5)
ENT problem, n (%)	60 (37.7)
Ocular problem, n (%)	85 (53.5)
Having any symptoms required TTM, n (%)	46 (28.9)

Abbreviations: ENT, ear nose throat; FRAX, Fracture risk assessment tool; SD, standard deviation; TTM, Thai traditional medicine

Additionally, fall risk was evaluated via a three-question screening tool, which has been previously validated among community-dwelling older adults in Thailand and has high sensitivity (93.9%) and specificity (75%).[29,30] Fracture risk was assessed via the FRAX score, a globally recognized, web-based algorithm recommended by the World Health Organization and other organizations, including the National Osteoporosis Foundation, to predict future fracture risk.[24] The modified version of the MRSA-5 tool used for sarcopenia screening in step 1 is another well-validated tool for the Thai population, offering a sensitivity of 82.6% and a moderate specificity of 43.4%.[26] This tool's effectiveness in identifying individuals at risk for sarcopenia has contributed to its widespread use in geriatric screenings. Similarly, frailty was assessed using the FRAIL scale, which has been validated in the Thai population and has high sensitivity (85.8%) and specificity (80.6%).[28] The high sensitivity of these tests is particularly appropriate for the two-step screening process, as they allow for the inclusion of a broad range of at-risk individuals in step 1, who are then further evaluated in step 2 to identify those in need of targeted interventions or treatments.[31] This approach ensures that the screening process is both comprehensive and efficient, allowing for early identification and timely management of GSs.

Some of the adapted questionnaires used in the first step of the screening process may exhibit limited efficacy owing to their development by experts on the basis of previously established standard instruments. The malnutrition screening questionnaire in step 1 could lower the sensitivity of the screening process. Adapted from the SPENT Nutrition Screening tool[12], the questions focus on more severe symptoms and advanced-stage signs of malnutrition, including a BMI of <18.5 and >30 kg/m^2 and significant weight loss over the preceding three months. Moreover, participants attending the check-up clinic predominantly came from higher socioeconomic backgrounds, where malnutrition is less prevalent.[32] As a result, only 9.3% of the participants tested positive for malnutrition during the first step. This finding contrasts with that of a previous study, which reported a 37.8% prevalence of malnutrition risk among older adults in Thailand.[33] However, after further assessment in step 2,

TABLE 3. Participant outcomes from the comprehensive screening (step 2).

Positive screening in Step 2	Values
Cognitive impairment (n =69)	
Assessment results, n (%)	
MCI	28 (40.6)
Significant impairment	25 (36.2)
Test results, point (mean±SD)	
TMSE (n =8)	22.5±5.8
MoCA (n =61)	20.9±4.3
MoCA-B (n =7)	17.1±4.9
Falling, (n =51)	
Positive, n (%)	26 (56.5)
Test results, second (mean±SD)	
TUG	10.8±2.8
5TSTS	15.2±4.7
Depression (n =17)	
Positive, n (%)	7 (41.2)
Test results, point (mean±SD)	
PHQ-9	5.8±3.5
At risk of malnutrition (n =15)	
Assessment results, n (%)	14 (93.3)
Test results, point (mean±SD)	
MNA-SF	22±4
Sarcopenia, (n =50)	
Positive, n (%)	39 (78)
Test results	
5TSTS, second±SD	15.2±7.6
Right hand grip, kg±SD	
Male	30±6.4
Female	19.6±3.4
BIA, kg/m^2±SD	6.4±1.1

Abbreviations: 5TSTS, five times sit-to-stand; BIA, bioelectrical impedance analysis; kg, kilogramme; MCI, mild cognitive impairment; MNA-SF, mini nutritional assessment short-form; MoCA, Montreal cognitive assessment; PHQ, patient health questionnaire; TMSE, Thai mental state examination; TTM, Thai traditional medicine; TUG, timed up and go test; SD, standard deviation

TABLE 4. Participant outcomes from the comprehensive screening (step 2).

Satisfaction	Values	p-value
Satisfaction score, point (mean±SD)	33.3±2.5	ref
Service time	**Values**	
Time to fill baseline characteristic data, minute (mean±SD)	8.1±3.8	0.941
Time to complete comprehensive screening, minute (mean±SD)	34.6±19.9	0.974
Time of waiting and using in examination room, minute (mean±SD)	61.6±36.3	0.810
Total service time, minute (mean±SD)	104.2±36.9	0.987

Abbreviations: CGCC, comprehensive geriatric check-up clinic; SD, standard deviation

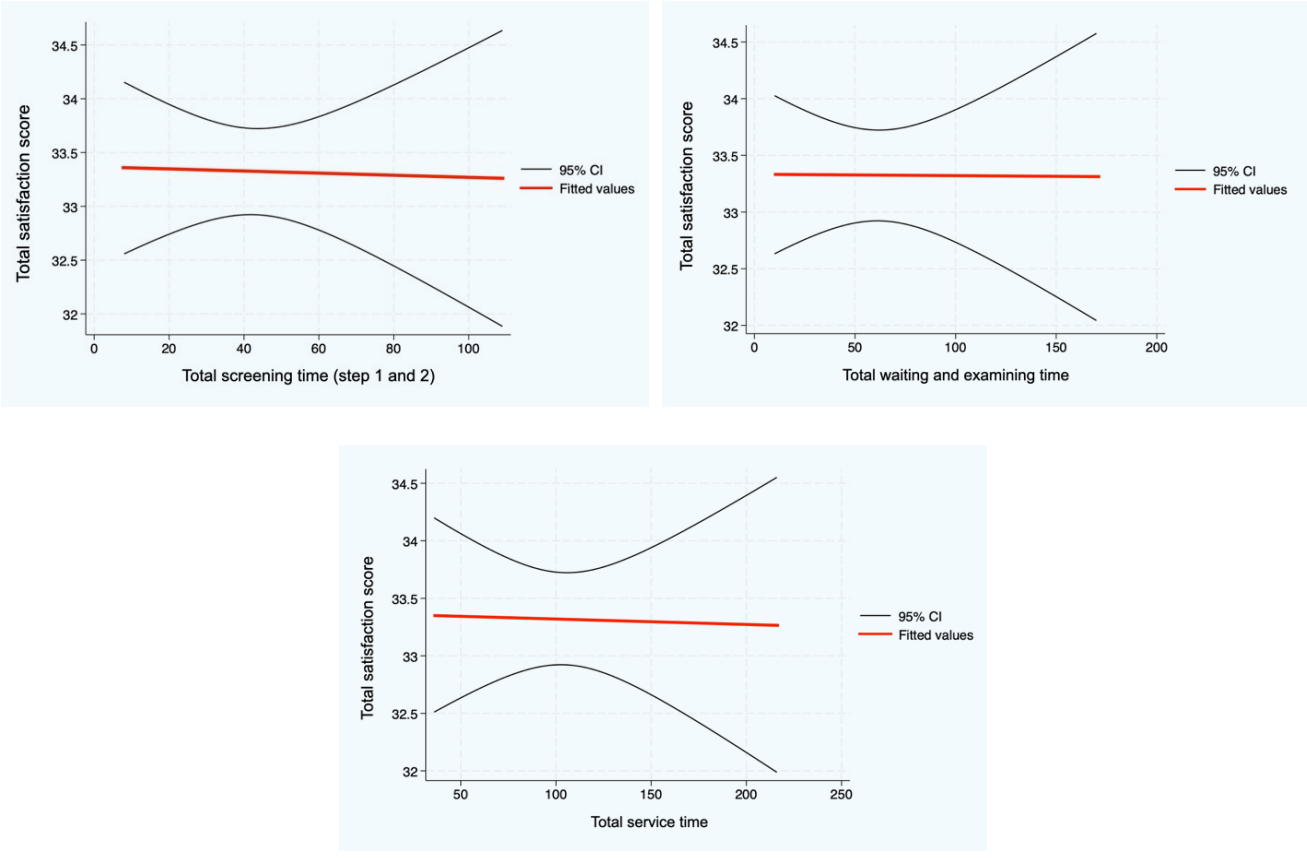


Fig 2. Relationship curve between total satisfaction score and time of service.

98.3% of the participants were confirmed to be at risk of malnutrition or malnourished, demonstrating the high positive predictive value of the step 1 questions. These findings suggest that while the step-one malnutrition screening tool is practical for high-volume clinical settings, its lower sensitivity may necessitate revisions of the incorporation of more sensitive questions to enhance the early detection of at-risk individuals.

The screening for oral health issues, ENT problems, and ocular conditions in step 1 involved the use of expert-designed questionnaires aimed at detecting clinical or urgent symptoms that need further evaluation by specialist clinics. These tools identified oral health problems, ENT issues, and ocular problems in 75%, 37.8%, and 50.6% of the participants, respectively. These results are consistent with those of previous studies. For example, 64% of older adults in the United States were reported to have periodontitis[34], whereas ocular issues, particularly visual impairment, affected 20–33% of older adults.[35,36] Similarly, ENT problems have been reported to affect 25–50% of this population.[37] The results from the step 1 screening in this study align with these previously reported prevalence rates, indicating that these screening questions are likely effective in general clinical practice.

This study highlights the relationship between service time and patient satisfaction, with findings consistent with previous research suggesting that higher satisfaction levels are associated with shorter waiting and service times.[38] However, older adults may prioritize interpersonal aspects of care and the thoroughness of assessments over efficiency alone.[38,39] The present study aligns with these observations, as the comprehensive screening process employed here provides a holistic evaluation, likely contributing to the overall satisfaction of patients despite the extended service time.

Strengths

Several notable strengths of this study can be identified. First, the check-up clinic's ability to detect unrecognized GSs before they lead to further deterioration or hospitalization is a substantial advantage. Early detection through comprehensive assessments allows multidisciplinary teams to intervene promptly, thereby preserving the functional capacity and enhancing the quality of life of older adults.[40] Second, the large sample size used in the primary data collection phase strengthens the generalizability of the findings, providing robust evidence on the efficacy of geriatric assessments in detecting prevalent yet often overlooked conditions. Third, the

implementation of standardized screening tools across both steps of the service process constitutes a key strength of this study. These validated tools, which adhere to international guidelines and established cutoff points, can be easily replicated in other health care settings, both within Thailand and globally, owing to the availability of translations and the use of standardized instruments. Finally, this study examined service-related metrics, including data collection times, waiting periods, and examination durations, providing valuable quantitative data for enhancing service quality. These metrics can be integrated with patient satisfaction data to inform targeted interventions aimed at improving service delivery.[41] By leveraging these data, the service team can optimize both the efficiency of care and the overall patient experience, ensuring that future improvements are data driven and aligned with patient expectations.

Limitations

Some limitations emerged in this study. First, social desirability bias, recall bias, or information bias may have influenced the responses, as participants might have underreported or misremembered relevant details during the self-reported questionnaires. Furthermore, participants may have tended to provide socially desirable responses when completing formal questionnaires.[42] Second, the reliance on the adapted version of screening questionnaires in step 1 is important, particularly for malnutrition and cognitive impairment.[12,15] Even though these adapted versions are based on previously validated instruments, these questionnaires may alter the sensitivity required for early detection, potentially resulting in the under- or over-detection of at-risk individuals. While practical for high-volume settings, incorporating more validated and sensitive questions could enhance the detection of early-stage conditions. Finally, the specific characteristics of the population at a check-up clinic in a high-volume hospital located in an urban setting may limit the generalizability of the results to rural populations or other health care settings with different demographic profiles and health care access challenges.[43] Future research should consider these limitations when designing studies applicable to broader populations.

Clinical implications

The findings from this study have several important implications for clinical practice. First, early detection of GSs through comprehensive geriatric screening can mitigate the progression of these conditions, reducing the need for more intensive health care services and improving overall well-being.[44,45] Second, the two-step comprehensive screening process for older adults offers a replicable model for other health care services. Health care systems can adapt and integrate similar comprehensive screening protocols into their services, particularly those focused on time management and the refinement of questionnaires to fit their specific contexts. Finally, the data on service efficiency and patient satisfaction underscore the importance of streamlining health care delivery without compromising the quality of care. These insights can guide future efforts to optimize service processes, ensuring that care remains both efficient and patient-centered.

CONCLUSION

This study highlights the effectiveness of a two-step comprehensive geriatric screening process in detecting GSs among older adults attending a check-up clinic at a tertiary care hospital. The findings revealed a high prevalence of GSs, including cognitive impairment, fall risk, and oral health issues, highlighting the critical role of early detection and timely intervention. The utilization of standardized screening tools facilitated reliable and consistent assessments, contributing to the reproducibility of the results across different settings. Moreover, despite extended service times, patient satisfaction remained notably high, reflecting the overall quality of care provided. However, this study identified certain limitations in the sensitivity of specific screening instruments, indicating the need for further refinement to improve early detection capabilities. These findings offer important insights into the improvement of geriatric care practices and the optimization of health care service delivery, both within Thailand and globally, through the implementation of structured and efficient screening protocols.

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DECLARATION

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

Author Contributions

Conceptualization and methodology, H.P., and W.M.; Investigation and data collection, S.C., T.V., N.P., P.C., U.V., J.W., A.T., S.T., and A.J.; Formal analysis, H.P., W.M.; Visualization and writing – drafted the original manuscript, H.P.; Writing – review and editing, H.P., W.M.; Supervision, W.M. All authors have read and agreed to the final version of the manuscript.

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