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Remaining Agile in the COVID-19 pandemic healthcare landscape – How we adopted a hybrid telemedicine Geriatric Oncology care model in an academic tertiary cancer center

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ABSTRACT

Introduction: The COVID-19 pandemic has impacted healthcare on an unprecedented scale, with healthcare resources being channeled into managing the devastating effects of the outbreak. Healthcare provision for vulnerable older adults has also been affected by lockdowns and suspension of selected medical services worldwide. In our tertiary cancer center, the National University Cancer Institute, Singapore (NCIS), our Geriatric Oncology (GO) service for older adults with cancer was halted for five months. In this paper, we describe the adoption of a hybrid telemedicine model by our GO service to continue care provision for older adults in the midst of the pandemic.

Materials and Methods: Comprehensive geriatric assessments (CGA) were done via telemedicine and virtual multidisciplinary discussions were held prior to the patients' clinic visits. A hybrid telemedicine consultation allowed geriatricians and oncologists, segregated in different sites during the pandemic, to provide a hybrid physical and video geriatric oncology consultation. Scheduled phone follow ups by GO nurses helped to monitor patients for treatment-related toxicities and geriatric syndromes.

Results: Two hundred fifty patients were enrolled in the program from July 2020 to August 2021. All were assessed with a CGA, with 240 receiving interventions in the one-stop clinic.

The average amount of time spent per visit was shortened from four hours to two and a half hours with an average of three interventions on the same day, versus one previously.

Of the patients who received interventions, 84.8% were satisfied with the hybrid telemedicine model and 80.8% of them had reported a maintained or improved quality of life after being enrolled in the program.

Discussion: Telemedicine has been widely adopted during the pandemic, but older adults with limited digital literacy may find it a challenge. Our hybrid telemedicine model has allowed us to continue to provide cancer care, identify issues brought about by social isolation, and render timely assistance. It has become imperative to adapt, prepare and plan for the challenges we may face amid the ongoing COVID-19 pandemic and similar future outbreaks. Only by doing so can we remain agile and resilient, to continue providing quality care to our older patients with cancer.

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1. Introduction

The World Health Organization (WHO) declared the coronavirus disease 2019 (COVID-19) outbreak a pandemic on 11 March 2020. To date, COVID-19 has affected more than 230 regions/countries, with more than 242 million confirmed cases, and close to five million deaths

globally [1]. The impact of the disease is multifaceted and devastating on a global scale, with countries adopting varying strategies and approaches to management as the understanding of the disease evolves, and vaccinations and treatments become available.

Older adults with COVID-19 are at particularly risk of adverse outcomes including severe illness, hospitalization, and death [2,3]. Those who are frail or have underlying cancer or multimorbidity are more likely to develop critical illness [4]. Public health measures such as safe distancing, hand hygiene, and mask wearing are key to safeguarding this vulnerable population.

These measures are especially relevant for countries with rapidly aging populations like Singapore, a multi-ethnic independent city-state with the second densest population in the world. Leveraging prior experience following the Severe Acute Respiratory Syndrome (SARS) epidemic in 2003, Singapore entered the preparedness phase, which saw the development of communicable disease detection and surveillance programs, the planning of infrastructure including healthcare facilities that can cope with a major infectious disease outbreak, and the stockpiling of medications and personal protective equipment (PPE) [5]. This was followed by the readiness phase when the first guidance was distributed by the Ministry of Health (MOH) in January 2020, and various processes in the healthcare system were reviewed, with disease testing put in place when it became available. In early February 2020, Singapore entered the response phase with heightened surveillance, border control, containment protocols, and widespread contact tracing. A nationwide “Circuit Breaker” measure was implemented from 7 April 2020 to 1 June 2020 with shutdown of multiple services to further curb community transmission.

Our healthcare system had to actively reduce physical ambulatory clinic visits and turn to alternatives such as telemedicine. This led to a direct impact on our tertiary cancer center, the National University Cancer Institute, Singapore (NCIS), which is a comprehensive academic cancer center that manages 7000 adult and pediatric outpatients per month [6]. While telemedicine is an effective solution to continuing medical care during the pandemic, there are also challenges with implementation given lower levels of digital literacy in a proportion of older adults. The resilience of our health system, which is the ability to prepare for and respond to crises by reorganizing systems to manage new conditions while maintaining core functions, was put to the test [6].

In this paper, we will describe how our Geriatric Oncology (GO) service was disrupted, and how we adapted our care model using a hybrid telemedicine workflow in order to remain agile and resilient in the pandemic, and continue to provide quality cancer care to our older patients with cancer. With more than 80% of the population now vaccinated against COVID-19 and the announcement on 9 October 2021 of Singapore heading towards COVID-resiliency through the streamlining of protocols in the healthcare system [7], we will also share our plans moving forward in order to provide a sustainable and effective service for older adults with cancer in the post-vaccination era.

2. The Geriatric Oncology Longitudinal End to End (GOLDEN) Program

The NCIS GO service is made up of a multidisciplinary team comprising geriatricians, oncologists, advanced nurse practitioner, nurses, care coordinators, pharmacists, medical social workers (MSW), physiotherapists (PT), occupational therapists (OT), and dietitians.

The Geriatric Oncology Longitudinal End to End (GOLDEN) Program was started in two restructured hospitals, NCIS and Ng Teng Fong General Hospital (NTFGH) in 2019. It is a service providing end-to-end clinical care from cancer diagnosis to treatment by the NCIS GO team.

The program comprises:

1. A Comprehensive Geriatric Assessment (CGA) of an older patient's health status and fitness for cancer treatment,

2. A Management and Innovation for Longevity in Elderly Surgical Patients (MILES) Surgical pre-rehabilitation program for patients planned for cancer surgery,
3. Tailored interventions by a multidisciplinary team of geriatricians, oncologists, oncology nurses, care coordinators, medical social workers, dietitians, pharmacists, physiotherapists and occupational therapists,
4. Transfer of care to the NCIS GO team post-surgery with a reassessment CGA post-surgery prior to initiation of chemotherapy or systemic therapy.
5. Telemedicine follow-up by nurses on patients' health status and monitoring of treatment side effects during cancer treatment.

3. GOLDEN Workflow Prior to the Pandemic

All patients with cancer aged 65 years and above who were seen in either NCIS or NTFGH would be screened on their first visit with a Geriatric 8 (G8) questionnaire [8,9] to identify patients who might benefit from a CGA with directed interventions and care. An electronic memo would be sent to the primary oncologist (surgical oncology, medical oncology and radiation oncology) through the hospital's electronic medical records if the G8 score ≤ 14 . Additionally, the primary oncologists could also directly refer their patients to the GO team for a geriatric oncology consultation.

Patients who were referred to the GOLDEN program would undergo a CGA during their initial visit to the NCIS and NTFGH GO Clinics.

1. Patients and the accompanying next-of-kin or caregiver would be interviewed by the GO case manager or nurse on-site and undergo several screening assessments.
2. This was followed by a medication review and reconciliation by the GO pharmacist.
3. The patient would then proceed with a medical consultation with both an oncologist and a geriatrician.
4. A referral would be made to the allied health professionals by the doctors if necessary, who would review the patient thereafter.

This entire process was time-consuming and tiring for the older person and their caregivers as each visit could last four hours or more. Consequently, a significant number of patients declined referrals to allied health, which were planned only after the doctors' consultation.

When the COVID-19 pandemic first broke out in 2020, NCIS had to adopt a segregated team workflow and cease inter-hospital staff movement to minimize transmission risk. The GOLDEN program had to be suspended for five months between January 2020 to June 2020 as a result. As these restrictions gradually lifted, the GOLDEN program in NUH and NTFGH resumed in July 2020.

Over the subsequent months, restrictions in inter-hospital movement of healthcare workers and segregation of healthcare teams within the hospital were intermittently imposed, depending on the epidemiological trend of COVID-19 infection nationwide. The GO multidisciplinary team had to be agile and continuously modified existing workflows to continue caring for the geriatric oncology population in two healthcare institutions amidst a changing landscape.

4. Materials and Methods

4.1. Adopting Telemedicine for the GOLDEN Care Model during the COVID-19 Pandemic

4.1.1. Pre-Clinic Assessment and Medication Reconciliation conducted via Telemedicine

Telemedicine was adopted to minimize time spent by patients and their caregivers in the GO clinic (Fig. 1). In Singapore, telemedicine refers to the provision of healthcare services using information and communications technology across physically separate environments, and it includes the exchange of information for clinical purposes between

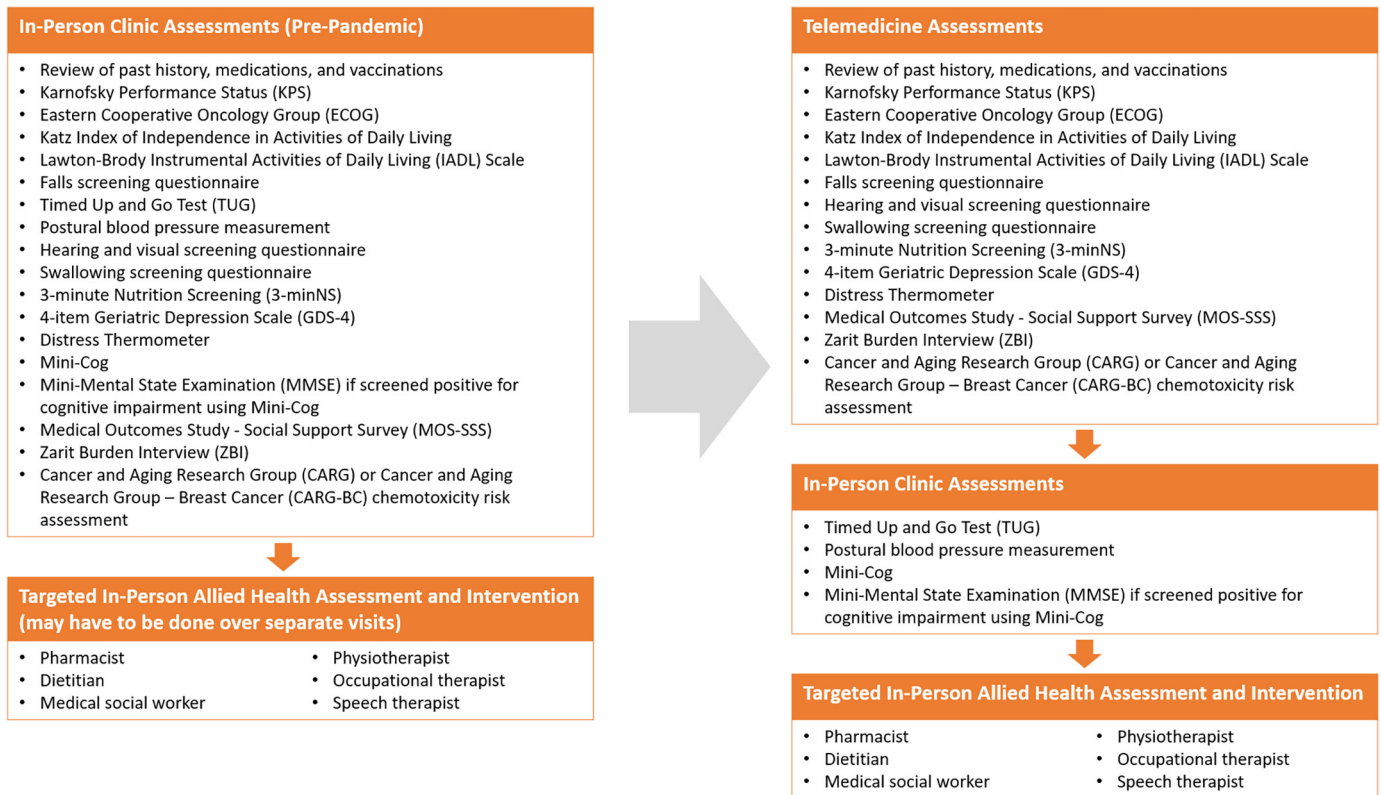


Fig. 1. Change in clinic assessment workflow before (left) and after (right) telemedicine adoption.

healthcare providers and patients/caregivers over telephone, text messages, and video/audio platforms [10].

A selected portion of the CGA was conducted remotely via a telephone or video call for selected patients by the GO nurse, coordinator and pharmacist up to two days prior to the GO clinic appointment. The GO coordinator contacted the patient prior to the teleconsult to arrange a suitable timing for the consult with the patients and their caregivers. Verbal consent was obtained and the patient/caregiver was interviewed on his/her medical comorbidities, adherence to medications, functional ability, nutritional and emotional status and social circumstances. This telemedicine pre-clinic evaluation took approximately 30 to 45 min to complete.

The GO pharmacist would also obtain the patient's active medication list and vaccination status from the National Electronic Health Records (NEHR), and check if the patient was taking the medications as prescribed.

With the information from the initial assessment, a patient's risk of chemotherapy related toxicities would be calculated using the Cancer and Aging Research (CARG) [11,12] or Cancer and Aging Research - Breast Cancer (CARG-BC) [13] chemotoxicity calculators.

Objective assessments that could only be done in person (e.g. cognitive assessments, timed up and go (TUG), postural blood pressure measurement) were performed on the day of the GO clinic consultation itself to complete the remainder of the CGA.

4.1.2. Virtual Pre-clinic GO Multidisciplinary Team discussion

A weekly multidisciplinary team meeting, using a secure online video communication platform, was held before every GO clinic session. The team discussed all patients who completed the pre-clinic telemedicine assessment and made preliminary plans for every patient before they were physically seen. After the initial assessment, the cases were again discussed in the virtual team meeting prior to their follow-up visit, which typically occurred within a month.

4.1.3. Hybrid Telemedicine Clinic Model

Originally, the doctors had to shuttle between sites to run GO clinics in two geographically separate healthcare institutions. During the pandemic, restrictions were imposed on the movement of healthcare workers between hospitals in Singapore to minimize transmission risk, which posed a significant challenge to the program.

A hybrid tele-consultation model was piloted and implemented to overcome this limitation. Instead of having both a geriatrician and an oncologist present physically on site, only one doctor was required to be physically present during the clinic consultation with the patient. The other doctor would join in the consultation remotely via a video communication platform set up concurrently in the physical clinic. The patient would hence be able to consult both the geriatrician and oncologist in the same clinic session and be involved in the joint decision-making process. In this way, this hybrid teleconsultation model allowed the GOLDEN program to continue supporting patients during the pandemic despite the movement restrictions imposed on healthcare workers between institutions.

4.1.4. Scheduled GO Nurse Phone follow-up on Treatment-Related Toxicities and Geriatric Syndromes

During the initial four months from the commencement of cancer therapy, the GO nurses performed follow-up phone calls every two weeks to assess for treatment-related toxicities graded with the Common Terminology Criteria for Adverse Events (CTCAE) version 4.0 [14]. The patients and caregivers were also assessed to ensure that they were coping well in the community. Each call lasted approximately twenty minutes.

GO patients who developed grade 3 or higher toxicities and worsening frailty during the phone follow-ups would be identified by the GO nurses, who then informed their primary oncologists for an early review in the clinic. If patients had grade 1–2 toxicities, they were given advice on how to manage and red flags to watch out for. As there were no

follow-up phone calls by the treating oncology team, it is crucial for our GO nurses to detect the grade 3 toxicities, as older adults have limited physiological reserves and may deteriorate rapidly if timely treatment is not instituted.

Patients who were deemed to be at a higher risk of grade 3–5 toxicities continued to be followed up by the GO nurses beyond the first four months of treatment.

Our nurses also evaluated patients' quality of life using the EORTC QLQ-C30 questionnaire [15] in the first and third month to ensure that they were coping appropriately and adapting well to any treatment-induced changes to their lifestyle. An overview of the GO hybrid telemedicine workflow is shown below in Fig. 2.

This study was approved by the National University Hospital (NUH) Institutional Ethics Review Board.

5. Results

The GOLDEN program resumed in NCIS in July 2020 and in NTFGH in August 2020. Over a period of one year since resuming the program during the pandemic, 690 patients were screened with G8, of which 510 (73.9%) patients were eligible and 250 (36.2%) patients were referred to the GOLDEN program (Fig. 3).

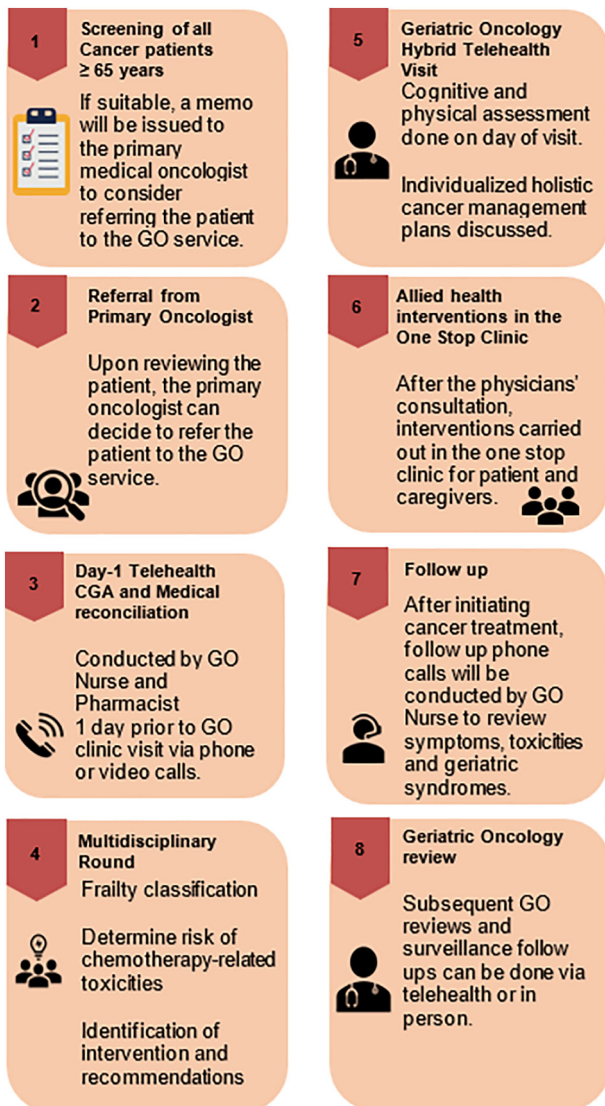


Fig. 2. Overview of Geriatric Oncology Hybrid Telemedicine Clinic Visit and Follow-Up.

Table 1 shows the characteristics of the patients referred to the GOLDEN program. The mean age was 75.3 +/- 6.2 years. Most of the patients were Chinese (86.8%). Two-thirds of the patients had early stage cancer, with lower gastrointestinal cancers being the most commonly diagnosed tumor type. Almost three-quarters were pre-frail (72.8%), one-fifth were frail (19.2%) and the remainder were fit (8.0%). The median G8 score was 11 (range 2–16). About three-quarters of the patients (73.8%) received treatment, of which 134 (54.0%) were of curative intent and 49 (19.8%) were of palliative intent.

The majority of patients (96.0%) required upstream interventions by our multidisciplinary allied health team of pharmacists, medical social workers, physiotherapist, and occupational therapist as recommended in the one-stop GOLDEN clinic (Table 2).

The average amount of time spent in the hospital per visit was shortened from four hours to two and one-half hours, with an average of three interventions on the same day versus one intervention previously in the one-stop clinic.

A proportion of the older adults were unable to participate in telehealth due to barriers such as impaired hearing, cognitive impairment, and limited digital literacy, but this was overcome by taking a corroborative history from their caregivers.

The majority of the patients who received interventions in the GOLDEN program (84.8%) were satisfied with the hybrid telemedicine model. The 227 patients who received interventions were followed up for quality of life (QOL) assessment using the EORTC QLQ-C30 questionnaire, of which 70 patients (33.9%) reported an overall improvement in their global health status, while 132 patients (58.1%) maintained their global health status after being enrolled in the GOLDEN program.

6. Discussion

The population of older adults with cancer is heterogeneous and requires a careful and tailored approach to care that considers frailty, a syndrome which in itself has been associated with an elevated risk of adverse outcomes [16,17]. The COVID-19 pandemic has disproportionately impacted older adults globally due to ageism, social isolation, loneliness, and higher threats of illness including mental health problems, leading to multiple unmet needs [18,19]. With safe distancing measures and restrictions on ambulatory healthcare and rehabilitation services, the pandemic also created barriers to geriatric oncology care by potentially leading to cancelled, missed, or delayed appointments, making the performance of comprehensive geriatric assessments challenging and causing treatment delays [18].

Our GOLDEN multidisciplinary team had to rapidly adopt a hybrid telemedicine model of care to overcome these barriers in order to continue providing our service to older adults with cancer during the pandemic. We have learnt that well-established geriatric oncology centers like the University of Rochester SO-CARE clinic had also adapted a telehealth geriatric assessment model in response to the COVID-19 pandemic. [20]

Despite screening all older adults in our cancer center for frailty with G8, only about half of the eligible patients were referred to the GOLDEN program. This could be attributed to the slow recognition of the need of a GO service by the primary physicians and patient factors, as many were reluctant to return for an additional visit to the hospital during the pandemic.

With a selected portion of the CGA done prior to the physical clinic visit, and with both geriatricians and oncologists co-consulting in the hybrid telemedicine model, the amount of time spent by the patients and their caregivers in the clinic was shortened. This minimized the potential exposure and infection risk to patients and caregivers. The time saved also allowed for additional tailored interventions by other allied health professionals to be carried out in the same visit to the one-stop clinic. This saved the patients and their caregivers direct and indirect costs of multiple visits for assessments by allied health professionals, leading to improved value driven outcomes.

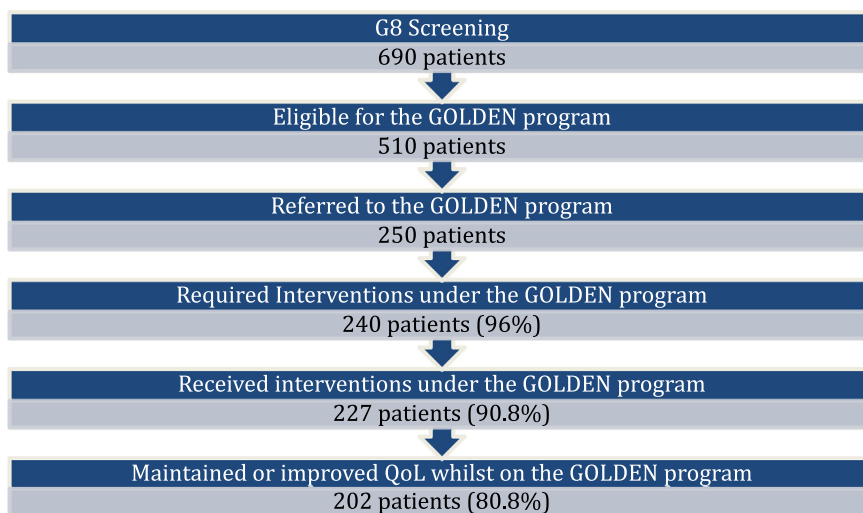


Fig. 3. Screening and recruitment of patients into the GOLDEN program.

Table 1
Patient characteristics.

Characteristics	Patients referred to GOLDEN program (n = 250)
Age	
65–69 years	34 (13.6%)
70–74 years	93 (37.2%)
74–79 years	59 (23.6%)
80–84 years	47 (18.8%)
≥ 85 years	17 (6.8%)
Age, mean	75.3 (±6.2 years)
Gender	
Female	117 (46.8%)
Male	133 (53.2%)
Ethnicity	
Chinese	217 (86.8%)
Malay	23 (9.2%)
Indian	6 (2.4%)
Others	4 (1.6%)
Tumor type	
Lower gastrointestinal	102 (40.8%)
Hepatobiliary	42 (16.8%)
Thoracic	31 (12.4%)
Genitourinary	20 (8.0%)
Breast	17 (6.8%)
Head and neck	13 (5.2%)
Upper gastrointestinal	10 (4.1%)
Gynecological	6 (2.4%)
Sarcoma	5 (2.0%)
Others	5 (2.0%)
Metastatic disease	
No	171 (68.4%)
Yes	79 (31.6%)
Level of education	
None	31 (12.4%)
Primary	116 (46.4%)
Secondary	78 (31.2%)
Tertiary	25 (10.0%)
Living arrangements	
Alone	21 (8.4%)
With family	221 (88.4%)
With others	8 (3.2%)
G8 score, mean (SD)	11 (2.64)
Frailty state	
Fit	20 (8.0%)
Pre-frail	182 (72.8%)
Frail	48 (19.2%)

Abbreviations: G8: Geriatric 8 questionnaire, SD: standard deviation.

Anxiety, while a normal response to a perceived threat, has been shown to be prevalent in older adults with cancer and is known to rise in response to additional threats such as surgery and disease progression [21,22]. In the context of COVID-19, with potential delays in diagnosis and initiation of treatment, disruptions in ongoing treatment and supportive care, this issue has become all the more relevant [23]. By engaging with patients and their caregivers earlier in the treatment journey starting with a telephone or video call, the GO team members were able to establish rapport earlier and elicit and address their concerns sooner. We have observed more than half of our patients reporting an improvement in their quality of life, though we are unable to make positive associations due to limitations of our study.

While we have found some success with our hybrid telemedicine model for the GOLDEN program in terms of reduction of time spent in clinic and cost, and a high level of patient satisfaction, we also faced some limitations. Some older adults found it difficult to comprehend some of the interview questions that were posed over telemedicine owing to barriers such as impaired hearing and vision, cognitive impairment, and limited digital literacy. We overcame these limitations as best as we could by engaging family members and caregivers who could assist our older patients during telemedicine sessions. Our study was also not designed to investigate how these barriers affected participation in telemedicine in our population, and this should be looked at in future studies.

Of note, digital literacy remains a significant challenge amongst older adults globally, with the proportion of older adults using digital technology being less than younger adults, though it is rising exponentially [24]. According to a 2019 survey by the Infocomm Media Development and Authority (IMDA), which is a statutory board under the

Table 2
Patients with interventions by allied health professionals in the GOLDEN program.

Interventions	Allied health professionals	Patients (N = 250)
Medication reconciliation and review	Pharmacist	237 (95.6%)
Psychosocial and financial support	Medical social worker	162 (65.3%)
Nutrition advice	Dietician	126 (50.8%)
Falls prevention and activity adaptation	Occupational therapist	72 (29.0%)
Exercise recommendation	Physiotherapist	70 (28.2%)
Swallowing assessment and management	Speech therapist	4 (1.6%)

Singaporean government, 58% of Singaporean residents aged 60 and above were internet users compared to 89% for all residents [25]. These figures are comparable to the findings of the Organization for Economic Cooperation and Development (OECD), with 63% of internet users being aged 55–74 years compared to 97% in 16–24-year-olds [26].

There has been a nationwide push to strengthen digital literacy across all age groups through the Digital Media and Information Literacy Framework as part of Singapore's Digital Readiness vision to be a Smart Nation, which has accelerated due to the pandemic [27]. The IMDA launched a "Seniors Go Digital" initiative at the height of the pandemic in May 2020 to equip older adults with skills such as using digital tools for video calls, with digital ambassadors being made readily available for them to do so [28], which will hopefully help them to overcome the barrier of digital illiteracy in the future. As part of the "Seniors Go Digital" initiative, a "Mobile Access for Seniors" scheme has also been put in place to provide subsidized smartphone and mobile plans to older adults who wish to go digital but are unable to afford them [29]. As we have begun to see the benefits of our hybrid telemedicine model during this pandemic, we perceive these initiatives to be an important step in the development of a pandemic-resilient healthcare system.

Our hybrid telemedicine model shows promise in terms of improving patient satisfaction and efficiency of the clinic consult and will continue to evolve in the post-vaccination era as the population becomes more familiar with telemedicine. Factors that have been previously described, such as the provision of an overarching architecture and infrastructure, strong program management, and a thorough needs analysis, will be key to success leading to a sustainable model of care [30].

7. Conclusion

It has become imperative to adapt, prepare, and plan for the challenges that we may face amid the ongoing COVID-19 pandemic and similar future outbreaks. The GOLDEN program has been able to continue caring for our patients with the implementation of the hybrid teleconsultation model during this period. Our model of care will continue to evolve and be sustainable in the post-vaccination era as the use of telemedicine gains traction in our population.

Ethics Approval

This study was approved by the National University Hospital (NUH) Institutional Ethics Review Board.

Consent for Publication

Yes. Author Contribution Form as attached.

Availability of Data and Materials

Yes.

Authors' Contribution

Conception and design: Angela Pang and Matthew Chen.

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Declaration of Competing Interest

The authors indicated no potential conflicts of interest.

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