Haematological Malignancies in Older People 5

Implementation of geriatric haematology programmes for the treatment of older people with haematological malignancies in low-resource settings

Enrique Soto-Perez-de-Celis, Javier Martínez-Peromingo, Yanin Chávarri-Guerra, Kah Poh Loh, Roberta Demichelis-Gómez, Morgani Rodrigues, Fresia Yabeta, Guldane Cengiz Seval, Osman Ilhan, Raul Cordoba

In 2020, about 600 000 people aged 65 years and older were diagnosed with a haematological malignancy worldwide, and this number will increase to almost 1 million by 2040, with the largest growth taking place in regions with less developed economies. Health-care systems globally are ill-prepared to face this impending increase in the burden of haematological malignancies among older people, and geriatric oncology and haematology are not properly developed in most low-income and middle-income countries, as well as in many community settings in high-income countries. Here, we provide an overview of the status of geriatric haematology in resource-limited settings, with a focus on health-care systems, educational activities, availability of resource-stratified guidelines, development of clinical programmes, and ongoing research initiatives. We also provide recommendations for the future development of geriatric haematology globally, focusing on the creation of educational activities for health-care providers, fostering research initiatives, improving the inclusion of principles of geriatric care into everyday clinical practice, and building strong international and local partnerships among organisations.

Lancet Healthy Longev 2021; 2: 754–63

Published Online October 5, 2021 https://doi.org/10.1016/S2666-7568(21)00182-3

This is the fifth in a Series of five papers about haematological malignancies in older people (papers 1 and 3 appear in *The Lancet Haematology*)

For the **Haematological malignancies in older people Series** see https://www.thelancet.com/series/haematological-malignancies-in-older-people

Department of Geriatrics (E Soto-Perez-de-Celis PhD) **and Department of Hemato-Oncology** (Y Chávarri-Guerra MD, R Demichelis-Gómez MD), **Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City, Mexico; Coordinación Sociosanitaria, Consejería de Sanidad, Madrid, Spain** (J Martínez-Peromingo MD); **James P Wilmot Cancer Institute, Rochester, NY, USA** (K P Loh MD); **Division of Hematology/Oncology, Department of Medicine, University of Rochester Medical Center, Rochester, NY, USA** (K P Loh); **Hospital Israelita Albert Einstein, São Paulo, Brazil** (M Rodrigues MD); **Hospital General de Agudos Dr Enrique Tornú, Buenos Aires, Argentina** (F Yabeta MD); **Hematology Department, Ankara University School of Medicine, Ankara, Turkey** (G Cengiz Seval MD, O Ilhan MD); **Department of Hematology, Fundacion Jimenez Diaz University Hospital, Health Research Institute, Madrid, Spain** (R Cordoba MD)

Introduction

Currently, more than 700 million people globally are aged 65 years and older, of whom more than half (about 470 million) live in low-income and middle-income countries (LMICs).[1] LMICs will be home to more than two-thirds of the world's population of older people by 2050, with the fastest increase seen in the least-developed countries (as defined by the UN).[2] This increase in the older population in LMICs, along with other factors—such as lifestyle changes, excessive tobacco and alcohol use, and increasing prevalence of persistent carcinogenic infections—will also lead to an increase in the burden of chronic diseases associated with ageing, including haematological malignancies. About 600 000 older people were diagnosed with leukaemia (all types), multiple myeloma, and lymphoma (Hodgkin and non-Hodgkin) worldwide in 2020, and this number will increase to almost 1 million (981 584) by 2040, with the largest proportional growth seen in populations with a low or medium Human Development Index (figure 1A).[3]

Although striking global disparities exist in the outcomes of patients of all ages with haematological malignancies, older people living in LMICs have a particularly dismal prognosis. Compared with older people living in regions with a very high Human Development Index, who have a mortality-to-incidence ratio of 61%, those living in areas with a low index have a very high ratio of 96% (figure 1B).[3] By contrast, patients younger than 65 years who live in areas with a low index have a ratio of 62%.[3] To reduce these disparities, the International Society of Geriatric Oncology (SIOG) has developed a set of recommendations aimed at improving the care of older people with cancer globally. These include the creation of age-friendly health-care systems and policies, the implementation of geriatric oncology clinics, the inclusion of principles of geriatric care into training programmes for haematology and oncology health-care professionals, and the development of regional and local guidelines for the treatment of older people with cancer.[4]

Broadly speaking, geriatric haematology aims to use the principles of geriatric care and assessments to inform tailored decision making and management for older people with haematological malignancies.[5] Existing evidence supports the use of a geriatric assessment and of geriatric assessment-based interventions before starting treatment in older people with haematological malignancies, since these can help to inform prognosis and treatment toxicity and guide treatment selection.[6] Unfortunately, most clinical and research programmes in geriatric haematology have been implemented in cancer centres in high-income countries (HICs), and few initiatives have been undertaken in LMICs.

In this Series paper, we provide an overview of the current situation of geriatric haematology in LMICs and outline the most relevant steps towards the implementation of geriatric haematology programmes and clinics to provide care for older people with haematological malignancies in settings with restricted resources, including in LMICs and community settings in HICs.

Health-care systems in LMICs and burden of haematological malignancies

Non-communicable disease burden has been growing during the last five decades and, because of demographic

Correspondence to:
Dr Enrique Soto-Perez-de-Celis, Department of Geriatrics, Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City 14080, Mexico
enrique.sotop@incmnsz.mx

and epidemiological transitions, LMICs contribute more than two-thirds of this burden.[7] Haematological diseases, such as haematological malignancies, haemoglobinopathies, haemolytic anaemias, iron-deficiency anaemia, and thromboembolism, contribute significantly to the burden of disease globally.[8] In addition, the burden of haematological disease (which is mostly caused by haematological malignancies) progressively increases with age.[9] As such, LMICs need to be well prepared to measure the burden of haematological disease and to provide treatment to patients. WHO recommends developing, maintaining, and strengthening disease registries to better understand regional needs.[10] However, the proportion of the world's population covered by registries is low in resource-poor settings—1% in Africa, 8% in central and South America, and 7% in Asia—when compared with resource-rich settings, such as North America (98%), Europe (46%), and Oceania (77%).[11] Less than a third of low-income countries have a national cancer control plan and cancer registries, which are essential for planning the management of haematological malignancies.[12] As of 2020, mortality rates among haematological malignancies are disproportionally higher in LMICs than in HICs due to several factors, including low access to health care.[9]

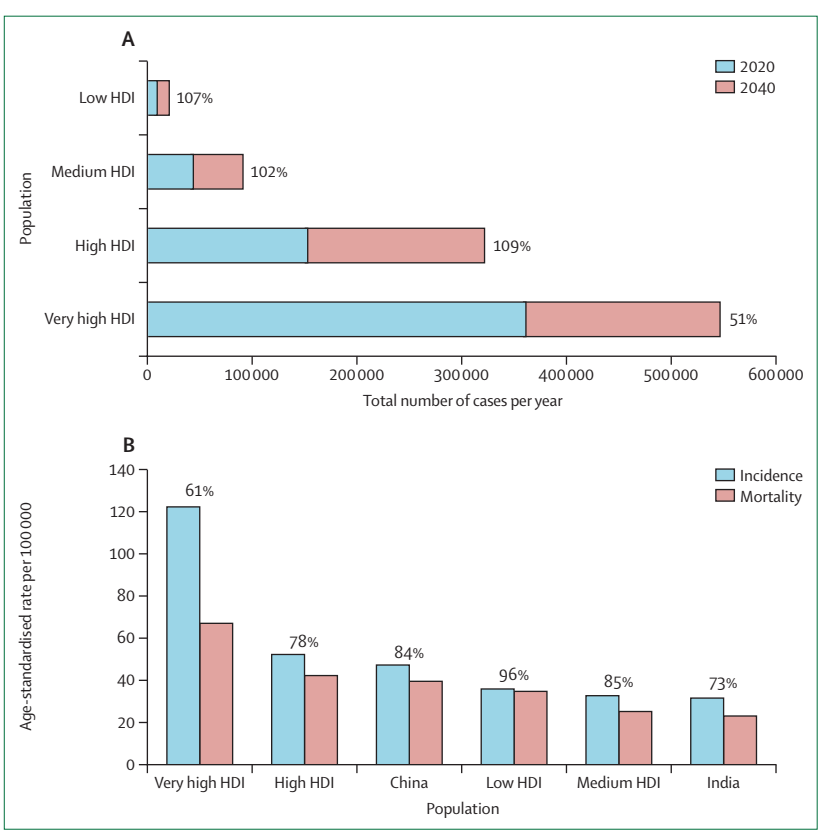


Figure 1: **Cases (A) and incidence-to-mortality ratio (B) for non-Hodgkin lymphoma, Hodgkin lymphoma, myeloma, and leukaemia among adults aged ≥65 years**
Data are grouped according to HDI.[3] Proportional increases are shown in panel A. Percentages in panel B refer to the incidence-to-mortality ratio (number of cases divided by number of deaths) in each region. HDI=Human Development Index.

Health-care systems in most LMICs are unable to meet population needs, with financial expenditure on health being a major problem.[13] On average, the gross domestic product spent on health in LMICs is 5·4%, compared with 12·4% in HICs.[14] Most LMICs have fragmented health-care structures that scarcely provide care for poor and unemployed people. Therefore, health-care financing for individuals without social security insurance comes from out-of-pocket payments, causing catastrophic expenses for households, which is the case for up to 30% of patients living in LMICs.[13] Some health systems have introduced different types of financial protection schemes to mitigate these financial burdens. For example, some countries in South Asia, such as Thailand, encourage their population to self-enrol in social security insurance programmes, and, in Latin America, some governmental programmes cover financial expenses for specific diseases, such as leukaemia and other haematological malignancies.[13,15] In addition, a scarcity of resources, poor infrastructure, and inadequately trained health-care workers are some of the other common challenges faced by health-care systems in LMICs. In terms of resources necessary for treating haematological malignancies, few centres in LMICs have advanced diagnostic tests or access to complex treatments, such as chemotherapy, monoclonal antibodies, or stem-cell transplantation.[16] The number of haematology specialists per inhabitant is also low; for example, in many countries in Africa and Latin America, this ratio is less than one specialist per 100 000 people, whereas in the USA there are 2·2 haematologists per 100 000 inhabitants.[17,18] Furthermore, the distribution of haematology professionals is unequal within each country.[17,18] The availability of trained personnel (such as haematopathologists and technicians) and of advanced diagnostic tests that are used to manage haematological malignancies—such as cytogenetics, flow cytometry, molecular biology, immunohistochemistry, and PET-CT—are scarce and centralised to large cities.[16] Blood supply in LMICs is not dependable due to several factors, including low public donation awareness, stigma related to donation, centralisation of services in urban centres, and the high prevalence of transfusion-transmissible infection in the blood supply in LMICs.[19] Advanced transfusion medicine, including platelet apheresis or irradiated blood products, is not available in most LMICs.[19]

Another important barrier for access to high quality care among older people with haematological malignancies in LMICs is the high prevalence of ageism, or age-related discrimination, and of cancer-related stigma among patients, their family members, and in the health-care system.[20] Studies done in middle-income countries have shown that older people with cancer are more likely to hold fatalistic views about their own illness and, in many LMICs, cancer treatment is seen as futile due to the high prevalence of fatalistic views.[21,22]

Components of a geriatric haematology programme

The therapeutic approach to haematological malignancies has substantially improved during the last few decades, with treatments becoming less toxic and better tolerated. However, offering optimal cancer therapy tailored to the individual needs of an older patient is still a challenge due to the wide heterogeneity of the older population. Since chronological age does not necessarily represent a true metric of an individual's functional or biological age, a comprehensive evaluation of ageing-related domains, such as comorbidity, cognition, psychological status, social support, functional capacity, and physical reserve, is needed to choose the best treatment for each patient.[23]

There is currently a broad consensus regarding the need to assess frailty and to undertake a comprehensive geriatric assessment among older patients with all types of cancer, including haematological malignancies.[23] However, there is a no consensus regarding the best model of care or the specific tools that health-care providers should use to evaluate patients and make treatment-related decisions.[24,25] In most settings, these choices depend on the availability of resources and personnel in each centre.

Models of care in geriatric haematology

The decision to treat older patients with haematological cancer should be guided by a comprehensive geriatric assessment and be discussed in a multidisciplinary setting. This approach allows health-care teams to determine the best treatment options, predict treatment-related toxicities, and establish ongoing management for cancer and other competing risks.[26]

Several geriatric screening tools, such as the Clinical Frailty Scale and the Frailty Index, have been developed and validated to detect and stratify frailty and to identify patients who could benefit from a comprehensive geriatric assessment. However, identifying which patients with abnormal results from screening tools are most likely to benefit from a comprehensive geriatric evaluation is still challenging.[27] SIOG recommends the use of self-administered screening tools, such as the Geriatric 8 (G8) screening tool or the Vulnerable Elders Survey-13 (VES-13).[25,28,29] Once patients at higher risk for frailty are identified, further evaluation by health-care providers with geriatric expertise should be undertaken. This evaluation, which can take place both in person or via telemedicine,[30] should include an in-depth assessment of function, cognitive reserve, mood, delirium, and nutritional and social support, using validated tools.[23]

Broadly speaking, three different models of care can be used to implement a geriatric haematology clinic and these models can be tailored to the resources available in each centre, region, or health-care system.[24,25,31]

First, in a geriatric oncology unit model, haematologists acquire the necessary geriatric knowledge to do a comprehensive geriatric assessment, including the use of tools and evaluations for geriatric screening. Additionally, geriatric interventions can be implemented by the geriatric haematologist. The participation of a nurse with geriatric knowledge as part of the team is an additional option. This type of model can be used mainly in tertiary cancer centres in HICs or multi-specialty hospitals in LMICs with dedicated haematology clinics.

Second, a geriatric consultation team or co-management model integrates geriatric care into the patient's clinical team through collaborations between a haematologist and a geriatrician with experience in treating older patients with haematological malignancies. Geriatricians can do comprehensive geriatric assessments or perform geriatric interventions with help from a team, which could include nutritionists, social workers, and physical therapists, among others. This type of model can be implemented in specialised hospitals in any region that have geriatricians available, even if they are not trained in haematology.

Third, in a referral model, the haematologist obtains geriatric consultations from health-care personnel located either in the same medical centre or health-care system, or in an external centre. Referral models can use telehealth, which is an effective modality for providing supportive care and geriatric assessment, even for vulnerable populations.[32] Previous research has shown that oncology-specific geriatric assessments can be successfully done using telemedicine, although little information exists on the use of this approach among older patients living in LMICs, where access to broadband internet and to mobile technology is often poor.[30,32] This type of model can be used in centres where geriatricians are not readily available, or in health-care systems where referrals to geriatrics require transfer between institutions.

An essential part of the comprehensive geriatric assessment is the implementation of interventions targeting identified geriatric syndromes or deficits.[23] Deficits in geriatric domains are common among older patients with haematological malignancies, even in those with good functional status.[27] Among the geriatric syndromes, the presence of frailty (evaluated either with a frailty detection tool or as a summary of the geriatric assessment) is arguably the most relevant, since it is associated with increased mortality, increased risk of treatment toxicity, and non-completion of treatment, and its identification might lead to therapeutic modifications.[33] Other relevant areas needing interventions are poor nutritional status, polypharmacy, psychological issues, cognitive impairment, and poor social support.[23] The successful implementation of these interventions in LMICs requires not only an increase in the number of personnel, but also an improvement in the geriatric competencies of the entire haematology workforce.

Global geriatrics training in haematology

There are several challenges when attempting to apply principles of geriatric care to the treatment of

haematological malignancies in LMICs, including the socioeconomic environment, human resources, cultural differences, and availability of cancer therapeutics.[34] However, one of the main barriers for the use of geriatric haematology principles is the low global availability of geriatricians and the scarcity of geriatric training across the health-care workforce. Even in HICs, the availability of geriatricians is poor, and this situation is much worse in LMICs.[35] According to WHO, 43% of medical schools in LMICs do not offer any training in geriatrics, and similar problems exist in geriatric nursing education.[36] Furthermore, there is low interest in a career in geriatrics among medical students globally, mostly due to poor exposure to the field, but also to a perceived low prestige associated with the field, low financial rewards, and concerns regarding the complexity of older patients.[37]

To tackle this issue, SIOG included increasing the geriatric training of the cancer workforce as one of the top ten priorities for the development of the field in 2011.[38] Since those recommendations were published, the number of LMICs with representation in SIOG has steadily increased, and a concerted effort has been made to include geriatric oncology and haematology training within local, national, and regional training efforts.

At the postgraduate level, the number of geriatric oncology and haematology programmes offering advanced training in LMICs is low, and most published reports come from three upper-middle-income countries with a growing population of older people: Brazil, India, and Mexico.[39–42] Since geriatric oncology is not yet considered a medical specialty in most countries (including HICs), education remains restricted to centres of excellence and academic research in the most economically developed LMICs. To provide training for geriatricians and oncologists, SIOG established the Advanced Course in Geriatric Oncology, which takes place yearly in Treviso, Italy, and has provided training for attendees from all around the world.[43] Regional and national organisations have also created courses that are inspired by SIOG's Treviso course, with one example being the 1-year geriatric oncology training programme offered by the Albert Einstein Institute in Brazil. The Spanish Group of Geriatric Haematology, a cooperative group of the Spanish Society of Haematology, provides in-person and virtual workshops in geriatric haematology in Spanish, which are open for attendees from Latin America.

For **The Spanish Group of Geriatric Haematology** see https://www.geheg.net/

Another useful strategy to reach a large audience is the inclusion of geriatric haematology and oncology sessions into local and regional haematology, oncology, and geriatrics meetings and seminars. An example of a successful regional initiative is the implementation of practical, hands-on geriatric oncology workshops, which were initially developed for the annual meeting of the Geriatrics Department of the National Institute of Medical Science and Nutrition in Mexico City and were later replicated in other meetings, including the SIOG Annual Meeting.[44] Various societies in LMICs, such as the Indian Cancer Research & Statistic Foundation-Mumbai or the Brazilian Society of Clinical Oncology,[45,46] have also included geriatric oncology in meeting programmes. In Turkey, the Turkish Society of Geriatric Haematology was established to improve the prevention, screening, diagnosis, treatment, and follow-up of older people with haematological malignancies, and to integrate geriatric haematology in the curricula of medical and nursing education.

Although many advances have been made, the 2021 SIOG priorities for the global advancement of care for older people with cancer still highlight increasing education in geriatric oncology and haematology as a top priority.[4] Achieving this goal requires close collaboration between haematologists, oncologists, and geriatricians to meet the needs of older people with haematological malignancies and disseminate knowledge. At the same time, educating the public and medical students regarding healthy ageing and the wellbeing of older populations might help to combat misconceptions and stigma surrounding ageing.[4] Educational initiatives need to be resource-stratified, target the largest possible number of health-care professionals, be culturally and socially appropriate, and adapt existing guidelines and tools to each specific region, country, and setting.[25]

Resource stratification in geriatric haematology

Attempting to replicate health-care interventions from HICs in LMICs without adapting them in line with the local resources available is not only difficult but also unpractical. As a result, WHO created the concept of resource stratification, which is defined as the adaptation of preventive, diagnostic, and therapeutic interventions according to the level of resources available in each country, but without disregarding an evidence-based approach.[47] Leading organisations in the development of resource-stratified guidelines include the Breast Health Global Initiative, the American Society of Clinical Oncology, and the National Comprehensive Cancer Network.[47,48] The National Comprehensive Cancer Network, for example, has published resource-stratified guidelines for the treatment of acute lymphoblastic leukaemia and for diffuse large B-cell lymphoma. Resource-stratified guidelines provide tailored recommendations for various health-care settings and are usually divided into four resource levels: basic, core (or limited), enhanced, and maximal. Basic includes resources or services that need to be available for any cancer health-care system to function and to provide the minimal standard of care for patients.[48] An example of a basic intervention in haematology is the use of R-CHOP (rituximab plus cyclophosphamide, doxorubicin, vincristine, and prednisone or prednisolone) to treat diffuse large B-cell lymphoma.[49] Core includes basic resources plus interventions that provide major improvements in outcomes, such as survival, without being cost prohibitive.[48] An example of a core intervention

in haematology is the use of intensified chemotherapy with sequential consolidation for diffuse large B-cell lymphoma.[50] Enhanced includes basic and core resources plus interventions that lead to minor improvements in outcomes (but increase therapeutic options) or those that provide major improvements in outcomes (but are cost prohibitive).[48] An example of an enhanced intervention in haematology is the use of PET-CT for response assessment in diffuse large B-cell lymphoma.[51] Maximal includes services that provide minor improvements in outcomes and are used in centres of excellence in HICs but are too costly or impractical to be used in settings with scarce resources.[48]

To date, no attempts have been made to develop geriatric oncology or geriatric haematology resource-stratified guidelines. However, as we have mentioned, the success of the implementation of the various models depends entirely on resource availability.[31] For example, in settings with maximal resources, dedicated multidisciplinary teams, consisting of geriatricians, haematologists, oncologists, occupational therapists, social workers, and nutritionists, can potentially be formed. Centres with core resources could include those where a geriatrician is available for consultation and co-management. In settings with basic resources (such as those without a geriatrician), haematologists or nurses could use validated geriatric screening tools, such as VES-13 or G8.[28,29,31] In addition, physicians working in settings with low availability of geriatricians can use haematology-specific geriatric assessments, such as the Geriatric Assessment in Haematology scale, a brief geriatric assessment tool developed by a group of Spanish haematologists and geriatricians, which takes 10–15 min to complete and can identify older people with various haematological malignancies who are at increased risk of adverse outcomes with more intensive treatments.[52,53] For older patients with diffuse large B-cell lymphoma, the Elderly Prognostic Index, which was published in 2021 and combines a short geriatric assessment, the International Prognostic Index, and haemoglobin concentrations, is an option for assessment, since it can predict outcomes and takes less than 10 min to complete.[54] A summary of brief geriatric assessment tools that could be used in low-resource settings is shown in table 1.

Existing clinical and research geriatric haematology initiatives in LMICs

To date, few medical centres in LMICs have published their existing approach to clinical practice in geriatric haematology, and there is a need for greater reporting of innovative models designed to combine geriatric assessments with usual haematology care within multidisciplinary geriatric haematology clinics.[33,39,42] Currently, most geriatric oncology clinics in LMICs are mostly focused on solid tumours.[61]

A good example of a geriatric oncology and haematology clinic is the publicly funded multidisciplinary Cancer Care in the Elderly Clinic, which was established at the National Institute of Medical Science, a public academic hospital in Mexico City.[42] In this clinic, three attending physicians (two geriatricians and one medical oncologist), experts in nutrition, rehabilitation and physical therapy, palliative care, and social work provide care for older people with recently diagnosed solid tumours and lymphomas. This clinic is an example of the geriatric consultation team or co-management model, since assessments and recommendations regarding treatment and supportive care are discussed

	Assessed domains	Purpose	Scoring	Use in haematological malignancies	Method and time of administration
Vulnerable Elders Survey-13[29]	Age, self-rated health status, functional limitations, and functional disabilities	Screens for risk of functional status deterioration, identifies need for complete geriatric assessment, and predicts outcomes (OS and treatment toxicity)[55]	Range 0–10; cutoff ≥3	Non-Hodgkin lymphoma[56]	Self-administered; 5 min
Geriatric 8 screening tool[28]	Age, weight loss, body-mass index, motor skills, psychological status, number of medications, and self-rated health status	Identifies need for complete geriatric assessment and predicts outcomes (OS and treatment toxicity)[55]	Range 0–10; cutoff ≤14	Leukaemia,[57] non-Hodgkin lymphoma,[57,58] and myelodysplastic syndromes[57,59]	Administered by health-care provider; self-administered version available;[60] 5 min[55]
Geriatric Assessment in Haematology[52,53]	Number of medications, gait speed, mood, ADL, self-rated health status, nutrition, psychological status, and comorbidities	Identifies frailty among older patients with haematological malignancies	NA	Leukaemia, myelodysplastic syndromes, and multiple myeloma	Administered by health-care provider; 10–12 min
Elderly Prognostic Index[54]	Age, ADL, instrumental ADL, comorbidity, international prognostic index, and haemoglobin level	Identifies frailty among older patients with DLBCL and predicts OS	Range 0–8; risk groups: low (0–1), intermediate (2–5), and high (6–8)	DLBCL	Administered by health-care provider; <10 min

ADL=activities of daily living. DLBCL=diffuse large B-cell lymphoma. NA=not applicable. OS=overall survival.

Table 1: **Examples of geriatric assessment tools used for the evaluation of older people with haematological malignancies**

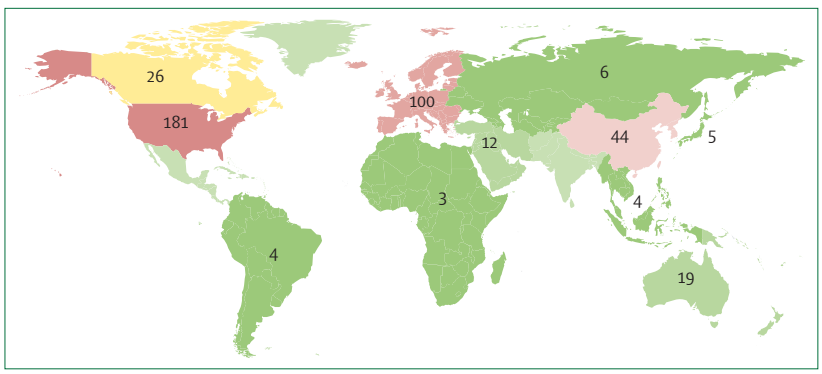


Figure 2: **Active studies recruiting older people per continent, as registered with ClinicalTrials.gov**
Eligible active studies included the keywords "haematologic neoplasm" or "haematologic malignancy".

with the patients' primary haematologist or oncologist, who then implements cancer-directed therapies.[42]

Geriatric haematology research done in LMICs is scarce. Although most evidence for treating haematological malignancies comes from clinical trials done in HICs, local research initiatives and collaborations between countries have been set up in LMICs.[17] However, there are many barriers to conducting clinical trials in LMICs, including scarce funding, insufficient research expertise, the absence of protected time to conduct research, and poorly developed infrastructure.[62] In a 2020 systematic review including 54 publications from 44 studies of geriatric assessments in patients with haematological malignancies, only three were from LMICs: two from Brazil and one from Turkey.[27,40,63,64] Figure 2 shows the number of clinical trials related to haematological malignancies that are currently recruiting older people worldwide and that are registered with ClinicalTrials.gov, highlighting the large regional differences in clinical trial availability.

A study from Peru analysed how frailty and vulnerability can predict chemotherapy toxicity in patients with cancer.[65] The study included 496 older men with cancer, of which 102 had haematological malignancies (55 with multiple myeloma and 47 with leukaemia or lymphoma). Patients with haematological malignancies were shown to have a high rate of chemotherapy toxicity: 83% in those with lymphoma or leukaemia and 82% in those with multiple myeloma. Both frailty (according to the Fried phenotype) and vulnerability (assessed by VES-13 and G8) were independently associated with an increased risk of chemotherapy toxicity.[65]

Two other studies[66,67] from Latin America examined the role of a comprehensive geriatric assessment in patients with lymphoma. A study from Mexico analysed the role of frailty for adjusting chemotherapy dosing in 56 older people with diffuse large B-cell lymphoma (median age 70·5 years). Patients were classified as fit, unfit, or frail. Adjusting chemotherapy according to frailty status allowed a group of unfit patients to tolerate treatment with good results.[66] Another study done in Peru compared different geriatric assessment tools in 253 older people with aggressive non-Hodgkin lymphomas. A locally developed tool, the Peruvian Abbreviated Comprehensive Geriatric Assessment, which included an evaluation of polypharmacy, physical function, instrumental activities of daily living, and social support, was shown to be superior to both VES-13 and G8 for detecting geriatric syndromes.[67]

In the same way, two studies from Brazil analysed the efficacy of performing a comprehensive geriatric assessment in older patients with various haematological malignancies before allogeneic haematopoietic stem-cell transplant (HSCT) and in patients with myelodysplastic syndrome.[40,63] In the study on HSCT, 640 patients aged at least 60 years who underwent comprehensive geriatric assessments before HSCT were analysed: the comprehensive geriatric assessment was shown to be feasible in identifying 90% who were independent in instrumental activities of daily living, 66% who had alterations on hand-grip strength testing, 38% who had memory loss, 30% at risk of malnutrition and, according to the Fried frailty phenotype, 43% considered vulnerable and 19% considered frail.[40] The other study analysed 102 patients with myelodysplastic syndrome, of which 78% were aged at least 65 years. Findings showed that 61% of the older patients had polypharmacy and 38% were frail (Clinical Frailty Scale ≥5). The group of older people with myelodysplastic syndrome reported significantly worse nutritional intake than their younger counterparts in the same study.[63]

Regarding studies in acute myeloid leukaemia done in LMICs, a group from Turkey published their experience in the analysis of frailty among patients of all ages with acute myeloid leukaemia. They found that Eastern Cooperative Oncology Group performance status, G8, and VES-13 predicted survival in patients younger and older than 65 years.[64]

The participation of researchers from LMICs in international haematology meetings is also low. In 2020, of 32 abstracts that included at least one aspect of the geriatric assessment in patients with haematological malignancies presented at the annual American Society of Hematology and European Haematology Association meetings, only three included data from LMICs: one from Peru and two multicentre international clinical trials with patients from Brazil and Ukraine.[66–71]

Geriatric haematology initiatives and research opportunities in community settings of HICs

Although academic cancer centres and large university hospitals in HICs often have the resources necessary to build strong geriatric haematology programmes, this might not be the case in community settings, where the limitations might mimic those of LMICs. To bridge this gap, some geriatric haematology programmes serve as referral centres for community practices. Example of such programmes in various countries are shown in table 2. Models of care vary, with clinics usually being led

by a dual-trained geriatric haematologist, haematologist (with interest and training in geriatrics), or geriatrician providing consultative care. Some clinics focus on the evaluation of patients undergoing high-risk procedures (eg, those undergoing HSCT or chimeric antigen receptor T-cell therapies), whereas others seek to help all older people with haematological malignancies. Patients might also be cared for by a geriatric haematologist or haematologist providing primary management. Models of care used in community settings in HICs could potentially serve as blueprints for clinical practices in LMICs, since the availability of personnel and of technical resources might be similar.

Consultative care clinics are usually staffed by a multidisciplinary team consisting of the physician (a haematologist or oncologist, and perhaps a geriatrician), nurse, advanced practitioner, social worker, dietitian, physical therapist, occupational therapist, pharmacist, and clinical or research coordinator. As is the case in LMICs, the availability of these team members in community settings in HICs depends on institutional resources. Many of these clinics focus on treatment decision making and optimisation of treatments for geriatric-related vulnerabilities, by providing recommendations on supportive care interventions or helping to manage non-cancer comorbidities. These consultations might consist of a one-time visit or of follow-up visits, with the latter option usually done for patients who would benefit from co-management alongside their primary haematologist. Before the COVID-19 pandemic, these visits were mainly done in-person. Due to the pandemic, some of these clinics are now able to complete assessments and consultations remotely.[30]

Inpatient geriatric haematology programmes in community settings in HICs are less common, though their utility is likely greater, compared with solid tumours, given the higher acuity associated with the diagnosis of haematological malignancies and the greater need for more urgent treatment. Therefore, the focus of these programmes is primarily on treatment decision making, such as deciding between intensive versus lower intensity treatment for acute myeloid leukaemia or between full versus reduced dose chemotherapy regimen for diffuse large B-cell lymphoma. Frailty screening could be used to identify patients who are more likely to benefit from a full geriatric assessment and supportive care interventions during their inpatient stays or subsequent outpatient follow-ups.

Geriatric haematology research in community settings can be done in parallel with clinical programmes or can exist independently of such clinics.[32,74,75] Ongoing research focuses on evaluating methods to improve the identification of age-related vulnerabilities,[74] understanding the relationships between geriatric-related vulnerabilities and outcomes,[76] examining longitudinal changes in geriatric-related vulnerabilities with treatment,[77] exploring treatment patterns within and outside of clinical trials,[78] testing novel strategies and treatments (including the use of geriatric assessment and frailty scores to guide therapies in older patients),[79] and developing interventions or models of care to improve outcomes.[75] Abel and colleagues evaluated a model of care in the USA wherein people aged at least 75 years, who were newly diagnosed with haematological malignancies and were identified as frail

	Geriatric haematology programme
USA	
Dana Farber Cancer Institute	Older Adult Hematology Malignancy Program
University of Rochester Medical Center	Specialized Oncology and Research in the Elderly Clinic[24]
Memorial Sloan Kettering Cancer Center	Cancer and Aging Service[72]
Ohio State Medical Center	Cancer and Aging Resiliency Clinic[32]
City of Hope National Medical Center	Aging and Blood Cancer Clinic
University of Chicago Medical Center	Transplant Optimization Program[73]
Scotland	
National Health Service Greater Glasgow and Clyde	Inpatient and Outpatient Oncogeriatric Programme
Germany	
St Marien Hospital	Oncogeriatric Unit
Spain	
Fundación Jiménez Díaz	Geriatric Haematology Unit
University Hospital Rey Juan Carlos	Onco-Haematology Geriatric Unit
ICO Duran i Reynals	Geriatric Haematology Unit

This list serves as a reference and is not intended to be exhaustive.

Table 2: **Examples of geriatric haematology programmes at institutions in high-income countries**

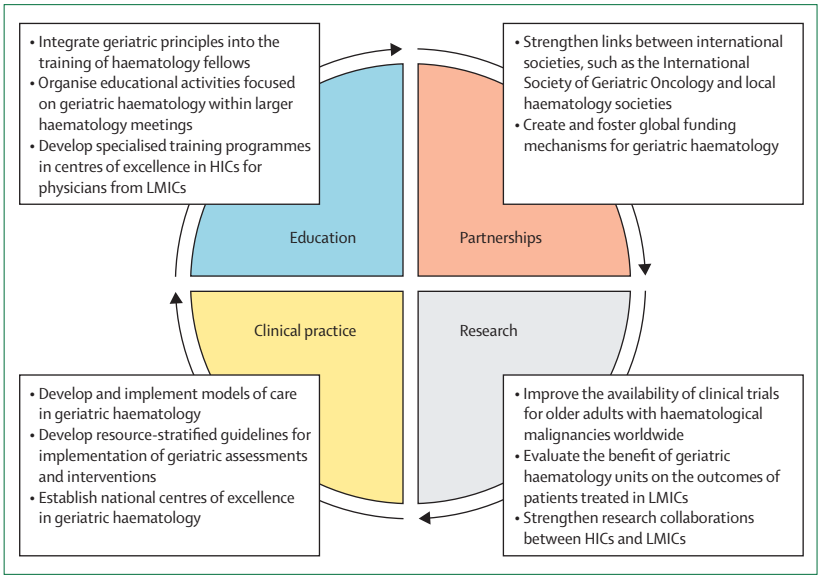


Figure 3: **Recommendations for the development of geriatric haematology in LMICs**
These recommendations are based on the priorities for the advancement of geriatric oncology from the International Society of Geriatric Oncology.[4] HICs=high-income countries. LMICs=low-income and middle-income countries.

Search strategy and selection criteria

For this Series paper, we searched PubMed for papers published between Jan 1, 2010, and Jan 1, 2021, using the search terms: "haematologic neoplasms", "geriatric assessment", "aged", and "developing countries". All types of studies, including reviews, published in any language were included in the search. We searched ClinicalTrials.gov for active studies focusing on older people, using the keywords "haematologic neoplasm" and "haematologic malignancy". We also searched the databases of abstracts presented at the 2020 American Society of Hematology and European Hematology Association meetings to identify abstracts submitted by authors from low-income and middle-income countries. Papers focusing on the use of principles of geriatric care for decision making in geriatric haematology in low-income and middle-income countries or community settings in high-income countries were selected for this review.

or pre-frail using prespecified geriatric screening tools, and were randomly assigned to consultations with a board-certified geriatrician versus usual care. Overall survival did not differ between the groups; however, those receiving geriatric consultations were more likely to have discussions about goals of care.[80] Although not specific to haematological malignancies, another cluster randomised trial found that, among patients aged at least 70 years with advanced cancer (including lymphoma) managed in community practices in the USA, those who received geriatric assessments had a higher number of discussions about ageing-related concerns and reported greater satisfaction with communication about ageing-related concerns compared with those in the usual care group.[81] Most of these research programmes focus on the use of geriatric assessments and interventions to improve shared decision making and patient-centred outcomes and, as such, could be potentially implemented in LMICs, where funding for therapeutic clinical trials might be scarce.

Conclusions

During the last two decades, global health and local initiatives have been developed to reduce the burden of haematological malignancies, including education of health-care professionals, prevention and early detection programmes, and international research collaborations.[17] Future regional and global collaborations could follow successful initiatives developed in other areas of global haematology, such as paediatric haemato-oncology, in which twinning institutions from HICs with medical centres in LMICs has led to improvements in outcomes among children with various haematological malignancies.[82] However, geriatric haematology is still a novel field, even in highly specialised cancer centres in western Europe and the USA, and its development both in LMICs and in community settings in HICs is in the early stages. There is a growing need for haematology providers with geriatric expertise in LMICs with a rapidly ageing population, and there are enormous opportunities for the growth of this field globally, both in clinical practice and in research. To support the development of the field, all stakeholders—including governments, universities, academic medical centres in both LMICs and HICs, and international organisations—need to work together, guided by the priorities laid out by SIOG (figure 3).[4] Only through international collaboration will access to high-quality, age-appropriate clinical care be improved for all patients with haematological malignancies, regardless of where they live.

Contributors

ES-P-dC, JM-P, and RC conceptualised the study. ES-P-dC designed the protocol, supervised the study, and was responsible for project administration. All authors collected data, analysed data, interpreted data, and prepared, reviewed, edited, and approved the manuscript for publication.

Declaration of interests

YC-G reports grants from Roche and personal fees from ASOFARMA, outside the submitted work. RD-G reports grants from Novartis and personal fees from Amgen, AbbVie, Celgene, and Novartis, outside the submitted work. KPL reports personal fees from Pfizer and Seattle Genetics, outside the submitted work. All other authors declare no competing interests.

References

1 The World Bank. Data bank. Population ages 65 and above, total. https://data.worldbank.org/indicator/SP.POP.65UP.TO?view=chart (accessed March 1, 2021).

2 UN, Department of Economic and Social Affairs. World population ageing 2019 (ST/ESA/SER.A/444). 2020. https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Report.pdf (accessed Aug 24, 2021).

3 Ferlay J, Ervik M, Lam F, et al; WHO, International Agency for Research on Cancer. Global Cancer Observatory: cancer today. https://gco.iarc.fr/today (accessed March 1, 2021).

4 Extermann M, Brain E, Canin B, et al. Priorities for the global advancement of care for older adults with cancer: an update of the International Society of Geriatric Oncology Priorities Initiative. *Lancet Oncol* 2021; **22:** e29–36.

5 Klepin HD. Ready for prime time: role for geriatric assessment to improve quality of care in hematology practice. *Blood* 2019; **134:** 2005–12.

6 Scheepers ERM, Vondeling AM, Thielen N, van der Griend R, Stauder R, Hamaker ME. Geriatric assessment in older patients with a hematologic malignancy: a systematic review. *Haematologica* 2020; **105:** 1484–93.

7 Daniels M, Donilon T, Bollyky TJ; Council on Foreign Relations. The emerging global health crisis. Noncommunicable diseases in low-and middle-income countries. Independent Task Force report no. 72. 2014. https://cdn.cfr.org/sites/default/files/report_pdf/TFR72_NCDs.pdf (accessed March 1, 2021).

8 Vos T, Lim SS, Abbafati C, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet* 2020; **396:** 1204–22.

9 The Lancet Haematology. The global burden of haematological diseases. *Lancet Haematol* 2020; **7:** e851.

10 WHO, World Health Assembly. Draft comprehensive global monitoring framework and targets for the prevention and control of noncommunicable diseases: formal meeting of the Member States to conclude the work on the comprehensive global monitoring framework, including indicators, and a set of voluntary global targets for the prevention and control of noncommunicable diseases: report by the Director-General. 2013. https://apps.who.int/iris/handle/10665/105633 (accessed Aug 24, 2021).

11 Bray F, Colombet M, Mery L, et al. Cancer incidence in five continents, vol XI. IARC Scientific Publication no 166. Lyon: International Agency for Research on Cancer, 2021.

12 Siddiqui AH, Zafar SN. Global availability of cancer registry data. *J Glob Oncol* 2018: **4:** 1–3.

13 Otieno PO, Asiki G. Making universal health coverage effective in low- and middle-income countries: a blueprint for health sector reforms. In: Bacha U, Rozman U, Turk SŠ, eds. Healthcare access—regional overviews. London: IntechOpen, 2020.

14 The World Bank. Current health expenditure (% of GDP). https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS (accessed Feb 21, 2021).

15 Strasser-Weippl K, Chavarri-Guerra Y, Villarreal-Garza C, et al. Progress and remaining challenges for cancer control in Latin America and the Caribbean. *Lancet Oncol* 2015; **16:** 1405–38.

16 Lehmann L, El-Haddad A, Barr RD. Global approach to hematologic malignancies. *Hematol Oncol Clin North Am* 2016; **30:** 417–32.

17 Roberts DJ, Cooper N, Bates I. Haematology in lower and middle income countries. *Br J Haematol* 2017; **177:** 833–35.

18 Gabús R, Galeano S, de Souza CA, et al. Hematology in Latin America: where are we? Analysis of the reports of Societies of Hematology associated organization of the Highlights of ASH in Latin America. *Rev Bras Hematol Hemoter* 2011; **33:** 449–54.

19 Kralievits KE, Raykar NP, Greenberg SL, Meara JG. The global blood supply: a literature review. *Lancet* 2015; **385** (suppl 2)**:** S28.

20 Wyman MF, Shiovitz-Ezra S, Bengel J. Ageism in the health care system: providers, patients, and systems. In: Ayalon L, Tesch-Römer C, eds. Contemporary perspectives on ageism. Basel: Springer, 2019.

21 Yılmaz M, Dissiz G, Usluoğlu AK, Iriz S, Demir F, Alacacioglu A. Cancer-related stigma and depression in cancer patients in a middle-income country. *Asia Pac J Oncol Nurs* 2019; **7:** 95–102.

22 Goss PE, Strasser-Weippl K, Lee-Bychkovsky BL, et al. Challenges to effective cancer control in China, India, and Russia. *Lancet Oncol* 2014; **15:** 489–538.

23 Mohile SG, Dale W, Somerfield MR, et al. Practical assessment and management of vulnerabilities in older patients receiving chemotherapy: ASCO guideline for geriatric oncology. *JCO* 2018; **78:** 8687.

24 Magnuson A, Dale W, Mohile S. Models of care in geriatric oncology. *Curr Geriatr Rep* 2014; **3:** 182–89.

25 Wildiers H, Heeren P, Puts M, et al. International Society of Geriatric Oncology consensus on geriatric assessment in older patients with cancer. *J Clin Oncol* 2014; **32:** 2595–603.

26 Klepin HD, Geiger AM, Tooze JA, et al. Geriatric assessment predicts survival for older adults receiving induction chemotherapy for acute myelogenous leukemia. *Blood* 2013; **121:** 4287–94.

27 Scheepers ERM, Vondeling AM, Thielen N, van der Griend R, Stauder R, Hamaker ME. Geriatric assessment in older patients with a hematologic malignancy: a systematic review. *Haematologica* 2020; **105:** 1484–93.

28 Bellera CA, Rainfray M, Mathoulin-Pélissier S, et al. Screening older cancer patients: first evaluation of the G-8 geriatric screening tool. *Ann Oncol* 2012; **23:** 2166–72.

29 Saliba D, Elliott M, Rubenstein LZ, et al. The Vulnerable Elders Survey: a tool for identifying vulnerable older people in the community. *J Am Geriatr Soc* 2001; **49:** 1691–99.

30 DiGiovanni G, Mousaw K, Lloyd T, et al. Development of a telehealth geriatric assessment model in response to the COVID-19 pandemic. *J Geriatr Oncol* 2020; **11:** 761–63.

31 Loh KP, Soto-Perez-de-Celis E, Hsu T, et al. What every oncologist should know about geriatric assessment for older patients with cancer: Young International Society of Geriatric Oncology Position Paper. *J Oncol Pract* 2018; **14:** 85–94.

32 Chien L, Roberts E, Soto-Perez-de-Celis E, et al. Telehealth in geriatric oncology: a novel approach to deliver multidisciplinary care for older adults with cancer. *J Geriatr Oncol* 2020; **11:** 197–99.

33 Presley CJ, Krok-Schoen JL, Wall SA, et al. Implementing a multidisciplinary approach for older adults with Cancer: geriatric oncology in practice. *BMC Geriatr* 2020; **20:** 231.

34 Aggarwal A, Unger-Saldaña K, Lewison G, Sullivan R. The challenge of cancer in middle-income countries with an ageing population: Mexico as a case study. *Ecancermedicalscience* 2015; **9:** 536.

35 Soto-Perez-de-Celis E, Cordoba R, Gironés R, et al. Cancer and aging in Ibero-America. *Clin Transl Oncol* 2018; **20:** 1117–26.

36 WHO. Health workforce for ageing populations. 2016. https://www.who.int/ageing/publications/health-workforce-ageing-populations.pdf?ua=1 (accessed Feb 20, 2021).

37 Meiboom AA, de Vries H, Hertogh CM, Scheele F. Why medical students do not choose a career in geriatrics: a systematic review. *BMC Med Educ* 2015; **15:** 101.

38 Extermann M, Aapro M, Audisio R, et al. Main priorities for the development of geriatric oncology: A worldwide expert perspective. *J Geriatr Oncol* 2011; **2:** 270–73.

39 Karnakis T, Gattás-Vernaglia IF, Saraiva MD, Gil-Junior LA, Kanaji AL, Jacob-Filho W. The geriatrician's perspective on practical aspects of the multidisciplinary care of older adults with cancer. *J Geriatr Oncol* 2016; **7:** 341–45.

40 Rodrigues M, de Souza PMR, de Oliveira Muniz Koch L, Hamerschlak N. The use of comprehensive geriatric assessment in older patients before allologeneic hematopoietic stem cell transplantation: a cross-sectional study. *J Geriatr Oncol* 2020; **11:** 100–06.

41 Noronha V, Ramaswamy A, Dhekle R, et al. Initial experience of a geriatric oncology clinic in a tertiary cancer centre in India. *Cancer Res Stat Treat* 2020; **3:** 208–17.

42 Verduzco-Aguirre HC, Navarrete-Reyes AP, Chavarri-Guerra Y, Ávila-Funes JA, Soto-Perez-de-Celis E. The effect of a geriatric oncology clinic on treatment decisions in Mexican older adults with cancer. *J Am Geriatr Soc* 2019; **67:** 992–97.

43 Colloca G, Monfardini S. A contribution to the future of geriatric oncology training: The SIOG Treviso advanced course. *J Geriatr Oncol* 2017; **8:** 387–88.

44 Luca Battisti NM, Gomes F, Haase K, et al. Geriatric evaluation workshop. *J Geriatr Oncol* 2019; **10:** S4.

45 International Society of Geriatric Oncology. SIOG LATAM joint session. 2017. https://www.siog.org/content/siog-latam-joint-session-0 (accessed March 14, 2021).

46 Horizon Conference Management. Lung cancer year-end review, geriatric workshop, 05 December 2020, CRSF, HCMPL. Dec 17, 2020. https://www.youtube.com/watch?v=w0rfSXoSsu8 (accessed March 14, 2021).

47 Hunter N, Dempsey N, Tbaishat F, Jahanzeb M, Al-Sukhun S, Gralow JR. Resource-stratified guideline-based cancer care should be a priority: historical context and examples of success. *Am Soc Clin Oncol Educ Book* 2020; **40:** 1–10.

48 Carlson RW, Scavone JL, Koh WJ, et al. NCCN framework for resource stratification: a framework for providing and improving global quality oncology care. *J Natl Compr Canc Netw* 2016; **14:** 961–69.

49 National Comprehensive Cancer Network. NCCN framework for resource stratification of NCCN guidelines (NCCN framework) B-cell lymphomas. Basic resources (version 4.2020). Aug 26, 2020. https://www.nccn.org/professionals/physician_gls/pdf/b-cell_basic.pdf (accessed March 14, 2021).

50 National Comprehensive Cancer Network. NCCN framework for resource stratification of NCCN guidelines (NCCN framework) B-cell lymphomas. Core resources (version 4.2020). Aug 26, 2020. https://www.nccn.org/professionals/physician_gls/pdf/b-cell_core.pdf (accessed March 14, 2021).

51 National Comprehensive Cancer Network. NCCN framework for resource stratification of NCCN guidelines (NCCN framework) B-cell lymphomas. Enhanced resources (version 4.2020). Aug 26, 2020. https://www.nccn.org/professionals/physician_gls/pdf/b-cell_enhanced.pdf (accessed March 14, 2021).

52 Bonanad S, De la Rubia J, Gironella M, et al. Development and psychometric validation of a brief comprehensive health status assessment scale in older patients with hematological malignancies: the GAH scale. *J Geriatr Oncol* 2015; **6:** 353–61.

53 Cruz-Jentoft AJ, González B, de la Rubia J, et al. Further psychometric validation of the GAH scale: responsiveness and effect size. *J Geriatr Oncol* 2017; **8:** 211–15.

54 Merli F, Luminari S, Tucci A, et al. Simplified geriatric assessment in older patients with diffuse large B-cell lymphoma: the prospective elderly project of the Fondazione Italiana Linfomi. *J Clin Oncol* 2021; **39:** 1214–22.

55 Decoster L, Van Puyvelde K, Mohile S, et al. Screening tools for multidimensional health problems warranting a geriatric assessment in older cancer patients: an update on SIOG recommendations. *Ann Oncol* 2015; **26:** 288–300.

56 Fama A, Martin P, Allmer C, et al. Vulnerable Elders Survey-13 (VES-13) predicts 1-year mortality risk in newly diagnosed non-Hodgkin lymphoma (NHL). *Blood* 2019; **134** (suppl 1): 69.

57 Hamaker ME, Mitrovic M, Stauder R. The G8 screening tool detects relevant geriatric impairments and predicts survival in elderly patients with a haematological malignancy. *Ann Hematol* 2014; **93:** 1031–40.

58 Oiwa K, Fujita K, Lee S, et al. Utility of the geriatric 8 for the prediction of therapy-related toxicity in older adults with diffuse large B-cell lymphoma. *Oncologist* 2020; **26:** 215–23.

59 Velghe A, Petrovic M, De Buyser S, Demuynck R, Noens L. Validation of the G8 screening tool in older patients with aggressive haematological malignancies. *Eur J Oncol Nurs* 2014; **18:** 645–48.

60 van Walree IC, Vondeling AM, Vink GR, et al. Development of a self-reported version of the G8 screening tool. *J Geriatr Oncol* 2019; **10:** 926–30.

61 Soto-Perez-de-Celis E, de Glas NA, Hsu T, et al. Global geriatric oncology: achievements and challenges. *J Geriatr Oncol* 2017; **8:** 374–86.

62 Gyawali B, Bouche G, Crisp N, André N. Challenges and opportunities for cancer clinical trials in low- and middle-income countries. *Nat Can* 2020; **1:** 142–45.

63 Aguiar APN, Mendonça PDS, Ribeiro-Júnior HL, et al. Myelodysplastic syndromes: an analysis of non-hematological prognostic factors and its relationship to age. *J Geriatr Oncol* 2020; **11:** 125–27.

64 Umit EG, Baysal M, Demir AM. Frailty in patients with acute myeloid leukaemia, conceptual misapprehension of chronological age. *Eur J Cancer Care (Engl)* 2018; **27:** e12810.

65 Runzer-Colmenares FM, Urrunaga-Pastor D, Roca-Moscoso MA, De Noriega J, Rosas-Carrasco O, Parodi JF. Frailty and Vulnerability as predictors of chemotherapy toxicity in older adults: a longitudinal study in Peru. *J Nutr Health Aging* 2020; **24:** 966–72.

66 Lastra-German IK, Navarrete-Reyes AP, Mejía-Domínguez NR, Agreda-Vásquez GP. Adjusted chemotherapy according to frailty status in elderly patients with diffuse large B-cell lymphoma: experience from a single referral center in Mexico City. *Clin Lymphoma Myeloma Leuk* 2019; **19:** e98–106.

67 Beltrán B, Gamarra MP, Carbajal JC, Castro D, Castillo J. Comparison of different geriatric screening methods in elderly patients with aggresive non-Hodgkin lymphoma in Peru (abstr EP1765). European Hematology Association congress 2020. May 14, 2020. https://library.ehaweb.org/eha/2020/eha25th/294245/brady.beltrn.comparison.of.different.geriatric.screening.methods.in.elderly.html (accessed Aug 24, 2021).

68 Auner HW, Gavriatopoulou M, Delimpasi S, et al. Once weekly selinexor, bortezomib, and dexamethasone versus twice weekly bortezomib and dexamethasone in relapsed or refractory multiple myeloma: age and frailty subgroup analyses from the phase 3 Boston study. *Blood* 2020; **136** (suppl 1): 17–18.

69 Bringhen S, Pour L, Benjamin R, et al. Progression-free survival (PFS) benefit demonstrated and quality of life (QoL) maintained across age and frailty subgroups with the oral proteasome inhibitor (PI) ixazomib vs placebo as post-induction maintenance therapy in non-transplant newly diagnosed multiple myeloma (NDMM) patients (Pts): analysis of the TOURMALINE-MM4 phase 3 trial. *Blood* 2020; **136** (suppl 1): 30–31.

70 American Society of Hematology. 2020 annual meeting abstracts. https://ash.confex.com/ash/2020/webprogramme/start.html (accessed Feb 21, 2021).

71 European Hematology Association. 2020 annual congress abstracts. https://library.ehaweb.org/eha/#!*menu=6*browseby=3*sortby=2*media=3*ce_id=1550 (accessed Feb 21, 2021).

72 Korc-Grodzicki B, Tew W, Hurria A, et al. Development of a geriatric service in a cancer center: lessons learned. *J Oncol Pract* 2017; **13:** 107–12.

73 Derman BA, Kordas K, Ridgeway J, et al. Results from a multidisciplinary clinic guided by geriatric assessment before stem cell transplantation in older adults. *Blood Adv* 2019; **3:** 3488–98.

74 Liu MA, DuMontier C, Murillo A, et al. Gait speed, grip strength, and clinical outcomes in older patients with hematologic malignancies. *Blood* 2019; **134:** 374–82.

75 Wall SA, Huang Y, Yuhasz N, et al. Effect of geriatric assessment and intervention on overall survival among older adults with hematologic malignancies. *Blood* 2020; **136** (suppl 1): 31–32.

76 Rosko AE, Huang Y, Benson DM, et al. Use of a comprehensive frailty assessment to predict morbidity in patients with multiple myeloma undergoing transplant. *J Geriatr Oncol* 2019; **10:** 479–85.

77 Klepin HD, Tooze JA, Pardee TS, et al. Effect of intensive chemotherapy on physical, cognitive, and emotional health of older adults with acute myeloid leukemia. *J Am Geriatr Soc* 2016; **64:** 1988–95.

78 Reljic T, Sehovic M, Lancet J, et al. Benchmarking treatment effects for patients over 70 with acute myeloid leukemia: a systematic review and meta-analysis. *J Geriatr Oncol* 2020; **11:** 1293–308.

79 Bhatt VR, Wichman C, Al-Kadhimi ZS, et al. Integrating geriatric assessment and genetic profiling to personalize therapy selection in older adults with acute myeloid leukemia (AML). *Blood* 2019; **134** (suppl 1): 120.

80 Abel GA, Uno H, Tanasijevic AM, et al. Feasibility and impact of embedded geriatric consultation for frail older adults with blood cancer: a randomized controlled trial. *Blood* 2019; **134** (suppl 1): 67.

81 Mohile SG, Epstein RM, Hurria A, et al. Communication with older patients with cancer using geriatric assessment: a cluster-randomized clinical trial from the National Cancer Institute Community Oncology Research Program. *JAMA Oncol* 2020; **6:** 196–204.

82 Barr RD, Antillón Klussmann F, Baez F, et al. Asociación de Hemato-Oncología Pediátrica de Centro América (AHOPCA): a model for sustainable development in pediatric oncology. *Pediatr Blood Cancer* 2014; **61:** 345–54.

© 2021 The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY-NC-ND 4.0 license.