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REVIEW

The effect of a geriatric evaluation on treatment decisions for older cancer patients – a systematic review

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Abstract

Aim. The aim of this systematic review is to summarise all available data on the effect of a geriatric evaluation on the multidisciplinary treatment of older cancer patients, focussing on oncologic treatment decisions and the implementation of non-oncologic interventions. *Methods.* A systematic search in MEDLINE and EMBASE for studies on the effect of a geriatric evaluation on oncologic and non-oncologic treatment for older cancer patients. *Results.* Literature search identified 1654 reports (624 from Medline and 1030 from Embase), of which 10 studies were included in the review. Three studies used a geriatric consultation while seven used a geriatric assessment performed by a cancer specialist, healthcare worker or (research) nurse. Six studies addressed a change in oncologic treatment, the initial treatment plan was modified in a median of 39% of patients after geriatric evaluation, of which two thirds resulted in less intensive treatment. Seven studies focused on the implementation of non-oncologic interventions based on the results of the geriatric evaluation; all but one reported that interventions were suggested for over 70% of patients, even in studies that did not focus specifically on frail older patients. In the other study, implementation of non-oncologic interventions was left to the cancer specialist's discretion. *Conclusion.* A geriatric evaluation has significant impact on oncologic and non-oncologic treatment decisions in older cancer patients and deserves consideration in the oncologic work-up for these patients.

As the management of cancer became more complex, it was considered important that all key professionals were involved in clinical decision making for individual patients [1]. For this reason, multidisciplinary teams were introduced to the treatment of the oncologic patient and have been implemented all over the world [2]. Despite differences in their working mechanisms and organisation, its role in cancer care is undisputed.

The imminent ageing of Western societies will introduce a new level of complexity to oncologic decision making. Existing trials do not provide sufficient evidence for this specific population, as older patients and those with comorbid conditions have often been excluded [3–5]. The heterogeneity of the elderly population, with its variation in physiological reserves, comorbidity and geriatric conditions mean that the results of studies in younger or fit patients cannot automatically be extrapolated to older patients. As a result, tailoring of care is needed, based on a thorough evaluation of the patient's overall health status in addition to tumour characteristics and patient preferences. Consequently, some form of geriatric evaluation is increasingly being incorporated in oncologic care [6], but its role in treatment decisions remains to be clarified.

The aim of study was to systematic review all observational cohort studies on the effect of a geriatric evaluation on the multidisciplinary treatment of older cancer patients, focussing on oncologic treatment decisions and the implementation of non-oncologic interventions.

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Methods

Search strategy and article selection

For this study, a geriatric evaluation could consist of a geriatric consultation or a geriatric assessment only. We defined a geriatric consultation as a consultation with a specialist in geriatric or elderly medicine, in which a multidimensional assessment of the patient's health status is performed. An assessment was defined as an evaluation performed by a cancer specialist, healthcare worker or (research) nurse, focussing on three or more of the following domains, preferably investigated with a validated assessment tool: cognitive function, mood/depression, nutritional status, activities of daily living, instrumental activities of daily living, comorbidity, polypharmacy, mobility/falls, or frailty. The primary outcome measures were defined as an alteration in oncologic treatment plan after geriatric evaluation and the number and type of non-oncologic interventions directly related to the results of the geriatric evaluation. Studies were excluded if the geriatric assessment included less than three geriatric domains, if they only used non-validated assessment tools or if the allocation of treatment was protocolled. In addition, studies were excluded if they only reported statistical associations between outcome of the geriatric evaluation and treatment, but did not describe whether this evaluation genuinely affected treatment decisions as they were being made.

The following search was performed on 10 January 2013, in both Medline and Embase: (geriatrics[MeSH] OR "Geriatric Assessment" [MeSH] OR geriatric*[tiab] OR elderly care[tiab] OR elderly medicine[tiab]) AND (neoplasm[MeSH] OR cancer[tiab] OR tumor[tiab] OR tumour[tiab] OR tumors[tiab] OR tumours[tiab] OR neoplasm [tiab] OR malignan*[tiab] OR oncol*) AND (multidisciplin*[tiab] OR interdisciplin*[tiab] OR team*[tiab] OR tumour board* OR tumor board* OR conference*[tiab] OR meeting*[tiab] OR decision*[tiab] OR decision making[tiab] OR decision-making[tiab] OR treatment choice*[tiab] OR intervention*[tiab]). MeSH refers to medical subheading, tiab refers to title and abstract. No limits in age, language or publication date were applied.

The titles and abstracts of all studies retrieved by the search were assessed by one reviewer (MH) to determine which warranted further examination. All potentially relevant articles were subsequently screened as full text by two authors (MH and AS). If only an abstract was available, an effort was made to find the final report of the study by searching Embase and Medline using the names of the first, second and/or final author as well as key words from the title. Also, in case of insufficient data in the original manuscript, the authors were contacted for additional information. Finally, references of included publications were cross-referenced to retrieve any additional relevant citations.

Data extraction

Data regarding study design and results were independently extracted by two investigators (MH and AS) for each eligible study. Items that were extracted were the type of study, study setting, study population (age, sex, cancer type), method of patient selection, content of the geriatric assessment/consultation, prevalence of geriatric conditions, the change in treatment after the geriatric consultation and the number and type of non-oncologic interventions.

Quality assessment

The methodological quality of each of the studies was independently assessed by two reviewers (MH, AS), using the Newcastle-Ottowa Scale adapted to this subject (Supplementary material Appendix Ia, available online at http://informahealthcare.com/doi/abs/10.3109/0284186X.2013.840741) [7]. Disagreement among the reviewers was discussed during a consensus meeting and in case of persisting disagreement, the assistance of a third reviewer (BvM) was enlisted.

Data synthesis and analysis

We summarised the study results to describe our main outcomes of interest. Due to heterogeneity in the study populations, a formal meta-analysis was not considered feasible.

Results

Study characteristics

The literature search identified 1654 citations (624 from Medline and 1030 from Embase), of which 435 were duplicates. Details on the search and reasons for exclusion can be found in Supplementary material Appendix II, available online at http://informahealthcare.com/doi/abs/10.3109/0284186X.2013.840741). After exclusion of 1209 publications, 10 studies were included in this review [8–17]. Cross-referencing yielded no additional results.

The characteristics of these 10 observational cohort studies are summarised in Table I [8–17]. The first publication is from 2004, but eight of the

Table I. Studies on the alteration of treatment after geriatric assessment or consultation.

Publication			Patients					Study method			Outcome	
Author	Publication year	Abstract (A) or full text (F)	Setting and department	Study population	No. of patients	% male	Median age in years (range)	Method of patient selection	Treatment modality under consideration*	Type of geriatric evaluation**	Change in cancer treatment plan	Non-oncologic interventions
Aliamus [8]	2011	F	Multidisciplinary thoracic oncology meeting	Lung cancer	47	80%	79 (70–91)	Age ≥ 70 years	Unclear	A	X	
Aparicio [9]	2011	F	Department of gastroenterology	Various gastrointestinal tract cancers	21	52%	81 (75–87)	Unclear	–	A		X
Caillet [10]	2011	F	Oncogeriatric cancer care unit	Various solid cancer types	375	47%	80 (70–99)	All consecutive referrals aged ≥ 70 years	Various	C	X	X
Chaibi [11]	2011	F	Multidisciplinary cancer conference	Various cancer types	161	35%	82 (73–97)	Age ≥ 75 years and chemotherapy decision deemed complicated	Chemotherapy	C	X	X
Extermann [12]	2004	F	Senior adult oncology programme	Early stage breast cancer	15	0%	79 (72–87)	All patients aged ≥ 70 years and eligible for adjuvant treatment	–	A		X
Frennet [13]	2011	A	Unclear	Various cancer types	53	42%	Mean age 79 (SD 5.9)	Age ≥ 70 years with VES-13 score ≥ 3	–	A		X
Girre [14]	2008	F	Geriatric oncology programme	Various cancer types	105	17%	79 (70–97)	All new referrals aged ≥ 70 years	Various	A	X	
Horgan [15]	2011	F	Tertiary medical oncology clinic	Lung or gastrointestinal cancer	30	57%	78 (70–88)	Age ≥ 70 years and assessment deemed necessary by oncologist	Various	C	X	X
Kenis [16]	2013	F	Multicentre study	Various cancer types	1967	36%	76 (70–96)	Age ≥ 70 years and G8 score ≤ 14	Unclear	A	X	X
Weltermann [17]	2011	A	Department of oncology/ hematology	Various cancer types	50	59%	77 (70–91)	All newly diagnosed patients aged ≥ 70 years	–	A		X

G8, Geriatric 8 (a screening tool for frailty in oncology patients); SD, standard deviation; VES-13, vulnerable elders survey-13 (a screening tool for frailty in the general elderly population).

*Only applicable in studies reporting on outcomes; **An assessment (A) refers to an assessment performed by the cancer specialist/healthcare worker/ nurse; geriatric consultation (C) refers to the assessment as used in standard geriatric care, performed by a geriatrician.

10 studies were published since 2011 [8,9,11,13, 15,17]. Median sample size was 50 patients (range 15–1967 patients) [8–17]. Study populations were heterogeneous, with only two focusing on a specific type of cancer [8,12]. Three studies used a geriatric consultation [10,11,15], while the other seven used an assessment performed by a cancer specialist, healthcare worker or (research) nurse [8,9,12–14,16,17]. Six studies addressed the change in oncologic treatment [8,10,11,14–16]. One of these focussed only on change in chemotherapy regimen [11], three addressed multiple treatment modalities (i.e. surgery, radiotherapy, chemotherapy etc.) [10,14,15] and for two studies, the treatment under consideration was unclear [8,16]. Eight studies reported on the number and type of recommended non-oncologic interventions [9–13,15–17].

All studies incorporated an assessment of ADL-impairment and nutritional status as part of the geriatric evaluation (Table II). IADL-impairment, comorbidity and mood were included in nine of 10 studies; mobility assessment and/or falls risk were included in eight studies, medication use in seven and the social environment in six studies.

Quality assessment

The results of the quality assessment can be found in Supplementary material Appendix Ib, available online at http://informahealthcare.com/doi/abs/10.3109/0284186X.2013.840741). The overall quality of the studies was good. In one study, the inclusion criteria were unclear, while in two studies, there was a potential risk of selection bias due to the inclusion of only a small proportion of the potentially eligible patients [11,15]. For one study, only 61% of included patients were evaluable for changes in oncologic and non-oncologic treatment [16]. There were no other quality concerns.

Prevalence of geriatric conditions

Table III lists the prevalence of geriatric conditions, as identified by the geriatric evaluation. The issue most frequently detected was polypharmacy or inappropriate medication use, present in a median of 67% of patients (range 48–74%), followed by malnourishment with a median prevalence of 63% (range 37–80%). Functional impairments were also common: median prevalence for IADL-impairment 46% (range 38–65%), for ADL-impairment 33% (8–57%) and impaired mobility/falls 33% (20–55%). Approximately one third of patients suffered from depressive symptoms (median prevalence 34%, range 13–61%), concerns regarding somatic comorbidity (36%, range 11–64%) and cognitive impairments (median prevalence 26%, range 3–38%). Social issues such as insufficient care, social isolation or high caregiver burden were present in a median of 21% of patients (range 13–35%).

Effect on oncologic treatment

Table IV reports the results of the six studies addressing the effect of a geriatric evaluation on the oncologic treatment choice. In approximately one third of patients, the geriatric evaluation resulted in a change in cancer treatment; this was 21% for patients undergoing a geriatric consultation (range 20–49%) and approximately 39% in patients receiving an assessment only (range 25–45%). Of the treatment changes, approximately two thirds consisted of less intensive treatment (Table IV); this was not affected by the performer of geriatric evaluation.

Effect on non-oncologic treatment

All but one study reported interventions rates of over 70% (Table V); in the study that formed the exception to this finding, with only 26% of patients receiving non-oncologic interventions, interpretation of geriatric assessment and implementation of interventions was left to the cancer specialist [16]. Overall, social interventions and modification of medication were the most frequent recommendations, suggested in a median of 38% and 37% of patients, respectively (range 6–55% and 24–71%, respectively). Nutritional interventions were recommended for a median of 26% of patients (range 7–91%). Psychological interventions, exploration and treatment of cognitive impairment, interventions aimed at mobility and falls risk, and investigations or treatment of previously unidentified or not optimised comorbid conditions were all recommended for approximately 20% of patients (median 16–23%).

Table II. Content of geriatric evaluation.

	Comorbidity	Medication Use	Cognition	Mood	ADL	IADL	Mobility/ Falls	Nutritional status	Social environment
Aliamus [8]	Charlson	–	MMSE	miniGDS	Katz	Lawton	TUG	MNA	–
Aparicio [9]	CIRS-G	+	MMSE	GDS	Katz	Lawton	+	MNA	+
Caillet [10]	CIRS-G	+	MMSE	miniGDS	Katz	–	+	MNA	+
Chaibi [11]	CIRS-G	+	MMSE Clock	GDS	Katz	Lawton	TUG	MNA	–
Extermann [12]	CIRS-G Charlson	+	MMSE	GDSscreen	Katz	Lawton	–	MNA	+
Frennet [13]	–	–	MMSE	–	+	+	TUG	MNA	–
Girre [14]	+	+	–	miniGDS	Katz	Lawton	+	weight loss	+
Horgan [15]	Charlson	+	MMSE Clock	GDS	Katz	Lawton	+	weight loss	+
Kenis [16]	Charlson	+	MMSE	GDS	Katz	Lawton	+	MNA	+
Weltermann [17]	Charlson	+	miniCOG	GDS	Katz	Lawton	TUG	MNA	–

CIRS-G, Cumulative illness rating scale-geriatric; GDS, geriatric depression scale; MMSE, mini mental state examination; MNA, mini nutritional assessment; TUG, timed up and go.
+ domain assessed without using a validated assessment tool or tool not mentioned; – domain not assessed.

Table III. Prevalence of impairments or issues per geriatric domain.

	Number of patients	Comorbidity	Medication use	Cognition	Mood	ADL	IADL	Mobility/Falls	Nutritional status	Social environment
Aliamus [8]	47	35%	–	*	38%	43%†		nr	63%	–
Aparicio [9]	21	52%	48%	38%	43%	29%	38%	29%	71%	24%
Caillet [10]	375	36%	67%	27%	28%	32%	–	55%	58%	18%
Chaibi [11]	161	47%	nr	26%	34%	32%	60%	20%	65%	–
Extermann [12]	15	64%	67%	26%	13%	33%	40%	–	53%	33%
Frennet [13]	53	‡	‡	‡	–	‡	‡	48%	‡	–
Girre [14]	105	33%	74%	–	53%	42%	54%	20%	46%	17%
Horgan [15]	30	17%	67%	3%	33%	23%	43%	20%	37%	13%
Kenis [16]	1967	39%	#	13%	61%	57%	65%	38%	80%	35%
Weltermann [17]	50	11%	55%	38%	26%	8%	46%	55%	65%	–

ADL, activities of daily living; IADL, instrumental activities of daily living; nr, not reported.
–not included in study; *reported as mean score only: mean mini-mental state score 25.2/30; †combined score of ADL and/or IADL impairments; ‡reported as mean scores only: global score on cumulative illness rating score-geriatric version 10.7 ± 4.6/56, number of medications 6.9 ± 3.7, mini-mental status score 24.8 ± 4.9/30, ADL 5.0 ± 1.2/6, IADL 4.6 ± 1.7/7, mini-nutritional assessment short form 9.0 ± 2.6/14; #median 4 (0–22).

Discussion

In this systematic review on the effect of a geriatric evaluation on treatment decisions for older cancer patients, the initial oncologic treatment plan was modified in a median of 32% of patients, and non-oncologic interventions were recommended in a median of 83%. Thus, the inclusion of a geriatric evaluation has significant impact on the treatment decisions for the older cancer patient.

Previous studies on team workings in multidisciplinary cancer care have emphasised the need for greater patient-centredness [18,19]. They demonstrated that knowledge of comorbid conditions and the patient's psychosocial context greatly increases the likelihood of reaching a treatment decision at a multidisciplinary cancer team conference. Currently, this information is often lacking or receives little attention at the multidisciplinary conference compared to other facets such as the results of imaging studies or histopathological data [18,19]. As a result, treatment decisions have to be based on clinical impressions, which are increasingly inaccurate with increasing age [12,20]. Furthermore, modifications are often implemented only after complications of treatment demonstrate the patient's inability to tolerate standard treatment [21]. Prior studies have demonstrated the predictive value of the presence of geriatric conditions for prognosis, complications of oncologic surgery and chemotherapy tolerance [22–24], thus allowing for upfront tailoring of treatment to the patient's vulnerability. This explains why the initial oncologic treatment plan was altered in 20–49% of patients when the results of a geriatric evaluation were available. However, this type of evaluation is yet to become a routine part of the

Table IV. Alterations in oncologic treatment after geriatric assessment/consultation.

	Treatment altered		More intensive treatment		Treatment delay		Less intensive treatment	
	%	n =	%	n =	%	n =	%	n =
Horgan [15]	20%	6/30	3%	1/30	0%		17%	5/30
Caillet [10]	21%	78/375	2%	8/375	2%	7/375	17%	63/375
Kenis [16]	25%	282/1115*	–		–		–	
Girre [14]	39%	36/93	2%	2/93	0%		37%	34/93
Aliamus [8]	45%	22/49	–		–		–	
Chaibi [11]	49%	79/161	28%	45/161	3%	5/161	18%	29/161

–not reported; *not all patients were available for inclusion in this analysis.

Table V. Proportion of patients with non-oncologic interventions after geriatric evaluation.

	Number of patients	Any intervention	Nutritional interventions	Psychological interventions	Cognitive exploration and/or treatment	Polypharmacy optimisation	Social interventions	Interventions aimed at mobility and falls	Investigations for previously unidentified or not optimised comorbidity
Kenis [16]	1115*	**26%**	15%	10%	5%	–	5%	6%	9%
Aparicio [9]	21	**72%**	19%	–	5%	71%	38%	–	19%
Chaibi [11]	161	**76%**	47%	19%	18%	37%	20%	–	–
Frennet [13]	53	**77%**	34%	23%	–	25%	49%	21%	19%
Caillet [10]	375	**83%**	70%	36%	21%	31%	46%	42%	55%
Horgan [15]	30	**93%**	7%	23%	–	63%	–	13%	33%
Weltermann [17]	50	**95%**	18%	10%	14%	24%	6%	19%	3%
Extermann [12]	15	**100%**	91%	45%	18%	64%	55%	–	64%

–not reported; *not all patients were available for inclusion in this analysis.

work-up of older cancer patients [25], and currently geriatricians are often not included in multidisciplinary cancer teams [2]. For example, in the elaborate descriptions of the composition and work processes of multidisciplinary teams for various cancer types, the National Institute for Health and Clinical Excellence (NICE) cancer service guidances suggest the involvement of a median of 19 (range 9–30) possible (para)medical professionals, but fails to mention a specialist with specific geriatric knowledge [26].

We believe that this systematic review provides a valuable overview of all currently available evidence on the effect of a geriatric evaluation on treatment choices in older cancer patients. However, it also has several limitations. Study populations were heterogeneous, investigating a wide range of cancer types and treatment modalities and regimens. This hampers extrapolation of these results to individual oncology practice. In addition, studies reported only on the alteration in treatment, but few reported a follow-up of how patients subsequently fared; we were therefore unable to ascertain whether the changes made to the treatment plan resulted in overall better outcomes. For some of the included studies, no full text reports have been published, and we had to rely on conference abstracts as the only source of information on the execution and results of the study. Moreover, the content of the geriatric evaluation differed between studies, and the criteria used to define the presence of the geriatric conditions were often not fully reported. Furthermore, most studies did not report on the association between the prevalence of geriatric conditions and treatment alterations.

Another limitation is that due to differences in patient populations and study methods, we could not make a comparison between the effect of a geriatric consultation and an assessment of geriatric domains performed by a cancer specialist, healthcare worker or (research) nurse. Although study outcomes differed slightly, i.e. in the proportion of patients for whom oncologic treatment was modified after the evaluation (median 21% for geriatric consultation; 40% for assessment), it is not possible to know if this was due the type of evaluation or due to other factors, such as patient selection. Most studies using an assessment incorporated standardised interventions based on the results of this assessment in the various geriatric domains. In the one study that left the implementation of non-oncologic interventions to the cancer specialist's discretion, only 26% of patients received such interventions, compared to over 70% of patients with a standardised intervention protocol or a geriatric consultation, despite similar prevalence of geriatric conditions [16]. This demonstrates that any assessment should incorporate a strategy for dealing with the issues that are identified. It is important to realise that the outcome of a screening tool for the possible presence of a particular condition, i.e. assessing a patient's mood with the geriatric depression scale, is not the same as making a diagnosis of depression [27]. Screening is a first step, and one that is also used by geriatricians (Table II). However, a geriatric consultation is superior to an assessment only as it allows for a more precise diagnosis of the various conditions that the assessment screens for. In addition, it will also allow for a more direct implementation of interventions aimed at these conditions. The only study thus far that has addressed the impact of a geriatric consultation on quality of life demonstrated that adding geriatric care to standard in-patient cancer care for

hospitalised elderly cancer patients resulted in a significant decrease in the amount of emotional limitations, social dysfunction and bodily pain that these patients experienced at three months; the effect on pain was still significant one year after hospital discharge [28].

Irrespective of the type of geriatric evaluation that is used, the studies included in this review demonstrate that it will provide information on a patient's somatic, psychosocial and functional health status that is invaluable to treatment decisions. However, the time-consuming nature of a geriatric evaluation has presented an important limiting factor to its routine implementation in oncology. Studies addressing the possibility of replacing a full evaluation by a frailty screening tool in an attempt to bypass the geriatric evaluation have yielded disappointing results [22], while tools developed for one aspect, i.e. for predicting the toxicity of chemotherapy [29,30], lack the wealth of information provided by a full evaluation. In an age where the amount of time spent on staging and exploring disease characteristics is rapidly increasing, and more and more money is spent on increasingly sophisticated anti-cancer treatments, taking the time to sit down with a patient and explore what they want and whether or not they will be able to benefit from and tolerate cancer treatment should not be a matter of discussion.

In conclusion, this review demonstrates that a geriatric evaluation, performed by a geriatrician or even a basic assessment of geriatric domains by a (research) nurse, provides invaluable information for the decision making process and identifies multiple issues that could be modified to improve treatment tolerance and quality of life. Although further research is needed to refine the role of a geriatric evaluation in oncologic decision making, the currently available evidence demonstrates that it can be a worthwhile addition in the oncologic work-up for older patients and geriatric specialists should become a standard part of the multidisciplinary cancer team. It is now up to cancer physicians, researchers, medical directors, government bodies and insurance companies to work together to make better cancer care for older patients a reality.

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Supplementary material available online

Supplementary Appendix Ia, b and Appendix II.