Family Medicine and Community Health

Harnessing innovation to help meet the needs of elders: field testing an electronic tool to streamline geriatric assessments across healthcare settings

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ABSTRACT

Background As populations age globally, effectively managing geriatric health poses challenges for primary care. Comprehensive geriatric assessments (CGAs) aim to address these challenges through multidisciplinary screening and coordinated care planning. However, most CGA tools and workflows have not been optimised for routine primary care delivery.

Objective This study aimed to evaluate the impact of a computerised CGA tool, called the Golden Age Visit, implemented in primary care in Israel.

Methods This study employed a quasiexperimental mixed-methods design to evaluate outcomes associated with the Golden Age electronic health assessment tool. Quantitative analysis used electronic medical records data from Maccabi Healthcare Services, the second largest health management organisation (HMO) in Israel. Patients aged 75 and older were included in analyses from January 2017 to December 2019 and January 2021 to December 2022. For patients, data were also collected on controls who did not participate in the Golden Age Visit programme during the same time period, to allow for comparison of outcomes. For physicians, qualitative data were collected via surveys and interviews with primary care physicians who used the Golden Age Visit SMARTEST e-assessment tool.

Results A total of 9022 community-dwelling adults aged 75 and older were included in the study: 1421 patients received a Golden Age Visit CGA (intervention group), and 7601 patients did not receive the assessment (control group). After CGAs, diagnosis rates increased significantly for neuropsychiatric conditions and falls. Referrals to physiotherapy, occupational therapy, dietetics and geriatric outpatient clinics also rose substantially. However, no differences were found in rates of hip fracture or relocation to long-term care between groups. Surveys among physicians (n=151) found high satisfaction with the programme.

Conclusion Implementation of a large-scale primary care CGA programme was associated with improved diagnosis and management of geriatric conditions. Physicians were also satisfied, suggesting good uptake and feasibility within usual care. Further high-quality studies are still needed but these results provide real-world support for proactively addressing geriatric health needs through structured screening models.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Little was known about the impact of streamlining comprehensive geriatric assessments (CGAs) into an electronic format suitable for integrated medical records and typical clinical workflows.

WHAT THIS STUDY ADDS

⇒ Implementation of a computerised CGA programme called the Golden Age Visit was associated with improved screening, diagnosis and management of geriatric conditions compared with usual care among older adults in Israel. Diagnosis rates increased for neuropsychiatric issues and falls while referrals to supportive services substantially rose following the Golden Age Visit CGA.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Findings provide preliminary evidence that digitising CGAs can optimise elder care delivery through primary care and warrants further exploration. Results support continued research and development of health information technology solutions to streamline comprehensive geriatric screening and care coordination. Standardising electronic CGAs may help inform policies aiming to address workforce gaps in meeting the needs of ageing populations.

INTRODUCTION

As human life expectancy increases, older adults face progressive declines in physical and cognitive abilities and tend to have multiple medical conditions and critical events concurrently.[1] The rising elderly population paired with fewer caregivers puts great pressure on healthcare systems regarding costs and resources. By 2050, over 1600 million people worldwide will be aged 60 years or older. This demographic shift poses challenges for sustainable health systems and impacts all facets of society.[1]

In particular, the growing senior population strains primary care delivery models that

are typically not optimised for complex geriatric patients.[2] Older adults have multidimensional health needs spanning medical, functional, mental health and social domains. Comprehensive geriatric assessment (CGA) evaluates an elder's medical, psychosocial and functional status to develop individualised care plans. First developed in the 1960s, CGA addresses the complexity of geriatric patients who often have multiple cooccurring issue.[3]

Over 50 years of research has demonstrated CGA's effectiveness through reduced mortality, functional and cognitive decline, nursing home placement and healthcare costs.[3 4] A standard CGA involves a multidisciplinary team assessing key domains like medical diagnoses/medications, functional ability, nutrition, mental health and social supports using standardised tools.[5] These domains provide a holistic understanding of an older adult's health in order to develop a coordinated care plan targeting common geriatric challenges such as multimorbidity, falls risk and polypharmacy.[6]

Following a visit that can take 1–2 hours, the team synthesises a plan addressing all areas of need. Long-term studies have found that CGA reduces mortality, functional and cognitive decline, nursing home placement rates and healthcare costs.[7] However, the intensive resource requirements limit its availability. Also, CGAs are time-intensive and primary care visits rarely allow comprehensive assessment and care planning across all relevant areas. International studies estimate that only 10%–25% of older adults receive a CGA.[8] Israel is a relatively young country compared with other developed nations, mainly attributable to its high fertility rates (see appendix 1 for more details regarding Israeli healthcare system).[9] However, projections indicate the number of Israelis aged 70 and over will double by 2040. During this period, the proportion of those 70+ is expected to rise from 8.5% to 11% of the total population. Furthermore, among those aged 65 and over, rates of chronic diseases, acute morbidity risk, functional decline, polypharmacy and health service utilisation are also increasing.[10]

Concurrently, issues affecting seniors such as multiple long-term illnesses, hospitalisation probability, self-care limitations, polypharmacy concerns and healthcare visits are progressively worsening within the 65+ cohort as well. These shifting national demographic trends pose looming challenges for the Israeli health system to comprehensively meet geriatric needs over the coming decades.[119]

Despite Israel's rapid ageing of its population, there are only approximately 400 geriatricians in the country.[12] This limited specialist workforce does not appear capable of providing comprehensive care to all elderly Israelis. Thus, primary care physicians must play a larger role in addressing the distinct needs of older adults, including through the application of geriatric assessment.[13] With just 400 geriatricians for its growing senior cohort, Israel requires increased involvement from primary providers to deliver solutions tailored to this vulnerable population.[14] Implementing standardised geriatric screening and care planning tools in primary care settings could help optimise currently fragmented care for seniors across settings.[8] Harnessing primary care in this manner may be necessary to fill gaps as the proportion of older Israelis continues expanding faster than available specialist geriatric resources.

Geriatric assessment evaluates medical, social and environmental factors that affect overall well-being, and addresses functional status, fall risk, medication review, nutrition, vision, hearing, cognition, mood and services.[15] CGA can lead to early recognition of problems that affect the patient's quality of life by identifying areas for focused intervention, and/or subtle or hidden problems.[15] For example, in a study conducted by Tak *et al*[16] among 180 homebound elderly, a geriatric assessment tool was used by primary care physicians to identify a wide range of mental and social problems among them, such as anxiety, depression, cognitive impairment, suspicion, loneliness and somatisation. Researchers found that using this tool helped family physicians to detect social and/or psychological problems early among their elderly patients and provide tailored solutions.

Following this, Maccabi Healthcare Services (MHS) developed a computerised tool called 'Golden Age Visit', for primary care physicians to detect geriatric symptoms at early stages, with the goal of promoting health and initiating preventive medicine for patients aged 65 and over. Accordingly, a smart structured visit sheet (SMARTSET) was built which includes the following components: physical/clinical, mental, functional, social, environmental/safety and nutritional.

While CGA is established as the gold standard for geriatric assessment, barriers around resource intensiveness and limited accessibility persist. Our study presents a novel approach that seeks to address this gap by automating core CGA components for use in primary care. To our knowledge, this is the first study to implement and evaluate an electronic comprehensive geriatric screening tool designed specifically for the primary care setting. By streamlining CGA into a structured e-form, our research explores whether proactive geriatric screening can be enhanced within existing healthcare structures. The automated assessment captures multiple domains known to be predictive of senior health outcomes, but streamlines the process for feasibility in routine clinical visits. In so doing, our study has potential to significantly expand access to proactive geriatric screening, care coordination and preventive services for growing senior populations worldwide.

Positive results could support widespread adoption of our geriatric screening approach to optimise healthcare quality, costs and efficiency as populations age. Given scarce research on technology-enabled CGA models, our study also addresses an important knowledge gap with implications for future care delivery innovation. Overall, this project emphasises an original strategic shift towards making CGA scalable within primary care.

Research aims

This study examines how primary care physicians at MHS use a tool for assessing geriatric symptoms to promote early detection and intervention among community-dwelling adults aged 65 and over, including homebound adults. Specifically, it explores the effects of the tool on physician satisfaction and patient outcomes.

The objectives are to:

1. Incorporate qualitative feedback from patient focus groups to inform development of the Golden Age Visit tool.
2. Assess physician perceptions of the usability, feasibility and clinical utility of the Golden Age Visit tool for routine primary care assessments.
3. Evaluate physician satisfaction with components of the Golden Age Visit including assessment of health domains and decision support features.
4. Compare healthcare utilisation outcomes between patients receiving a Golden Age Visit versus usual primary care, including rates of office visits, transitions to long-term care, new diagnoses identified and hip fractures.

METHODS

Study design

This study employed a quasiexperimental mixed-methods design to evaluate the impact of the SMARTEST tool among physicians and patients. Quantitative analysis used electronic health record data from 2017 to 2022.

The quantitative component compared changes in patient outcomes between those who received the SMARTEST assessment between January 2017 and December 2019 at MHS primary care clinics versus matched controls receiving usual care during the same period. Baseline patient data including demographics, comorbidities, functional status and so on were collected from electronic health records for both groups during 2017–2019. Healthcare utilisation, diagnoses and clinical measures were extracted from electronic health records at baseline (2017–2019) and follow-up (through 2022), providing approximately 3 years of follow-up.

Primary outcomes in the quantitative analysis included changes in patient healthcare utilisation measures over time between the SMARTEST and control groups.

Study Population

The study included primary care physicians from MHS who administered at least one Golden Age Visit assessment between 2017 and 2022, as well as their patients aged 65+.

Patient eligibility criteria for receiving a Golden Age Visit assessment were as follows:

(1) homebound residents aged 65+ under home care; (2) residents aged 65+ identified at high risk for falls; (3) residents aged 75+ meeting additional risk criteria such as advanced age, hospitalisation frequency, malnutrition, home visit frequency, number of chronic diseases, polypharmacy, and high-risk medication use.

Patients who did not receive a Golden Age Visit served as the control group. They included community-dwelling adults aged 65+ who did not meet the stated eligibility criteria during the study period.

Physicians were invited to participate in surveys and interviews about their experiences implementing the Golden Age Visit.

Data collection

Physician satisfaction assessment

Anonymous questionnaire data previously collected from primary care physicians at 3 months postvisit was analysed. The questionnaire assessed ease of use, usefulness for identifying issues and impact on patient management. The questionnaire was compiled for the purposes of the research and includes nine closed questions, some of which ask the respondent to rate on a 5-point Likert scale (1=not at all to 5=very much) their satisfaction with the tool and its perceived contribution. In addition, the questionnaire allows for free text. To validate the questionnaire, we conducted cognitive interviews with a sample of 18 primary care physicians not involved in the study. The goal of the interviews was to evaluate question comprehension, response options, flow and face validity. Based on physician feedback, we made minor modifications to the wording of two items for clarity. All other items were deemed clearly understood by participants. Prior to use in the main study, the revised questionnaire was administered to an additional sample of 15 physicians to test–retest reliability over a 2-week interval. Intraclass correlation coefficients demonstrated good reproducibility for all items (ICC range 0.72–0.87).

Patient outcome assessment

The electronic medical records (EMRs) of patients aged 65+ who received a Golden Age Visit between 2021 and 2022 were reviewed. Healthcare utilisation and living arrangements data were retrieved from the EMR previsit and at 3 months postvisit and compared with a matched control group. Healthcare utilisation included number of specialist visits in the 3 months postvisit recorded in the EMR. Living arrangements (community-dwelling vs nursing home) were assessed based on EMR documentation at baseline and 3 months. Additional patient-reported outcome data from follow-up phone surveys administered at 3 months postvisit and recorded in the EMR were also analysed to assess outcomes like self-rated health, independence and satisfaction with care.

We also collected sociodemographic data regarding the patient (eg, age, gender). Socioeconomic status and clinical characteristics (eg, having diagnosis of hypertension or diabetes mellitus) were also collected.

Instrument development

Golden Age Visit and SMARTEST

Figure 1 illustrates the process of developing the SMARTEST for Golden Age Visit.

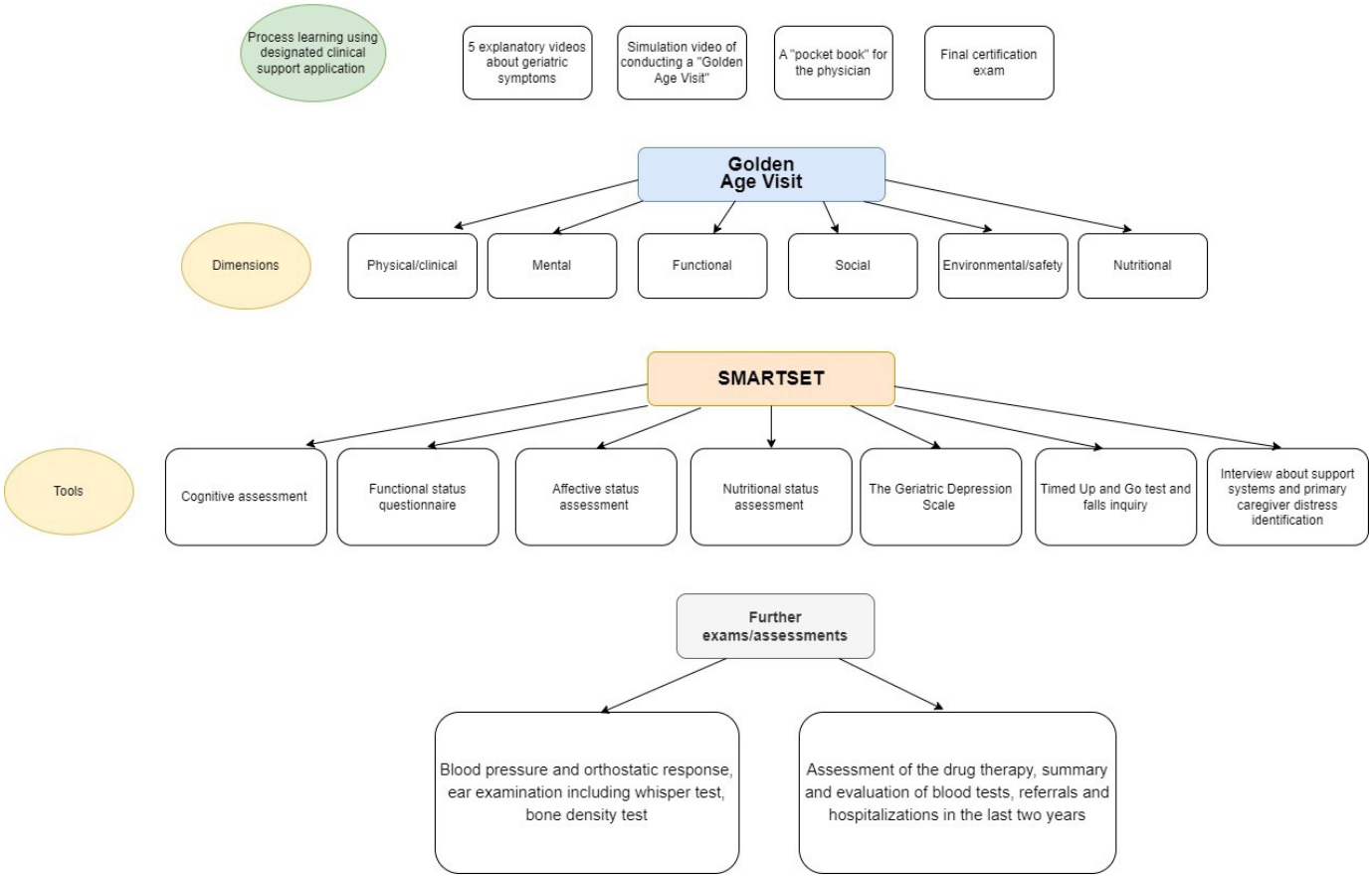

Figure 1 The process of developing the SMARTEST for Golden Age Visit.

The tool developed at MHS is a smart system tool called 'Golden Age Visit', which is found in the patient's computerised medical file (see appendix 1) and allows the family physician to assess six areas: physical/clinical, mental, functional, social, environmental/safety and nutritional. The duration of the visit is about 45 min. Accordingly, a smart structured visit sheet (SMARTSET) was built which includes the following components:

1. Cognitive assessment: the Sweet 16 is a brief cognitive assessment tool that was developed and validated in two cohorts as an alternative to the Mini-Mental State Examination (MMSE).[17] The Sweet 16 demonstrated high correlations with the MMSE and Modified Blessed Dementia Rating Scale in both cohorts and performed equivalently to or better than the MMSE when assessed against the independent formant Questionnaire on Cognitive Decline (IQCODE) reference standard, with areas under the receiver operating characteristic curve ranging from 0.84 to 0.97 depending on the analysis. Sensitivity of the Sweet 16 was equal to or higher than the MMSE across validation analyses, meeting the study goal of maximising sensitivity for use as a brief cognitive screening tool.
2. Assessment of affective state using the two depression screening questions from the Patient Health Questionnaire-2 (PHQ-2). The PHQ-2 consists of only the first two items from the larger Patient Health Questionnaire-9 (PHQ-9) scale, assessing depressed mood and anhedonia. With just two items, internal consistency statistics like Cronbach's alpha cannot be calculated for the PHQ-2. However, the PHQ-9 from which the PHQ-2 is derived has demonstrated excellent internal reliability, with a Cronbach's alpha of 0.89 reported in the large validation study by Kroenke *et al*.[18]
3. The 15-item Geriatric Depression Scale (GDS) is a commonly used screening tool to assess depression in older adult populations. A validation study conducted by Hoyl *et al* in 1999 found the 15-item GDS to have high internal reliability. Specifically, the study reported a Cronbach's alpha of 0.86 for the full scale, demonstrating good internal consistency between the 15 items on the GDS questionnaire.[19]
4. Interview regarding support systems and identification of primary caregiver distress (with a family member of the patient present at the visit).
5. Functioning assessment: Barthel Index for Activities of Daily Living questionnaire. The Barthel Index is a validated tool used to assess functional independence after a stroke or other disabling disease/injury. The two primary version of the Barthel Index—the 10-item and the 15-item—both received high mark reliability ratings. The 15-item version has a 0.89 test–retest reliability and 0.95 internal reliability calculated by Granger *et al*.[20] The 10-item has an alpha internal consistency coefficient of 0.87–0.92 reported by Shah *et al*.[21]

6. Nutritional status—to comprehensively assess nutritional status, we evaluated multiple factors beyond only body weight changes and meal receipt. Participants underwent screening for risk of malnutrition using the validated Short Nutritional Assessment Questionnaire.[22] Through interview, we documented each individual's appetite level, recent eating habits and ability to independently manage food shopping and preparation. Dental status and symptoms of difficulty in swallowing were recorded due to their potential impact on nutrition.
7. Functional status was evaluated using components from standardised tools. Gait speed was measured via the 'Get Up and Go' test, where participants rise from a chair, walk 3 metres, turn and return to sit down. This assesses mobility and risk of falls. Fall history in the past year was determined through structured inquiry about the number, circumstances and injuries related to any falls.

At the end of the visit, the system assists the family physician by suggesting relevant referrals to additional care providers as needed. This may include referrals to a social worker, multidisciplinary geriatric clinic, geriatrician, physiotherapist, dietician, nurse or services from the National Insurance Institute for the elderly. The system can also facilitate virtual consultations. In addition, informational leaflets on preventive healthcare topics are available to print for the patient and their family. Example topics include home and street safety procedures, healthy longevity and smart nutrition in old age.

The duration of a regular visit using this system is approximately 45 min, allowing adequate time for consultation, review of the patient's needs and history, referrals, and health education resources.

Developing an application

Prior to this study, IT team at MHS developed a clinical support application to operationalise the SMARTEST geriatric assessment for family physicians. Key application features were informed by previous studies[23 24] on best practices for clinical decision support systems and virtual patient simulation tools. These included explanatory videos summarising common geriatric conditions, a digital handbook with assessment protocols, and a virtual simulation of the 'Golden Age Visit' modelled after descriptions. Since its public launch, administrative data indicate over 6000 geriatric assessments have been facilitated through the SMARTEST application by primary care clinicians in our healthcare system. As successful adoption occurred, it became important to formally evaluate users' experiences through their perspectives.

Sample size

Physician sample

Approximately 100 primary care physicians were invited to participate via a randomised selection process from an anonymised list of all physicians who had used the SMARTEST tool at least once (n=200). Physicians were randomised using a computer-generated number sequence with a 1:2 ratio of selection. We estimated that 100 physicians would allow detection of moderate effects, while accounting for possible non-response.[25]

Patient sample

Power analysis using GPower software determined that with five prespecified patient predictors (age, sex, comorbidities, living situation, cognition), power of 0.8, and effect size of 0.25, a minimum total sample of 128 patients was needed between control and research groups combined.[26] The five predictors were identified from previous literature as relevant to outcomes of CGA.[8 23] To account for non-participation, the target sample was inflated to 250 patients (125 per group).

Both samples captured diverse urban and rural practice settings where the tool had launched.

Data analysis

Quantitative analysis

Descriptive statistics including means, SD, counts and percentages were used to characterise patient demographic and clinical variables.

Comparative analyses were conducted between patients who did and did not receive Golden Age Visits. For continuous variables that were normally distributed based on visual assessment of histograms and Q–Q plots, independent sample t-tests were performed. Mann-Whitney U tests were used for non-normally distributed continuous variables. χ^2 tests examined differences in categorical variables between groups. A subgroup analysis further compared outcomes between patients with and without cognitive impairment, as determined by their documented diagnosis, based on whether they received a Golden Age Visit assessment. This allowed exploration of how the assessment tool may differentially impact patients at varying cognitive function levels.

All statistical tests were two-sided and a p value of <0.05 was considered statistically significant. Statistical analyses were performed using IBM SPSS Statistics V.29 (SPSS Inc, Chicago, Illinois, USA).

Qualitative analysis

For qualitative analysis of physician interview data, we will use thematic analysis procedures. Digital interview recordings will be transcribed verbatim and analysed line-by-line to identify emergent themes. Two researchers will independently code transcripts, compare for consistency and resolve discrepancies through discussion. Qualitative data analysis software NVivo V.12 will facilitate organisation and management of themes.

RESULT

A total of 9022 older adults were included in the analysis, of which 1421 (15.8%) visited the Golden Age Visit. There were no significant differences between Golden Age visitors and non-visitors in mean age (84.1 vs 83.8 years,

Table 1 Comparison of baseline characteristics between the population that visited the Golden Age Visit and the population that did not visit the Golden Age Visit

Demographics	All n=9022	Golden Age Visit n=1421	No Golden Age Visit n=7601	P value*
Age, years (SD)	83.9 (3.7)	84.1 (5.9)	83.8 (5.7)	0.121
Range	60–85	60–85	60–85	
Female, n (%)	4935 (54.7)	795 (55.9)	4140 (54.5)	0.31
Residing in the periphery, n (%)	550 (6.1)	91 (6.4)	459 (60)	0.63
Socioeconomic status, n (%)				0.11
High	2192 (24.3)	341 (24.3)	1851 (24.6)	
Medium		663 (47.3)	3732 (49.6)	
Low		398 (28.4)	1941 (25.8)	
Oncological disease, n (%)	4395 (48.7)	519 (36.5)	2955 (38.9)	0.09
Hypertension, n (%)	8330 (92.3)	1323 (93.1)	7007 (92.2)	0.25
IHD, n (%)	6382 (70.4)	980 (69)	5402 (71.1)	0.11
COPD, n (%)	1386 (15.4)	235 (16.5)	1151 (15.1)	0.19
Fall, n (%)	8334 (92.4)	1367 (96.2)	6967 (91.7)	<0.001
DM, n (%)	4815 (53.7)	764 (53.8)	4051 (53.3)	0.75
Osteoporosis, n (%)	4564 (50.6)	778 (54.8)	3786 (49.8)	<0.001
Antidepressants, n (%)	3846 (42.6)	630 (44.3)	3216 (42.3)	0.16
Cognitive problem, n (%)	2951 (32.7)	757 (53.3)	2194 (28.9)	<0.001

Descriptive data are presented as means and SD for continuous variables, and percentages for categorical variables.
*Difference between Golden Age Visit and No Golden Age Visit.
COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; IHD, ischaemic heart disease.

p=0.121), gender distribution (55.9% vs 54.5% female, p=0.31), residing in the periphery (6.4% vs 6%, p=0.629), distribution of socioeconomic status (p=0.114), prevalence of oncological disease (36.5% vs 38.9%, p=0.096), hypertension (93.1% vs 92.2%, p=0.254), ischaemic heart disease (69% vs 71.1%, p=0.112), chronic obstructive pulmonary disease (16.5% vs 15.1%, p=0.186), diabetes (53.8% vs 53.3%, p=0.75) and antidepressant use (44.3% vs 42.3%, p=0.161). In addition, Golden Age visitors had higher rates of history of falls (96.2% vs 91.7%, p<0.001), osteoporosis (54.8% vs 49.8%, p<0.001) and cognitive problems (53.3% vs 28.9%, p<0.001) (table 1).

Table 2 presents the comparison of outcomes between patients who received a golden visit and those who did not, stratified by cognitive status. Among older adults with cognitive problems (n=1279), those who received a Golden Age Visit were more likely to have subsequent geriatric visits (69% vs 76.3%, p<0.001), physical therapy visits (31.2% vs 18%, p<0.001), dietitian visits (33.4% vs 15.4%, p<0.001) and occupational therapy visits (22.3%

Table 2 Comparison of frequency of visits to health professionals between patients who received a Golden Age Visit and those who did not, stratified by cognitive status

	Cognitive problem					No cognitive problem				
	Golden Age Visit (n=756)		No Golden Age Visit (n=2192)			Golden Age Visit (n=663)		No Golden Age Visit (n=5401)		
Visit type	Mean/n	%/SD	Mean/n	%/SD	P value	Mean/n	%/SD	Mean/n	%/SD	P value
Geriatric*	n=522	69.0%	n=1673	76.3%	<0.001	n=250	37.7%	n=1939	35.9%	0.37
Physical therapy	n=236	31.2%	n=394	18.0%	<0.001	n=181	27.3%	n=767	14.2%	<0.001
Dietitian visit	n=253	33.4%	n=338	15.4%	<0.001	n=168	25.3%	n=593	11.0%	<0.001
Occupational therapy	n=169	22.3%	n=211	9.6%	<0.001	n=108	16.3%	n=261	4.8%	<0.001
Nursing home	n=15	2.0%	n=104	4.7%	<0.001	n=7	1.1%	n=119	2.2%	0.059

*Performed by family physician.

Table 3 Number of patients receiving initial diagnoses in the 3 months following the index date by receipt of Golden Age Visit

	Golden Visit n=1421		No Golden Visit n=2446	
	n	%	n	%
Dementia/Alzheimer's	37	2.60	20	0.82
Depression	53	3.73	13	0.53
Falling	42	2.96	32	1.31
Functional deterioration	409	28.78	28	1.14
Hearing loss	14	0.99	9	0.37
Mild cognitive impairment	483	33.99	20	0.82
Polypharmacy	43	3.03	13	0.53
Walking difficulty	38	2.67	32	1.31
Orthostatic hypotension	11	0.77	3	0.12
Cerumen impaction	6	0.42	4	0.16
Weight loss of 10%	6	0.42	6	0.25

vs 9.6%, p<0.001) compared with those who did not receive a Golden Age Visit. There were no significant differences in rates of hip fracture at 3 months (1.2% vs 1.6%, p=0.491) or relocation (11.1% vs 8%, p=0.011) between the groups.

Among older adults without cognitive problems (n=2189), those who received a Golden Age Visit were also more likely to have physical therapy visits (27.3% vs 14.2%, p<0.001), dietitian visits (25.3% vs 11%, p<0.001) and occupational therapy visits (16.3% vs 4.8%, p<0.001) compared with non-visitors. However, there was no significant difference in subsequent geriatric visits (37.7% vs 35.9%, p=0.369) between the two groups. No differences were observed in hip fracture rates (1.5% vs 1%, p=0.22) or relocation (10.4% vs 9%, p=0.253).

Table 3 presents the number of patients who received initial diagnoses for the first time in the 3 months following the index date, stratified by those who received a Golden Age Visit and those who did not. Among patients who had a Golden Age Visit, the most common initial diagnosis was mild cognitive impairment, affecting 483 patients (19.75% of the group). The second most frequent diagnosis in this group was functional deterioration, received by 409 (16.72%) patients.

Comparatively, for patients who did not receive a Golden Age Visit, mild cognitive impairment remained the leading initial diagnosis but was substantially lower at 20 patients (0.82% of the group). This difference in rates of mild cognitive impairment between the two groups was statistically significant (p<0.001).

Depression and falling were the next most prevalent initial diagnoses within the no visit group, received by 13 (0.53%) patients and 32 (1.31%) patients, respectively. These rates were significantly lower than that in the group who had a Golden Age Visit, where depression affected (3.73%) and falling (2.96%) (p<0.01 and p<0.05, respectively).

In general, initial diagnostic rates tended to be higher in patients who received a Golden Age Visit. For instance, dementia/Alzheimer's was diagnosed for the first time in 37 (1.51%) patients with a visit compared with 20 (0.82%) patients without. Exceptions were falling and walking difficulty, which showed similar initial diagnosis rates between the groups. Rare diagnoses such as cerumen impaction and weight loss of 10% or more affected small percentages overall.

A total of 151 physicians participated in the pilot programme by conducting at least one golden visit. Of these, 67 physicians (44% response rate) completed the postpilot questionnaire. The majority were female (61%) and specialised in family medicine (64%). Physicians aged 48 years or younger constituted the largest age group that conducted golden visits (42%) and responded to the questionnaire (48%). Regional response rates varied, with 34% of respondents practicing in the Sharon district.

Among physicians who performed golden visits, satisfaction with the programme was high. Nearly two-thirds (65%) reported being greatly to very greatly satisfied overall. Satisfaction was even higher (82%) for the largest participating age group of physicians under 48 years old (figure 2).

The main perceived contribution of golden visits was in diagnosis and geriatric assessment (69%). Over half felt it helped identify new previously unknown geriatric symptoms (53%) and monitor existing symptoms (48%), while nearly half said it expanded their knowledge of caring for older patients (45%). Approximately 70% believed the supporting training was helpful.

For physicians who did not conduct golden visits (n=1100), the questionnaire response rate was lower at 13% (n=148). Respondents were predominantly female (53%). The Jerusalem and Lowland districts exhibited the highest response rates (25%). Despite not directly participating, most (80%) were aware of the pilot programme. The primary deterrent cited was concerns about time investment required per visit (41%). A similar proportion indicated the pilot closed before they could enrol (41%).

Qualitative findings

Focus group feedback: prior to tool development, focus groups provided valuable feedback from community-dwelling older adults. Participants emphasised the importance of a user-friendly assessment format with large print, simple language and a relaxed structure to accommodate varying health literacies and abilities. A holistic, comprehensive approach addressing medical, social, mental health and functional concerns impacting daily living was preferred. Older adults also sought solutions to address systemic access challenges like transportation difficulties and long wait times that hinder receiving regular preventative and chronic care services. This qualitative feedback

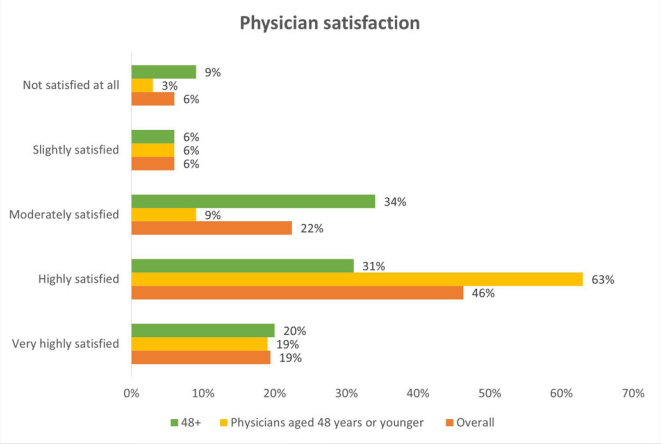

Figure 2 Primary care physicians' satisfaction and perceived value of the Golden Age Visit SMARTEST decision support features.

informed development of the Golden Age Visit tool and decision support features aimed at facilitating ongoing health monitoring and linkage to community resources.

Physician interview themes

Interviews with physicians explored their experiences using the Golden Age assessment tool. Emergent themes included improved diagnosis and assessment capabilities. Physicians reported new insights into previously unknown issues, as one doctor noted, 'I visited a patient from my list - it was very educational and interesting for both of us' (Physician 1). Enhanced monitoring of chronic conditions was also reported, with another physician sharing how proactively inviting a patient led to important insights, saying '*I proactively invited a patient for a 'age 75 visit'*, she happily accepted. Transferring the completed questionnaires took about 35 min' (Physician 2).

Regarding the tool's clinical utility, a third physician stated 'As a family doctor I wanted to congratulate you on the project. In ten years as a family doctor in two different funds, I have not yet seen such a beautiful project in terms of understanding the role of the family doctor. A wonderful idea, extremely important, focuses mainly on the important!' (Physician 3). Physicians also reported expanded geriatric care knowledge through the assessments.

Training support was found to be helpful by the majority of physicians. Concerns around timely implementation deterred some from participating directly. However, most non-users were still aware of the programme due to widespread communication efforts during the pilot phase. Improvements to visit efficiency were also observed, with one doctor commenting 'I can tell from my experience that a birthday visit to the clinic takes about 15–20 min, the patient is very satisfied with the thorough examination. The examination yields problems that require treatment and attention, which without the dedicated and structured visit, we might have missed them' (Physician 4).

DISCUSSION

This comprehensive evaluation provides valuable insights into deploying geriatric assessment programmes on a large scale within a major healthcare system. By analysing outcomes for both community-dwelling older adult patients and their primary care physicians across Israel's second largest health organisation, this study evaluated the real-world impact of the Golden Age Visit programme implemented as a digital tool, on a significant population level.

Detection of geriatric conditions

The current study found a significant increase in detection of neuropsychiatric diagnoses after implementation of the primary care-based Golden Age Visit assessment. This finding mirrors results from Ellis *et al*[27] demonstrating improved identification of conditions through comprehensive screening approaches. Early detection allowed for proactive management strategies, as supported by Stuck *et al* (1993).[28] Comprehensive assessments like the Golden Age Visit aim to screen for conditions such as dementia through cognitive testing and evaluation of neuropsychiatric symptoms. Left undiagnosed, diseases involving cognitive decline can negatively impact quality of life and functional status.[27] The findings underscore the value of structured geriatric assessments in primary care for improving detection of Alzheimer's disease, dementia and related conditions that disproportionately impact ageing populations. From the physician perspective, understanding time requirements, workflow impacts and strategies to address these challenges would be informative. Physicians' views on how SMARTSET may influence outcomes compared with usual care would also aid adoption. Capturing both positive and negative feedback in a balanced way would generate useful knowledge.

Physician perspectives on usability and feasibility

Physician satisfaction with the Golden Age Visit assessment tool observed in the current study aligns well with previous research by Morley *et al*[29] highlighting the acceptability of integrating such instruments into routine primary care. The acceptability of assessment tools by physicians not only depends on their satisfaction rates but also requires the assessment of tool usability by validated instruments.[30] While some non-adopting physicians cited concerns over time barriers, as observed by Ellis *et al*[27] streamlining assessment components as achieved by Boult *et al*[31] through guided care models may help address feasibility issues. Additional cost-effectiveness analyses evaluating the sustainability of CGA programmes, as recommended by Morley *et al*[29] could further strengthen national implementation efforts.

Satisfaction with decision support features

The current study assessed physician satisfaction with various Golden Age Visit components. Furthermore, examining specific decision support elements could help optimise their utility. Previous research shows

computerised decision support improves adherence to care guidelines when integrated into clinical workflows.[32 33] Features like easily accessible comprehensive screening results aim to efficiently translate assessments into timely clinical decisions.[34 35]

Computerised prompts on indicated follow-up care or missing screening metrics then support addressing all patient needs. However, prompts must be carefully designed to avoid clinical interruption and fatigue.[36]

Access to linked educational resources as a decision support feature can empower ongoing physician learning, especially when combined with clinical decision support.[37] Nonetheless, physician feedback on resource utilisation and perceived value was not explicitly reported in this study.

Future studies should conduct detailed evaluations of satisfaction with individual decision support components. Standardised questionnaires have been used successfully in previous decision support research to gather feedback on usability, efficiency and influence on medical decisions.[38] Targeted research assessing user-friendliness, time efficiency and influence on clinical decision-making for features like screening results and care guidelines could guide further refinement. The goal of clinical decision support should be increasing quality and consistency of care through evidence-based recommendations informed by individualised patient data, as supported by previous literature.[39] More rigorous examination is still needed regarding physician satisfaction with specific decision support functionalities in the Golden Age Visit tool.

Impact on outcomes

This study demonstrated associations between Golden Age Visits and increased subsequent utilisation of allied health services. This aligns with prior evidence that CGAs identify unmet needs and catalyse appropriate referrals.[4 27] Earlier identification of care requirements through programmes like Golden Age Visits may also influence transitions to long-term care, an important outcome given associated challenges. While the current study did not analyse this directly, geriatric evaluations have shown promise for institutionalisation delays in past randomised work. Targeted investigation of transitions as they relate to early needs recognition could inform policy and service planning.

Early diagnosis enables initiation of beneficial interventions shown to improve health outcomes. However, deeper analysis of specific conditions detected, such as neuropsychiatric disorders, may illuminate how to optimise postvisit pathways. Identifying the patient characteristics or conditions that are most likely to benefit from a CGA could help guide targeted implementation and prioritisation of assessment resources. For example, focusing assessment programmes on patients demonstrating specific healthcare needs or functional impairments may maximise diagnostic and care planning yields.[40] A key strength of this study was that it evaluated outcomes using data from MHS, the second largest health management organisation (HMO) in Israel. This provided insights into the impacts of Golden Age Visits on a national scale rather than just a single healthcare organisation or location. The study design aligns with Chen *et al*'s (2022)[40] recommendation that assessments implemented across multiple settings generate more robust evidence. By leveraging data from Maccabi, a large national HMO, the study was able to analyse patterns in a diverse patient population across various regions. This broad scope of demographic characteristics was considered, however generalisability is limited without a sampling method to represent those populations. Future research involving other large national healthcare datasets could further add to the evidence supporting the effectiveness of CGA programmes.

Limitations

First, as an observational study conducted within a single healthcare organisation, causal inferences are limited. The inclusion of one HMO in Israel also constrains generalisability. Residual confounding from baseline differences between groups may persist without advanced adjustment techniques.

Second, aspects of the study outcome measurements introduce potential for bias. Outcomes relied on physician documentation rather than standardised assessments. Functional status and quality of life measures came from notes not validated patient scales. Completion time for the Golden Age tool and whether it exceeded typical visits was unknown. Third, follow-up periods were relatively short for some outcomes. Relocation and fractures were only reported out to 3 months. Longer follow-ups may have shown differences not apparent in the short-term. Cost-effectiveness over extended periods also could not be evaluated.

Fourth, the patient perspective was not formally assessed postintervention despite involvement in development. Direct collection of patient-reported outcomes and perceptions was lacking. Finally, methodological enhancements in the future could address several limitations. Incorporating validated measures, assessing administration metrics, expanding follow-ups, adjusting for confounders and evaluating cost-savings quantitatively could strengthen the evidence base.

CONCLUSION

In conclusion, this study found that the Golden Age Visits CGA programme was associated with increased diagnoses, referrals and physician satisfaction after 1 year. However, longer-term impacts on health, function and costs require further examination.

Sustainable models for routinely incorporating comprehensive assessments into varied primary care systems deserve additional exploration. Future research should evaluate scalability across settings and populations. Standardised screening tools could potentially be integrated

across multiple primary care clinics through training, shared care plans and outcomes monitoring.

Proactively managing common geriatric conditions via coordinated screening may benefit older adults. As populations age, optimising primary care delivery for their needs is increasingly important. Additional high-quality studies can provide guidance on best practices for geriatric care delivery and integration into healthcare systems.

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