**Interventions for older people having cancer treatment: A scoping review**

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**ABSTRACT**

Objectives: There is currently no overview of supportive interventions developed for older people having cancer treatment. The aims and objectives, methods, and outcomes of interest of existing supportive interventions have not been evaluated. To understand how health services might meet the needs of older people undergoing cancer treatment, a scoping review was undertaken to identify and characterise supportive interventions developed for this patient group.

Materials and methods: This scoping review examined supportive interventions (services, programs, tools or policies) applied during diagnosis or treatment that address physical, psychological, social or spiritual needs of older patients. A systematic search of the following electronic databases was undertaken August-October 2017 (updated March 2019): AMED; CINAHL; EMBASE; Medline; PsychINFO.

Results: Sixty-two papers met the inclusion criteria. The review established that existing interventions to support older people having treatment for cancer are diverse in aim, and the evaluation methodology and outcome measure selection vary considerably. The interventions rarely target complex issues such as multimorbidity, frailty, or the impact of other geriatric syndromes in addition to cancer.

Conclusion: We suggest that future research should focus on patient populations with complex needs, including addressing comorbidity with age-associated conditions such as dementia.

**Keywords**

**Neoplasms; Aged; Aged, 80 and over; Review; Health Services Administration; Intervention**

**INTRODUCTION**

There is increasing international recognition that older age is part of the picture for a significant proportion of people with a new diagnosis of cancer. More than a third of new cancer cases in the UK in 2013-2015 were in people aged 75 and over (Cancer Research UK, 2018). In the USA, a quarter of new cancer cases are diagnosed in people aged 65 to 74 (National Cancer Institute, 2018). Older people are more likely to have comorbidities and geriatric syndromes including incontinence, falls, functional decline, polypharmacy and delirium (Macmillan Cancer Support, 2012a). Interactions between these issues and cancer treatment can lead to poor patient experiences and outcomes.

Interventions to improve the wellbeing of older people with cancer are beginning to be developed and evaluated, including assessment and care planning, geriatric oncology liaison, practical support and care coordination (Macmillan Cancer Support, 2012b). Globally, protocols are emerging of studies designed to investigate interventions such as ‘Nurse Navigator’ programmes (Chillakunnel et al., 2016) or social care interventions (Crétel-Durand et al., 2017) but results are not yet available. Facilities and systems to improve the wellbeing of the general older hospital population such as Geriatric Evaluation and Management Units (Van Craen et al., 2010) have been identified as having relevance for older cancer patients (Burhenn et al., 2016).

This is a relatively new research area. There is no dedicated overview of the types of interventions developed for older people having treatment for cancer, their aims and objectives, methods (including target population) and outcomes of interest. To understand how health services might meet the needs of older people undergoing cancer treatment, this scoping review aims to capture and summarise the approaches employed. Some time ago Bourbonniere and Kagan (2004) examined interventions for older people with cancer. This review included screening and survivorship interventions as well as treatment-focused interventions. In comparison, this review targets interventions in the treatment phase. Many articles make recommendations as to what services might comprise (Naiem et al., 2014), but this review will set out *what* has been tried, *how*, and *with whom*.

**MATERIALS AND METHODS**

Scoping reviews are an effective way of understanding diverse studies with various methodologies and outcome measures. A scoping review examines the extent, range and nature of research activity to inform practice, policymaking and research (Daubt et al., 2013; Pham et al., 2014). It follows a formal process, using systematic searching and methodological framework (Levac et al., 2010):

1. *Identifying a research question*: with a wide approach for breadth of coverage.
2. *Identifying relevant studies*: using systematic searching.
3. *Study selection*: using an evolving inclusion/exclusion strategy.
4. *Charting the data*: extracting key data by sorting material according to themes.
5. *Collating, summarizing and reporting results*: highlighting gaps in the literature.

This review was designed to answer the following broad question: what studies report the use of supportive interventions to address the needs of older people undergoing treatment for cancer? The review examined supportive interventions (services, programs, tools or policies) applied during diagnosis or treatment that address physical, psychological, social or spiritual needs of older patients. The review focused on patients with cancer, having treatment (chemotherapy or other systemic anti-cancer therapy (SACT), radiotherapy, surgery), with curative or palliative intent. **Table 1** displays inclusion/exclusion criteria. No specific age demarcation was set in order to allow for difference in views of what constitutes an ‘older’ adult; papers were included if they described the target population as ‘older’ or ‘elderly’. No restrictions were set on the type of intervention in order to capture the full range in this review. The only interventions excluded were those of a pharmacological nature or treatment-specific (such as chemotherapy dose adjustment), and those focusing on survivorship or end of life (where supportive needs are likely to be different). Outcomes were expected to be diverse and include: promoting treatment tolerance, managing symptoms, maintaining function, improving health, enhancing quality of life, or providing psychosocial support (Bond et al., 2016).

**Search Strategy**

Search terms **(Appendix A)** were derived from MeSH terms and key publications such as Kagan (2016), to capture a broad overview of the services, programs, tools or policies in existence. PRISMA guidelines were employed (Liberati et al., 2009, Tricco et al 2018). Search terms were divided into 2 categories. ‘Population’ captured older cancer patients using the terms: aged, older, geriatric, neoplasms, cancer and variations. ‘Strategies/approaches’ captured interventions using the terms nursing role, treatment support, case management, geriatric assessment and variations. These electronic databases were initially searched August-October 2017 and the search updated March 2019: AMED; CINAHL; EMBASE; Medline; PsychINFO. There was no date limit. The review included English-language publications only. Reference lists were assessed for relevant studies.

**Data Extraction and Data Analysis**

Titles and abstracts were screened by the principal reviewer (NF). Where they appeared relevant, full papers were examined. Where there was uncertainty, study group members were consulted for clarification. Data were extracted using a standardised data extraction form. Extracted data included: aims and objectives, methods, study population, nature of intervention, outcome measures, results and conclusions. As customary with scoping reviews, studies were not formally assessed for quality. **Figure 1** illustrates the process.

**RESULTS**

Data were extracted from 62 papers (reporting results from 57 studies) detailing supportive interventions deployed to meet the needs of older people undergoing treatment for cancer (see **Appendix B** for study characteristics). It should be noted that results are reported by *paper* (n=62) rather than by *study* (n=57) to allow for differences that occur between papers produced within the same study. Half of all the papers reviewed originated from the USA, with one third from Europe. None met the inclusion criteria from Africa, Australia, or South America, and with the exception of China, there were none from developing nations. Eighty-five percent of papers reported on interventions in hospital. Very few were located in settings other than hospital; seven papers were located in the community, one in a primary care clinic, and one in a hospice. The earliest publication meeting the criteria appeared in 1996. There has been a marked increase in publications since, with 66 percent of papers reviewed having been published after 2010. Twenty different types of intervention were described, ranging from single, targeted interventions (such as exercise programs) to multifaceted interventions (such as geriatric oncology services). By far the most (n=24) reported on some form of geriatric assessment (e.g. Kenis et al., 2013; McCleary et al., 2013). Five reported on telephone monitoring or support (e.g. Kornblith et al., 2006; Lynch et al., 2010). Four reported on geriatric oncology services (e.g. Lynch et al., 2007). Three each reported on exercise-based interventions (e.g. Sajid, et al., 2016), inpatient geriatric units (e.g. Rao et al., 2005), and nurse case managers (e.g. Goodwin et al., 2003). Other interventions included education (Clotfelter 1999, Rigdon 2009) and complementary therapy (Xue et al 2015). For a full list see **Table 2**.

**Intervention**

**Table 3** describes the population(s) targeted by the interventions. Most papers focused on multiple cancer types and stages. Most did not specify treatment modality, and of those that did, many targeted patients undergoing systemic anti-cancer therapy or multiple treatment types. Most papers involved patients ≥ 65 or ≥ 70 years of age. The oldest age group targeted was 75 years of age or older, employed by four papers. No papers targeted the ‘oldest-old’, those 85 years of age or older (Nolen et al., 2017). No papers actively targeted patients with complex needs, for example in one study patients were only included if they were cognitively alert, had intact vision and hearing, and could use a telephone (Clotfelter, 1999). Similarly, Dronkers et al. (2010) excluded patients who had ‘heart disease that prohibits or impedes exercise, severe systemic illness, recent embolism, thrombophlebitis, uncontrolled diabetes severe orthopaedic conditions that prohibit or impede exercise, and wheelchair dependence’.

Interventions targeted various aspects of the care process. Twenty papers related to the organisation and management of care and described interventions aimed at improving the way in which care is delivered through application of a service model, for example a geriatric oncology service (e.g. Korc-Grodzicki et al., 2017). Fourteen investigated how geriatric assessment in some form supports oncological treatment decision making, including Comprehensive Geriatric Assessment (e.g. Aparicio et al., 2011). Fourteen papers detailed interventions to improve quality of life and/or symptom management for physical and psychological issues, including a collaborative care intervention to treat depression (e.g. Fann et al., 2009). Eight papers addressed multidisciplinary support, including referrals (e.g. Baitar et al., 2015) and medications optimisation (e.g. Yeoh et al 2012). The final group (n=6) targeted peri-surgical optimisation and included interventions to improve post-operative outcomes, such as prevention of delirium (e.g. Hempenius et al., 2013; Hempenius et al., 2016).

The papers reviewed described diverse intervention aims. Twenty-one papers aimed for the optimisation of oncological treatment. This included choosing the most appropriate treatment (e.g. Aparicio et al., 2011), preventing post-surgical complications (e.g. Indrakusumar et al., 2015), and telephone monitoring (e.g. Lynch et al., 2010). Twenty-two papers aimed to improve symptoms associated with cancer or cancer treatment, including papers which focused on improving mental health (e.g. Canoui-Poitrine et al., 2006), or maintaining quality of life during radiotherapy (e.g. Lapid et al., 2007). Nineteen papers aimed for the optimisation of care management, including papers focusing on the environment, processes and personnel involved in care (e.g. Korc-Grodzicki et al., 2016; Kuzmarov and Ferrante, 2011; Lynch et al., 2007).

Geriatric Assessment

Geriatric assessment, in some form, was a frequently encountered intervention in the papers reviewed, and therefore this merits some further description. Papers examining geriatric assessment were included in this review if the assessment itself was employed as the intervention. Papers reporting on geriatric assessment were not included if the focus was establishing the value of assessment in terms of validity or reliability, or if the primary aim was to predict outcomes (without guiding individual treatment decisions), or if the focus was on geriatric assessment as a frailty identification tool. Some papers reviewed incorporated assessment within a wider intervention, for example as part of geriatric oncology service activity. This section focuses on papers where assessment was the sole intervention.

Twenty-four papers (39 per cent of studies reviewed) used some form of geriatric assessment as the intervention. The majority of these (n=17) described a form of *Comprehensive Geriatric Assessment* (CGA) as the intervention. This can be defined as a ‘multidimensional interdisciplinary diagnostic process focused on determining a frail older person’s medical, psychological and functional capability in order to develop a coordinated and integrated plan for treatment and long term follow up’ (Rubenstein et al., 1991). This is a complex intervention carried out by a trained individual, often a geriatrician. The remainder of the papers employed *Geriatric Assessment*, where patient data are collected using clinician and/or patient completed tools, without the explicit inclusion of an integrated treatment plan. Despite these differences, all assessments contained similar components: cognitive status; functional status; nutritional status; mental health; social support network; medical history including comorbidity.

**Design**

**Table 4** displays study designs. The most common were cohort studies, describing a quasi-experimental method where a group of patients with a defining characteristic is followed to gain data on the outcome of interest.

**Outcome**

**Table 5** displays outcome measures. Evaluation measures are divided into 4 categories:

1. Process measures: how care was enacted e.g. treatment decisions made after CGA;
2. Outcome measures: impact on patient or healthcare system e.g. length of stay;
3. Descriptive measures: establishing the status quo e.g. type of geriatric syndromes present on a ward;
4. Not specified: measures not explicitly stated.

Where papers have more than one outcome measure, the primary measure has been chosen.

The most frequently employed measure overall was the recording of oncological treatment decision alterations (n=11). In these papers, the focus was the process of decision making rather than the impact of treatment on the patient. For example, Girre et al (2008) measured changes in treatment decisions that occurred after geriatric consultation. The second most frequently appearing measure related to toxicities, complications, survival or mortality (n=9). These measures focused on the impact on the patient, for example Hempenius et al (2013) measured the incidence of post-operative delirium. Six papers measured how and to what extent clinical actions were recommended or implemented (e.g. Alibhai et al 2018). Other frequently appearing measures included: symptoms (such as pain – Clotfelter, 1999); quality of life (Lapid et al 2007); and functional abilities/dependencies (such as physical performance – Sajid et al 2016). Eight papers utilised descriptive measures such as the prevalence of geriatric syndromes (Flood et al 2006). In 3 papers, no outcome measure was specified (Klemm et al., 2013; Korc-Grodzicki et al., 2017; Kuzmarov and Ferrante 2011).

**DISCUSSION**

‘*It is no longer reasonable to ignore the fact that this is a special group that requires specific interventions’* (Korc-Grodzicki et al., 2017: 111)

This scoping review aimed to identify and characterise supportive interventions developed for older people undergoing cancer treatment. It has established that existing interventions to support older people having treatment for cancer are diverse in terms of aims, and the methodology and outcome measures used to evaluate them vary considerably. However, trends and themes can be identified, and significant gaps observed. To summarise, most papers emerging from the review were of a cohort study design. Most were motivated to optimise oncological treatment, during treatment, regardless of disease stage. Most papers focused on patients aged 65 or older.

One area of commonality throughout many of the papers was that the interventions took place in hospital rather than in the community or other primary care settings. There may be several reasons for this; for example, many of the papers focus on optimising treatment or decision making around treatment, and therefore a hospital focus with oncologists and other relevant personal (including geriatricians) would be expected. However, this apparent homogeneity may be misleading as there are multiple types of hospital, including teaching hospitals, community hospitals and specialist cancer centres. In addition, there are marked differences in healthcare systems due to local health care delivery models, for example the insurance-based system in the United States operates differently from the UK’s National Health Service. Despite these caveats, it is important to consider the fact that most of the interventions were located in hospitals (and that few papers reported on interventions which encompassed multiple care settings) as this may suggest a divide between community/primary care and secondary care services, making it challenging to address the broader needs of this patient group. Further work would be needed to establish the relative effectiveness of hospital-and community-based interventions in terms of improving outcomes.

Another common feature is the focus on geriatric assessment, specifically in relation to oncological decision making. Previous studies have highlighted the potential benefits of geriatric assessment for patients considered for cancer treatment (Chen et al., 2012; Extermann et al., 2005; Repetto et al., 2003; Somana-Ehrlinger 2013) in terms of managing complexity, detecting hidden problems, improving functional status and selecting appropriate treatment. The prevalence of this topic in the papers reviewed is therefore unsurprising. Moreover, implementing an assessment for patients in an existing clinic is feasible, with demonstrable outcomes. The papers reviewed here reinforce that geriatric assessment is not the end point, rather it is the means to an end. This is emphasised by the fact that several of the papers reviewed focused primarily on the actions arising from geriatric assessment (e.g. Baitar et al., 2015; Extermann et al., 2004; Hurria et al., 2007). The key part of the intervention is therefore not the assessment itself but the subsequent actions.

Some areas are surprisingly absent given demographic trends. The terms ‘informal carer’ or ‘family caregiver’ were not included in the search strategy in order to limit the search strategy to a manageable size, but only two papers offered support to family caregivers as part of the intervention (Klemm et al., 2013; Lynch et al., 2007). It is known that informally caring for someone with cancer can have a detrimental effect on psychosocial and physical health (Shaffer et al., 2017), and care for an older person with multiple medical conditions or existing frailty may be more complex. No papers targeted the ‘oldest-old’, those who are aged 85 years of age or older. This population of patients may have qualitatively different needs and concerns, but we are currently unaware of what form these might take. Only a couple addressed multi-morbidity (Fann et al., 2009; Schmidt et al., 2017). Comorbidities were often reported as a participant characteristic in the papers reviewed but were not the primary focus. Many older patients with cancer live with an additional health condition (National Cancer Intelligence Network 2014) so this is a pertinent subject. The search strategy did not employ the terms ‘comorbidity’ or ‘multimorbidity’ for reasons of practicability, nonetheless it is significant there were not more interventions to address patients with these concerns.

The interventions identified in this review belie the complex nature of the experience of the older person with cancer. The interventions rarely addressed complex issues such as multimorbidity, frailty, or the impact of other geriatric syndromes in addition to cancer. In some studies in this review, complexity was actively avoided through the application of certain eligibility criteria (Clotfelter 1999; Dronkers et al., 2010). This may have been necessary for a study investigating a pre-operative exercise programme to optimise recovery after surgery, but it may well limit the applicability to an older person with more complex needs. The family of a wheelchair-dependent 90-year old woman living with frailty, dementia, and stage IV ovarian cancer who resides in a residential care setting may not see themselves or their relative as participants in the interventions detailed here. Researchers and practitioners need to acknowledge and respond to complexity during the design and evaluation of interventions if health services are to become responsive to the specific needs of this population. This can be promoted in oncology services firstly by recognising the importance of factors such as frailty, dementia and polypharmacy (Oliver et al., 2014), and secondly by incorporating what is already known about the preferences of older people with complex care needs (Ellins et al., 2012).

Lastly, evidence shows that older people as a group, while no less likely to choose to have treatment for cancer, greatly value independence, and indeed for many maintaining independence is as important as maintaining health (Macmillan Cancer Support 2015). While promotion of independence for this patient population was implicit in some of the interventions reported in this review, it was by no means an overt aim, as reflected in the outcome measures in use. In order to achieve concordance with the concerns of patients, researchers need to respond with interventions that are relevant to the needs expressed.

**Strengths and limitations**

Methodologically, scoping reviews are not without limitations. The volume of literature amassed is substantial, requiring significant interpretative work (Brien et al., 2010). Conducting a broad search with diverse search terms was a challenge. A previous review of nursing interventions for older adults with cancer (Bourbonniere and Kagan, 2004) found their search returned high numbers of studies with only a tenuous link caring for elders with cancer. Our own search also returned numerous items (see **Figure 1**), many of which were extraneous. This was therefore a time-consuming and labour-intensive project. Due to the broad nature of the review, the search strategy was unable to include a detailed breakdown of the specific components of CGA such as comorbidity or geriatric syndromes. This may have resulted in papers evaluating single domain interventions being unintentionally excluded.

Several papers returned by the original search contained findings that could potentially have a function in improving the cancer journey for the older person despite not having the characteristics of an intervention. For example, Jansen et al. (2010) found that patients who were accompanied to nursing consultations were likely to benefit from extra information their companions were able to recall. Similarly, some papers discussed the effect of social support on outcomes (Jatoi et al., 2016; Karakoç and Yurtsever 2010). While not interventions, these studies should not be ignored in an examination of improving care for older people with cancer.

Due to practical considerations, screening and data extraction was conducted by one reviewer (NF) except in cases where clarification was requested from other members of the study team. Quality assessment was not conducted, rather, the review’s focus was on understanding the range of studies and the nature of interventions employed, their various methodological approaches and outcome measures. Finally, Levac et al (2010) recommend consultation with stakeholders as the sixth stage in a scoping review framework. While not detailed here for reasons of brevity, this scoping review forms part of a programme of work which is informed by stakeholder groups of clinicians and service users. Despite this, the use of scoping review methodology was able to provide a broad overview of the range of interventions to meet the needs of older people undergoing treatment for cancer, highly necessary in this relatively nascent field. A key strength of this scoping review was its ability to encompass a variety of study designs and intervention types to allow an understanding of the diversity of approaches that exist in this area.

**CONCLUSION**

This scoping review asked wide-ranging questions and examined a diverse assortment of papers. It captured the number and types of interventions that have been employed to improve the care and support for older people undergoing cancer treatment. It illustrated the gaps in the knowledge base. Whilst research on any aspect would be useful, future research may focus on one of the understudied areas identified in this review, namely:

* Supporting the ‘oldest-old’ with cancer;
* Addressing the issue of multi morbidity in this patient group, especially comorbidity with conditions commonly associated with ageing such as dementia;
* Incorporating the needs of informal carers or family caregivers.

Research could focus on improving specific symptoms or function with a narrow intervention, or develop and deploy particular approaches to healthcare delivery in an attempt to improve a broader range of outcomes. Either approach would enhance the state of the science and pave the way for appropriate interventions to improve care and management of older people with cancer.

The nascent character of research in the areas identified means that preliminary work is needed in relation to topics identified above including:

* epidemiological/prevalence data;
* establishing the needs, concerns and preferences of the stakeholders;
* identifying aspects of healthcare systems amenable to modification;
* identifying the feasibility, impact and sustainability of interventions across contexts.

When information has been gathered and the status quo established, interventions to improve outcomes can be developed and then tested in large-scale experimental studies and then tested more definitively in a range of contexts using mixed methods. We will only get a sense of the processes and outcomes that it is most desirable to address following such work.

**Appendix A**

**Search Strategy Terms**

|  |  |
| --- | --- |
| **Population** | |
| *Age* | Aged/ (exp.) |
| TI elder\* OR AB elder\* |
| Geriatrics/ OR Gerontologic nursing/ OR Gerontologic care/ |
| TI geriatric\* OR AB geriatric\* |
| TI older N3 adult\* OR AB older N3 adult\* |
| TI geriatric N3 oncolog\* OR AB geriatric N3 oncolog\* |
| TI gero-oncolog\* OR AB gero-oncolog\* |
| TI frail\* OR AB frail\* |
| *Disease* | Neoplasms/ (exp.) |
| TI cancer\* OR AB cancer\* |
| Oncology/ |
| Oncologic nursing/ |
| Oncologic care |
| Cancer patients/ |
| TI oncolog\* OR AB oncolog\* |
| **Strategies/Approaches** | |
|  | Nursing role/ |
| TI case N3 manag\* OR AB case N3 manag\* |
| TI nurs\* N3 role OR AB nurs\* N3 role |
| Support, psychosocial/ (exp.) |
| Information needs/ |
| TI treatment\* N3 support\* OR AB treatment\* N3 support\* |
| TI support\* N3 need\* OR AB support\* N3 need\* |
| Case management/ |
| Geriatric assessment/ |
| TI geriatric\* N3 assess\* OR AB geriatric\* N3 assess\* |
| Nursing care delivery systems/ (exp.) |
| Nursing practice/ (exp.) |
| Program development/ (exp.) |
| Pilot studies/ |
| TI treatment N3 burden OR AB treatment N3 burden |
| Health services/ OR health services for the aged/ |
| TI management N3 unit\* OR AB management N3 unit\* |
| Support\* care OR Support\* intervention OR Support\*need |
| Human needs (psychology)/ OR Human needs (physiology)/ |
| Needs assessment/ |

**Appendix B**

**Characteristics of included studies**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Study** | **Aims** | **Methods** | **Population** | **Intervention(s)** | **Outcome** |
| **Alibhai et al 2018;**  Hospital; Canada | Describe enhancements to care provided in a geriatric oncology clinic. | Prospective observational study | 219 patients with cancer;  Aged ≥ 65 years. | Treatment enhancements recorded: educational support, comorbidity management, symptom management, oncologic treatment delivery and per-operative management recommendations. | Most common enhancements educational support and comorbidity management. |
| **Aparicio et al 2011**;  Hospital; France | Evaluate feasibility of a mini geriatric assessment (MGAa) to adapt anticancer treatments. | Prospective cohort study | 21 patients treated for digestive tract cancers;  Aged > 75 years. | MGA/CGAb carried out and scores compared. | Conclude that MGA assists treatment decisions. |
| **Baitar et al 2015**;  Hospital; Belgium | 1) describe geriatric recommendations based on a geriatric assessment;  2) evaluate implementation of recommendations | Multicentre prospective study | 1550 patients with any cancer;  Aged > 70 years. | GAc carried out and recommendations made. Patient charts reviewed after 1 month to verify which geriatric recommendations had been performed. | Not all geriatric problems lead to recommendations and not all recommendations are carried out. Referrals for cognition, falls and depression least likely to be performed. |
| **Barthélémy et al 2011;**  Hospital; France | Investigate impact of age and CGA in tumour boards recommending adjuvant chemotherapy in early breast cancer patients | Retrospective record analysis | 192 patients with early breast cancer;  Aged ≥ 70 years. | Reviewed tumour board records to investigate whether treating physicians followed the treatment proposal after CGA. | Geriatric assessment insufficiently taken into account for adjuvant therapy recommendation. Physicians relied on clinical assessment. |
| **Boulahssass et al 2019**  Hospital; France | Analyse factors that identify patients who need more geriatric interventions and therefore specific follow-up. | Prospective cohort study | 3140 patients with solid tumours;  Aged ≥ 70 years. | CGA performed at baseline. Analysed association between factors at baseline and need to perform more than 3 geriatric interventions. | CGA modified therapeutic decision in 22% of patients. |
| **Caillet et al 2011**;  Teaching hospital; France | Identify CGA components associated with changes in planned cancer treatment. | Prospective survey study | 375 elderly patients with solid cancer;  Aged ≥70 years. | Compared treatment proposed by geriatrician after CGA and treatment carried out after MDTd review. | Conclude that functional status and malnutrition independently associated with changes in treatment. |
| **Canoui-Poitrine et al 2016**;  Hospital geriatric oncology clinics; France | Assess prevalence and factors associated with clinical depression in older patients with cancer. | Prospective open cohort study. Multicentre. | 1092 patients with various cancer diagnoses;  Aged ≥ 70 years. | Analysed GA factors associated with clinical depression (primary) and actions including referral or medication (secondary). | GA leads to identification and treatment for depression. |
| **Chaïbi et al 2011**;  Hospital; France | Analyse the change in initial MDT decisions in older cancer patients after CGA, consultation with a geriatrician and interventions of the oncogeriatric board. | Prospective cohort study | 161 patients with cancer;  Aged > 75 years. | Patients referred for CGA, then discussed at oncogeriatric MDT consultation where the final treatment options were proposed. Changes analysed. | Change in proposed treatment common. Geriatric treatment intervention focused on: nutrition, depression, cognitive impairment, polypharmacy, social intervention. |
| **Chapman et al 2014 ;**  Hospital; USA | Develop a model for the establishment of a comprehensive multidisciplinary geriatric oncology centre. | Service development and descriptive analysis. | Service development: Patients with cancer; Aged ≥ 70 years.  Descriptive analysis: 211 patients with cancer;  Aged > 60 years. | Two-hour visit in which patient is seen by medical oncology, geriatric medicine, pharmacy, social work, and nutrition. CGA conducted. | Interventions include: nutrition counselling, minimization of inappropriate medications, home care referrals, individualized oncology treatment plan. |
| **Clotfelter 1999**;  Private oncology practice; USA | Determine if an educational intervention could decrease pain intensity in elderly people with cancer. | Randomised controlled trial | 36 patients with known cancer diagnosis;  Aged ≥ 65 years. | Pain intensity assessed at baseline and 2 weeks post-intervention in participants who underwent an education session compared with control group. | Participants in the experimental group had significantly less pain intensity when compared with the pain intensity of the control group. |
| **Corre et al 2016**;  14 university hospitals, 4 cancer centres,27 community hospitals; France and Spain | Compare chemotherapy allocation on the basis of performance status with experimental strategy on the basis of CGA | Multicenter, open-label, phase III trial | 494 patients with NSCLCe;  Aged > 70 years. | Randomly assigned chemotherapy allocation on the basis of PS and age, or treatment allocation on basis of CGA. Analysed TFFSf, OSg, PFSh, tolerability and QoLi. | Conclude that in elderly patients with stage IV NSCLC, treatment allocation on the basis of CGA failed to improve TFFS or OS but slightly reduced treatment toxicity. |
| **Decoster et al 2013**;  2 university hospitals; Belgium | Evaluate how clinical assessment determines physician’s treatment decisions, and how GA influences these decisions. | Prospective, non-interventional questionnaire study | 937 patients with breast, ovarian, lung, prostate, colorectal, and haematological malignancies;  Aged > 70 years. | All patients underwent GA. Results communicated to treating physician. Physician asked if aware of GA results at time of treatment decision; and questions on treatment decision. | Clinical assessment and GA influence treatment decisions. Physicians use different treatments for older and younger patients. Impact of GA appears limited in this study. |
| **Dronkers et al 2010**;  Hospital; Netherlands | Feasibility and preliminary effect of a short-term intensive preoperative exercise programme for patients scheduled for elective abdominal surgery. | Single blind randomized controlled pilot study | 42 patients undergoing elective colon surgery;  Aged > 60 years. | Short-term intensive therapeutic exercise programme delivered in outpatient setting or home-based exercise advice. | Conclude that programme was feasible and improved respiratory function of patients due to undergo elective abdominal surgery compared with home-based exercise advice. |
| **Extermann et al 2004**;  Hospital; USA | Assess prevalence of geriatric problems amenable to intervention in older breast cancer patients, and feasibility of introducing interventions e.g. CGA | Single centre, pilot study. | 15 early breast cancer patients;  Aged ≥ 70 years. | Patients received multidisciplinary CGA every 3 months and structured follow up. Number and type of interventions assessed. | A CGA with follow up has the potential for improving treatment and prognosis of these patients and is feasible in an academic oncology setting. |
| **Fann et al 2009**;  Primary care clinics belonging to 8 healthcare providers in 5 states; USA | Evaluating the effectiveness of a collaborative care programme for depression in cancer patients in primary care. | Secondary analysis of subset of data from wider multi-centre RCT | 215 cancer patients with depression;  Aged ≥ 60 years. | Intervention patients offered education, care management, anti-depressant management, and brief, structured psychosocial interventions including behavioural activation and problem-solving treatment. | Conclude that collaborative care program appears feasible and effective for depression among older cancer patients in primary care. |
| **Flood et al 2006**;  Teaching hospital; USA | Characterise population admitted to an Oncology-Acute Care for Elders unit; determine prevalence of functional dependencies and geriatric syndromes; examine suitability for an interdisciplinary model of care. | Retrospective review of clinical records | 119 patients with cancer admitted to unit;  Aged ≥ 65 years. | Standard geriatric screens administered to assess mood, functional and cognitive status. Demographic and medical data compiled by review of patients’ medical records. | Geriatric syndromes prevalent and appropriate for interdisciplinary care. Recommendations included: discontinuation of medications with adverse effects, dietary supplements, referrals to spiritual care, oncologists, dieticians, and home help. |
| **Garman et al 2004**;  Hospital; USA | Describe patterns of functional status, symptoms, therapeutic goals, and outcomes among older adults with cancer diagnoses hospitalized on a Geriatric Evaluation and Management Unit. | Retrospective systematic review of clinical records | 36 veterans with diagnosis of cancer by the time of discharge;  Average age 80 years. | Recorded ‘goals for admission’ (e.g. diagnosis, symptom relief, functional improvement, caregiver support). Used a modified version of a goal attainment scale to determine how well the goals set by patients and their care teams were met. | Goals accomplished 78% of the time for diagnosis, 73% for symptom management, 79% for functional improvement, and 100% for caregiver support. Conclude these services represent a promising approach to care for older cancer patients. |
| **Girre et al 2008**;  Hospital; France | Describe treatment plan modifications after a geriatric oncology clinic. Determine whether geriatric oncology clinic helpful for treatment decision process. | Cross-sectional pilot study | 105 patients with cancer;  Aged ≥ 70 years. | Oncology data and treatment decisions recorded before and after consultation. Data analysed for a correlation between assessment and treatment plan. | Conclude that a geriatric oncology consultation led to modification of cancer treatment in more than 1/3 of cases (unknown whether these modifications improve outcomes). |
| **Goodwin et al 2003**;  13 community and 2 public hospitals; USA | Evaluate effect of nurse case management on treatment of older women with breast cancer. | Randomized prospective trial | 335 women with breast cancer;  Aged ≥ 65 years. | Women in intervention group received the services of a nurse case manager for 12 months after the diagnosis of breast cancer. | Conclude case management results in more appropriate management of older women with breast cancer. |
| **Hempenius et al 2013**;  3 hospitals; Netherlands | Evaluate effect of a geriatric liaison intervention compared with standard care on incidence of postoperative delirium in frail elderly cancer patients. | Multi-centre, prospective RCT | 260 patients undergoing elective surgery for solid tumour;  Aged > 65 years. | Patients randomised to standard treatment vs geriatric liaison intervention: preoperative geriatric consultation, individual treatment, daily visits by a geriatric nurse during hospital stay. | Conclude that geriatric liaison intervention for the prevention of post-operative delirium in frail elderly cancer patients undergoing elective surgery has not been deemed effective. |
| **Hempenius et al 2016**;  3 hospitals; Netherlands | Evaluate long-term effects of a hospital-based geriatric liaison intervention to prevent post-operative delirium in frail elderly cancer patients. | Multi-centre, prospective RCT | 260 patients undergoing elective surgery for a solid tumour;  Aged > 65 years. | 3 month follow up performed with participants of the geriatric liaison intervention. | Intervention did not improve outcomes 3 months after discharge from hospital. Negative effect of postoperative delirium on late outcome was confirmed. |
| **Horgan et al 2012**;  Hospital; Canada | Feasibility and impact of CGA on treatment decisions in older cancer patients. | Prospective pilot study | 30 patients with histological diagnosis of GI or lung cancer;  Aged ≥ 70 years. | Standard assessment by oncologist made, and treatment decision recorded. CGA carried out with a medical oncologist and geriatrician, and final plan made by oncologist after recommendations from CGA. Changes in treatment noted. | Impact of CGA in informing treatment decisions in this study was modest, but may be helpful where initial treatment decision is uncertain. |
| **Hurria et al 2007**;  Academic tertiary care cancer centre and community based satellite practice; USA | Integrate principles of geriatric assessment into care of older patients with cancer to identify vulnerable older adults and develop interventions to optimise treatments. | Questionnaire and development of an intervention algorithm. | 245 patients with cancer;  Aged ≥ 65 years. | Questionnaire administered (functional status, comorbidity, psychological status, nutritional status and social support). Scoring algorithm for referral to MDT developed. | Questionnaire identified physical and psychological impairments, poor nutrition, lack of social support, untreated comorbidities. |
| **Indrakusuma et al 2015**;  Hospital; Netherlands | Evaluate if geriatric assessment influences postoperative outcome after colorectal surgery. | Retrospective cohort and matched control study | 443 patients who underwent colorectal resection between 2008 and 2013;  Aged ≥ 70 years. | Patients screened with questionnaire to identify frail patients. Those with positive scores referred to geriatric specialists for CGA and interventions. | Conclude that CGA assessment and intervention has a positive influence on post-operative outcomes after colorectal surgery. |
| **Jennings-Sanders andAnderson 2003**;  13 community hospitals and2 public hospitals; USA | Describe how older breast cancer clients perceive community-based nurse case managers. Develop recommendations for practice. | Qualitative content analysis using data from randomized, prospective trial | 335 older women newly diagnosed with breast cancer;  Aged 60-89 years. | Nurse case managers implemented multiple nursing interventions over 12 months. Patients interviewed about perceptions. | Nursing case managers made a positive impact on older women with breast cancer. |
| **Jennings-Sanders et al 2005**;  13 community hospitals and2 public hospitals; USA | Describe how nurse case managers care for older women with breast cancer. | Secondary analysis using data from a randomized, prospective trial | 335 older women newly diagnosed with breast cancer;  Aged 60-89 years. | Nurse case managers implemented multiple nursing interventions over 12 months covering assessment, implementation and evaluation. | Conclude nurse case managers may help older women with breast cancer achieve positive outcomes, and recommend that the Model of Nurse Case Management be used to manage care for older women with breast cancer. |
| **Kalsi et al 2015**;  Hospital; UK | Evaluate the impact of geriatrician-delivered CGA interventions on chemotherapy toxicity and tolerance for older people with cancer. | Prospective cohort comparison study | 135 patients undergoing chemotherapy);  Aged ≥ 70 years. | Intervention group underwent risk stratification using patient-completed screening questionnaire (CGA-GOLD), after which high risk patients received CGA. Impact of interventions on chemotherapy tolerance outcomes and grade 3+ toxicity rates evaluated. | Conclude that geriatrician-led CGA interventions associated with improved chemotherapy tolerance. Recommend that standard care should shift towards modifying coexisting conditions in order to optimise chemotherapy outcomes for older people. |
| **Kenis et al 2013**;  10 hospitals; Belgium | Evaluate feasibility and usefulness of geriatric screening and assessment in clinical oncology practice by assessing impact on the detection of unknown geriatric problems, geriatric interventions and treatment decisions. | Prospective, multi-centre, non-interventional study | 1967 patients with breast, colorectal, ovarian, lung, prostate and haematological malignancies;  Aged ≥ 70 years. | Patients screened using G8j, followed by GA. Results communicated to physician. Questionnaire sent to physicians after final treatment decision to assess awareness of results; new information revealed; actions taken; influence on treatment decision. | Conclude that GA screening and assessment in older patients with cancer is feasible at large scale and has a significant impact on detection of unknown geriatric problems, leading to geriatric interventions and adapted treatment. |
| **Kenis et al 2018;**  Hospital; Belgium | Investigate adherence to geriatric recommendations and subsequent actions undertaken in older patients with cancer. | Prospective multicentre cohort study | 4167 patients with cancer;  Aged ≥ 70 years. | Patients with abnormal geriatric screening result underwent GA. Geriatric recommendations formulated. Adherence to recommendations documented at follow-up. | Not all problems led to recommendations; not all recommendations led to actions. Highest grade of adherence for referrals to dietician, geriatrician, social worker, occupational therapist, psychologist and physiotherapist. Most frequent actions nutritional support, home care and psychological support. |
| **Klemm et al 2013**;  Community; USA | Describe lessons learned from partnership between a cancer helpline and an academic facility to improve outreach to older adults with cancer. | Practice development using community-based participatory research approach. | Patients affected by cancer and their family caregivers. | Cancer Care Connection: telephone-based social worker support model focusing on self-efficacy, empowerment, and identification of individual strengths. Partnered with University of Delaware. | Conclude that the partnership provided useful lessons. Suggest social workers seek collaborative agreements with professionals from other related disciplines to improve patient outcomes. |
| **Klepin et al 2011**;  Hospital; USA | Examine feasibility of an exercise intervention among older adults with AMLk undergoing induction chemotherapy  Obtain preliminary efficacy data. | Prospective, non-randomised pilot study. | 24 patients hospitalised for AML chemotherapy;  Aged ≥ 50 years. | 4 week exercise intervention.  Physical function, HRQoL l, depression and distress measured at baseline, after completion, and at follow up. | Conclude that recruitment to an exercise intervention was feasible and that exercise shows promise to maximise physical function and enhance HRQoL. |
| **Korc-Grodzicki et al 2017**;  Hospital; USA | Describe model of care for older adults with cancer developed at Memorial Sloan Kettering Cancer Centre, share the lessons learnt since its inception, and identify barriers and tactics. | Programme development | Older adults with cancer | Geriatric service for patients with cancer and geriatric syndromes. Provided comprehensive evaluation, management recommendations and shared care. | Suggest model can be adapted to other settings. Need to identify and address geriatric syndromes before treatment is essential. Can be role of registered nurse, physician assistant or nurse practitioner. |
| **Kornblith et al 2006**;  Community; USA | Determine whether distress in older cancer patients would be reduced by educational materials supplemented by monthly telephone monitoring compared with educational materials alone. | Prospective randomized study | 131 older patients with breast, prostate or colorectal cancer; Aged ≥ 65 years. | Patients evaluated by telephone for psychological and physical distress at baseline and at 6 and 9 months. Patients in educational materials group also received written materials regarding cancer-related psychosocial issues and resources. | Conclude findings support use of multiple telephone monitoring sessions to assess distress and refer for treatment. Suggest patients need to be assessed at multiple time points to identify problems. |
| **Kuzmarov and Ferrante 2011**;  Community hospital and community network; Canada | Describe development of Cancer Control Program in Canada, designed to actively prevent, cure and manage cancer. | Programme development | Older patients with cancer | Anti-cancer programme in Québec including creation of a nurse navigator to coordinate programme supported by regional team. | Allowed shift from more centralised approach within a hospital setting to provision of health care services on an outpatient or home care setting. |
| **Lapid et al 2007**;  Tertiary care comprehensive cancer centre; USA | Examine impact of elderly age on response to participation in a structured, multi-disciplinary QoL intervention for patients with advanced cancer undergoing radiotherapy. | Randomised, stratified, 2-group, controlled clinical trial | 103 patients with newly diagnosed cancer requiring radiotherapy;  33 patients aged ≥ 65 years. | Intervention consisted of 8 90 min sessions designed to address 5 QoL domains of cognitive, physical, emotional, spiritual and social functioning. QoL measured at baseline, and weeks 4, 8 and 27. | Overall QoL maintained in intervention group, but significantly reduced in control group. Conclude that geriatric patients with advanced cancer undergoing radiotherapy benefit from participation in a structured QoL intervention. |
| **Loh et al 2018;**  Hospital; USA | Evaluate the feasibility/usability of a novel app (TouchStream) designed to deliver GA-driven interventions. | Prospective single arm pilot study | 18 patients with cancer and 13 caregivers;  Patients aged 68-87 years, caregivers aged 33-81 years. | Patient underwent GA at baseline to guide app interventions. Participants provided with app for use at home for 4 weeks. Assessed usability, recruitment, retention, as well as patient symptom burden and satisfaction. Interviewed to identify barriers. | Concluded that TouchStream is feasible and usable for older patients on cancer treatment and their caregivers. |
| **Lynch et al 2007**;  Hospital; USA | Describe development of Geriatric Oncology Programme at Joan Karnell Cancer Center at Pennsylvania Hospital. | Programme development | Older adults (> 65 years) with cancer and their caregivers. | Living Well: A Program for Older Adults allows nursing assessment, social work evaluation, psychological evaluation and support, nutrition counselling, patient and family education, prescription guidance, and caregiver support. | Most issues faced psychosocial in nature, and best addressed through collaboration among social work intern/ social worker, palliative care nurse practitioner, and other members of MDT. |
| **Lynch et al 2010**;  Hospital; USA | Project aimed to understand several adverse events experienced by older adults who received chemotherapy, and to better service the needs of this population after chemotherapy. | Quality improvement project | 18 older adults with cancer receiving first course of chemotherapy i;  Aged ≥ 65 years. | Telephone follow up and intervention after chemotherapy administration. Issues identified during calls referred to physician or nurse for follow up. | Project results suggest older patients receiving chemotherapy may not report or may delay reporting symptoms and side effects. Make recommendations for identifying patients at high risk so services can be targeted. |
| **Magnuson et al 2018;**  Hospital; USA | Assess feasibility and preliminary efficacy of GA with an algorithm to guide GA management interventions on chemotherapy toxicity and other outcomes. | Randomised pilot study | 71 patients with solid tumour malignancy.  Aged ≥ 70 years. | Comparison of GA with management interventions verses usual care. For patients in intervention arm, recommendations identified via algorithm and relayed to oncologist for implementation. Investigated chemotherapy toxicity. | Conclude than an algorithm can be used to guide GA management recommendations in older adults with cancer, although reliance on the oncologist for execution resulted in low implementation. |
| **Mantovani et al 1996**  Hospital; Italy | Assess impact of 3 different psychological interventions on QoL of elderly cancer patients with symptoms of anxiety or depression.  Chemotherapy Impact questionnaire. | Prospective, open, randomised, parallel group design | 72 hospitalised patients with solid tumours/ haematological malignancies, symptoms of anxiety and depression;  Aged > 65 years. | After stratification for main prognostic factors, patients randomly assigned to Group A (psycho-pharmacological treatment), Group B (treatment plus social support) or Group C (as group B plus structured psychotherapy). QoL assessed at 3 points. | Combination of psycho-pharmacological treatment with social support, *or* this plus structured psychotherapy (integrated approaches) yielded best results. |
| **Marenco et al 2008**;  Outpatient geriatric oncology service in hospital; Italy  **GERIATRIC ASSESSMENT: TREATMENT DECISION-MAKING** | Evaluate role of multi-dimensional GA as an aid in treatment decision-making. | Prospective cohort study | 571 cancer patients with solid tumour;  Aged ≥ 70 years. | All patients underwent multidimensional GA as part of initial evaluation. After evaluation, each patient received an indication of what was deemed the most appropriate treatment. | Conclude that multidimensional GA is a useful tool in clinical practice for deciding cancer treatment for older adults, with a major independent role played by living alone, ADLm, IADLn and BMIo as well as age. |
| **McCleary et al 2013**;  Hospital; USA | Feasibility study to (a) develop a computer-based Cancer-Specific Geriatric Assessment, (b) assess administration feasibility, and (c) assess clinical utility for healthcare providers. | Feasibility study (non-randomised) | 38 patients at the initiation or change of treatment for GI malignancy;  Aged ≥ 70 years. | Completed Cancer Specific GA at baseline and follow up. Physicians sent Physician Utility Questionnaire asking about Cancer Specific GA influence. | Cancer Specific GA added information to clinical assessment but did not alter immediate clinical decision-making.  Conclude that feasibility endpoints were met. |
| **McCorkle et al 1998**;  Home care; USA | Examine effects of home nursing care on QoL outcomes for post-surgical cancer patients over 60. | Secondary analysis of randomised clinical trial data.  Longitudinal descriptive study. | 37 patients who died after receiving complete home nursing intervention following surgical treatment of a solid cancer;  Aged ≥ 60 years. | Patients received usual follow up care plus short-term home nursing intervention by advanced practice nurses. | Most teaching focused on self-care management of symptoms (mostly pain and fatigue). Those who died within 6 months showed intense symptom distress.  Authors advocate home care. |
| **McCorkle et al 2000**;  Community; USA | Compare length of survival of older post-surgical cancer patients who received specialised home-care intervention provided by advanced practice nurses with patients who received usual follow-up care in ambulatory setting. | Randomised controlled trial | 375 patients with solid cancers;  Aged 60-92 years. | Home care intervention. Patients and family caregivers received comprehensive clinical assessments, monitoring, and teaching including skills training. Nurse’s records used to analyse and quantify home care intervention. | Specialised home care group found to have increased survival. No difference among early stage patients, significant difference in favour of intervention group for late stage patients. |
| **Nipp et al 2012**;  Hospitals; USA | Determine whether pain medication use with inpatient consultations and services were associated with significantly better pain control. | Secondary analysis of dataset from randomised trial | 99 patients with a diagnosis of cancer;  Aged 65 years and older. | Pain medications measured at baseline and discharge; consultations and other services quantified for entire admission. | Suggest better pain control may be related to interdisciplinary approach. Suggest that inpatient consultations might alleviate suffering better than medications. |
| **Nipp et al 2019;**  Hospitals; USA | Demonstrate feasibility and efficacy of integrating pharmacists into the care of older adults with cancer to enhance medication management and vaccination administration. | Pilot randomised trial | 60 patients with breast, gastrointestinal, or lung cancer receiving first-line chemotherapy;  Aged ≥65 years. | Patients assigned to intervention met with pharmacist during treatment. Discrepant and potentially inappropriate medications recorded baseline and week 4. | Intervention patients had higher rates of vaccinations and fewer potentially inappropriate medications (not significant). Integrating pharmacists into the care of older adults with cancer is feasible with preliminary efficacy. |
| **O’Toole et al 2009**;  Hospital; USA | Assess perspectives of patients with advanced cancer as well as oncologists regarding PCP p involvement and shared care during advanced cancer treatment. | Secondary analysis of randomised controlled trial | 357 patients with Stage IV cancer or stage III lung, liver or pancreatic cancer;  39 oncologists;  Aged 40-88 years. | Oncologists and patients interviewed re: perspectives on PCP involvement in advanced cancer care. 2 age groups (<65 years and ≥65 years) to evaluate age-related perspectives. | Greater PCP involvement associated with greater patient satisfaction with involvement.  Implications for mechanisms of shared care. |
| **Puts et al 2018;**  Hospital; Canada | Assess ability of GAMq to identify current health issues and recommend interventions to optimise well-being of older adults. | Two-group parallel single-blinded randomized phase II trial | 61 patients with stage II–IV gastrointestinal, genitourinary, or breast cancer;  Aged ≥70 years. | CGA carried out for intervention group. Feasibility outcomes evaluated plus clinical outcomes: QoL and modification of cancer treatment. | Feasible to recruit and retain older adults for a GAM study. Those who survived at least 6 months seemed to receive a greater QoL benefit than those who died or withdrew. |
| **Rao et al 2005**;  Hospital; USA | Assess impact of geriatric evaluation and management units on care of the elderly cancer patient. | Secondary analysis of randomised controlled trial | 99 hospitalised, frail patients with cancer after stabilization of acute illness;  Aged ≥65 years. | Randomised to receive care in a geriatric inpatient unit, a geriatric outpatient clinic, both, or neither. Interventions involved core teams that provided geriatric assessment and patient management. | Suggest that inpatient units may be effective in management of pain and psychological status in elderly cancer inpatient (no greater length of stay or cost). |
| **Rigdon 2009**;  Outpatient clinic; USA | Review of chemotherapy patient education and pilot study educational materials for teaching basic chemotherapy safety practices. | Pilot study, survey design | 21 patients having chemotherapy;  Aged > 65 years. | Educational materials for teaching older adults used with older adults receiving first doses of chemotherapy Feedback gathered from patients and nurses. | Overall positive feedback. Teaching materials adopted and being used for patients of all ages. |
| **Rose et al 2008** | Describe key components of CSSr intervention including intervention strategies used and role of CSS practitioner. | Service development and preliminary results from randomised controlled trial | Age comparison from preliminary trial data: 82 middle-aged (40-60 years) and 79 young-old patients (61-80 years)  Stage IV (or stage III lung and pancreatic) cancer patients. | CSS practitioner addressed issues and assisted with developing strategies including supportive listening, education, problem solving, validation, case navigation, behavioural strategies, web-based guidance, and referrals. | Older patients similar to middle-aged patients in level of engagement, problems faced and strategies used. |
| **Rouge-Bugat et al 2013**;  University Hospital; France | Creation of an oncogeriatric consulting team to carry out GA at the bedside of hospitalised patients.  Article is analysis of the impact of the GA on the final cancer treatment decision. | Retrospective cohort study | 107 patients with cancer;  Median age 81 years. | Standard assessment and GA carried out. Team gave opinion on compatibility of cancer treatment proposed by oncologist and the patient’s gerontological status. Where there were differences, recorded whether final decision changed or unchanged. | Conclude that GA of hospitalised older patients by an oncologic consulting team feasible. Suggest geriatrician recommendations more likely to be followed when less aggressive treatment proposed as an alternative. |
| **Roulston et al 2012**;  Hospice outpatient clinic; Northern Ireland, UK | Explore expectations, experiences, anxiety and depression status and QoL of patients with lung cancer who attended Breathing Space clinic. | Mixed methods pilot study with prospective panel survey design. | 5 patients with lung cancer or mesothelioma;  Participant age range: 66-87 years. | ‘Breathing Space’: weekly hospice-based outpatient clinic aiming to enhance independence and QoL of people with lung cancer or mesothelioma and to support primary informal care giver. | Anxiety and EQ-VAS scores improved for all patients, depression scores improved for 4/5 patients. Qualitative data suggested psychosocial benefits to attending clinic. |
| **Sajid et al 2016**;  Home; USA | Assess feasibility and collect preliminary data on possible impact of a home-based walking and resistance intervention and a comparable program in older men with prostate cancer. | 3-arm randomised pilot study. | 19 men with prostate cancer on androgen deprivation therapy;  Aged ≥ 65 years. | Patients randomised to: 1) multi-component, home-based aerobic exercise; 2) multi-component, technology mediated programme; 3) usual care. Assessments conducted at baseline, post-intervention and follow up. | Conclude that home-based aerobic and resistance exercise program shows promise for improving physical performance for older men with prostate cancer on androgen deprivation therapy. |
| **Sakaguchi and Okamura 2015**;  Home/ rehabilitation hospital/ outpatient clinic; Japan | Examine narrative of cancer patients that emerged from life review involving the production of a collage; assess effectiveness in relation to psychosocial and spiritual aspect of their lives. | Quasi-experimental cohort study. | 11 cancer patients in receipt of palliative care;  Aged ≥ 65 years. | Collage activity based on life review. | Conclude that collage may be effective in improving spiritual well-being, mitigating anxiety and depression and improving self-efficacy. |
| **Schiphorst et al 2015**;  Hospital; Netherlands | Establish the value of a geriatric assessment in oncological decision-making. | Prospective observational cohort study | 72 cancer patients;  Median age 82 years. | Geriatric evaluations performed by geriatrician. Oncological treatment options formulated by oncologist. Geriatrician then proposed adaptation of treatment if required, based on patient’s ability to tolerate treatment (and proposed interventions for pre-treatment optimisation). | Conclude that analysis shows that implementation of geriatric oncology program is of great value to optimisation of elderly cancer patients and reducing their risk of over/ under treatment. |
| **Schmidt et al 2017**;  Hospital; Germany | Evaluate multi-component intervention comprising CGA, assessment of HRQoL and telephone-based nurse-led aftercare to facilitate trans-sectoral supportive care, with overall aim of maintaining HRQoL and functioning of older patients with cancer. | Pre-test/post-test multicentre pilot study | 100 patients with cancer, at least 1 comorbidity and/or functional impairment;  Aged ≥ 70 years. | CGA carried out, plus telephone-based nurse-led aftercare. Evaluation at admission and 6 month follow up. | Conclude results show feasibility and potential benefit of combining CGA and HRQoL to complement standard assessments. Suggest patient-reported symptoms and functioning indicate need for intensified supportive therapy during aftercare. |
| **Shuman et al 2013**;  Hospital; USA | Implementation and feasibility of a novel intervention to improve perioperative care in geriatric head and neck surgery. | Cohort study (prospective). Single-centre pilot study. | 168 surgical patients with head and neck cancer;  Aged > 75 years. | Perioperative consultation with geriatrician. For patients who went on the have surgery, seen by geriatricians as inpatients in addition to usual post-operative care. Some patients also seen in geriatric clinic after discharge. | Conclude that geriatric perioperative support for elderly head and neck cancer patients well-received with promising potential. |
| **Wang et al 2012;**  Hospital; China | Evaluate the efficacy and safety of fast-track rehabilitation in elderly patients following laparoscopic surgery to remove colorectal cancer. | Randomized controlled trial | 78 patients with colorectal cancer requiring laparoscopic colorectal resection;  Aged > 65 years. | Patients randomly assigned to either fast-track care programme or conventional perioperative care programme. | Conclude that the fast-track recovery programme resulted in a more rapid postoperative recovery, earlier discharge from hospital and fewer general complications. |
| **Whitman et al 2018;** | Compare 3 geriatric medication screening tools to Beers Criteria alone for potentially inappropriate medication quantification; to determine feasibility of a pharmacist-led polypharmacy assessment in a geriatric oncology clinic. | Prospective cohort study | 26 patients with cancer;  Aged ≥ 65 years. | CGA carried out. Polypharmacy assessment included a review of all drug therapies. Potentially inappropriate medications were screened. Deprescribing occurred after discussion with the pharmacist, geriatric oncologist, patient, and caregiver. | Mean of 3 medications deprescribed per patient. Approximately two thirds of patients reported a reduction in symptoms. Pharmacist-led interventions are feasible and may lead to improved patient outcomes and cost savings. |
| **Xue et al 2015**;  Hospital; China | Observe symptom improvement and clinical benefit in elderly patients with advanced NSCLC stratified on the basis of CGA findings after treatment with combination of traditional Chinese medicine and Western medicine. | Non-randomised controlled trial | 24 patients with advanced NSCLC (+ 9 controls);  Aged ≥ 65 years. | Patients receiving standardised or individualised care treated with or without traditional Chinese medicine for symptom control. For all those receiving best supportive care, traditional Chinese medicine administered. Symptoms before and after treatment assessed. | Conclude that traditional Chinese medicine may be beneficial to symptom control in functionally dependent patients. Further investigation needed for functionally independent and mildly functionally impaired patients. |
| **Yeoh et al 2012**;  Hospital (cancer centre); Singapore | 1) Identify common DRPs among cancer patients; 2) determine effectiveness of MTMt; 3) determine clinical significance of pharmacist interventions; 4) determine patient satisfaction. | Prospective cohort study | 118 cancer patients receiving chemotherapy;  Aged ≥ 65 years. | MTM included comprehensive medical review, formulating medication treatment plan, verbal education and training. Any DRP detected recorded and steps taken to resolve. Pre and post service patient satisfaction surveys. | Suggest MTM is an important service to identify and resolve DRP among elderly cancer patients. |

**Conflict of Interest**

All authors declare no conflict of interest.

**Ethical statement**

This manuscript has not been published elsewhere.

**Authorship**

Conception and Design: NF, AR, JB;

Data Collection: NF;

Analysis and Interpretation of Data: NF, AR, JB;

Manuscript writing: NF, AR, JB;

Approval of Final Article: NF, AR, JB

All named authors have given final approval of the version to be published; and have agreed to be accountable for all aspects of the work.

**Funding Statement**

This is independent research supported by the National Institute for Health Research (**HEE/NIHR ICA Programme Clinical Lectureship, Dr Naomi Farrington, ICA-CL-2015-01-003**). The views expressed in this publication are those of the authors and not necessarily those of the NHS, the National Institute for Health Research, or the Department of Health.

**Acknowledgements**

The authors would like to thank Paula Sands of the Health Services Library, University Hospital Southampton NHS Foundation Trust for assistance with the development of the search strategy used in this review. In addition, NF would like to thank the NIHR for funding support.

**Table 1. Inclusion & Exclusion Criteria**

|  |  |  |
| --- | --- | --- |
|  | **INCLUDE papers reporting on:** | **EXCLUDE papers reporting on:** |
| **POPULATION** | * Older adultsa with cancer having chemotherapy or other SACTb, radiotherapy, surgery (or combination). | * Patients with non-melanoma skin cancers (unique treatment profile compared with other types of cancer). |
| **INTERVENTION** | * Treatment support interventions (services, programs, tools, policies) that: * Occur during diagnosis or treatment; * Address the needs (physical, psychological, social, spiritual) of older patients undergoing cancer treatment. | * Pharmacological/treatment-specific interventions; * Interventions focusing on survivorship or end of life (patient needs likely to be different); * Recommendations with no intervention. |
| Papers reporting on Geriatric Assessment included if the focus is on using Geriatric Assessment as an intervention to address needs. | Papers reporting on Geriatric Assessment not included if the focus is:   * Validity/reliability/feasibility; * Problem identification alone; * Prediction of outcomes. |
| **PAPER TYPE** | * Quantitative and qualitative. * Randomised controlled trials, cohort studies, cross-sectional studies. | * Editorial or commentary; study protocol; abstract only; letter; news or magazine article, review article. |

a Papers where ‘older’ people were included even if an age limit was not stated, allowing inclusion of papers where older adults formed a cohort within a larger sample.

b Systemic anti-cancer therapy.

**Figure 1. PRISMA Flow Diagram: Review Process**

Records identified through database searching August-October 2017 (**n = 20,627**)  
(n = CINAHL = 10,278; AMED = 111; PsychInfo = 3,236; MEDLINE = 4,878; EMBASE = 2,124)

## Screening

## Included

## Eligibility

## Identification

Additional records identified through other sources (**n = 9**)

Records after titles screened (**n= 791**) (n = CINAHL = 315; AMED = 7; PsychInfo = 37; MEDLINE = 161; EMBASE = 262; reference lists = 8) &

Records after duplicates removed (**n = 679**)

Records screened  
(n = **679**)

Records excluded  
(n = **603**)

Full-text papers assessed for eligibility  
(**n = 76**)

Full-text papers excluded, with reasons\*  
(**n = 23**)

Total papers included in qualitative synthesis  
(**n = 62**)

Papers identified in March 2019 repeat search   
(**n = 6**)

Additional records identified through other sources (**n=3)**

Total excluded at abstract (**603**) or full-text (**23**) stage: **626**

Reasons for exclusion:

* *Record type*: **81** (editorial or commentary; study protocol; abstract only; letter; news or magazine article; review article)
* *Topic focus not relevant*: **544** (end of life care focus; no older participants; no intervention)
* *Other:* **1** (article retracted due to plagiarised material)

**Table 2. Types of Interventions.**

|  |  |  |
| --- | --- | --- |
| **Papers (N=62)** | **Intervention** | **N** |
| Alibhai et al 2018, Aparicio et al 2011, Baitar et al 2015, Barthelemy et al 2011, Boulahssass et al 2019, *Caillet et al 2011*, *Canoui-Poitrine et al 2016,* Chaibi et al 2011, Corre et al 2016, Decoster et al 2013, Extermann et al 2004, Girre et al 2008, Horgan et al 2012, Hurria et al 2007, Indrakusuma et al 2015, Kalsi et al 2015, Kenis et al 2013, Kenis et al 2018, Magnuson et al 2018, Marenco et al 2008, McCleary et al 2013, Puts et al 2018, Rouge-Bugat et al 2013, Schiphorst et al 2015 | Geriatric assessment | 24 |
| Klemm et al 2013, Kornblith et al 2006, Lynch et al 2010, Rose et al 2008, Schmidt et al 2017 | Telephone monitoring or support | 5 |
| Dronkers et al 2010, Klepin et al 2011, Sajid et al 2016 | Exercise | 3 |
| Flood et al 2006, Garman et al 2004, Rao et al 2005 | Inpatient unit | 3 |
| Chapman et al 2014, Korc-Grodzicki et al 2017, Kuzmarov & Ferrante 2011, Lynch et al 2007 | Geriatric oncology service | 4 |
| Nipp et al 2012, Shuman et al 2013 | Specialist consultation | 2 |
| Clotfelter 1999, Rigdon 2009 | Education | 2 |
| *Goodwin et al 2003, Jennings-Sanders & Anderson 2003, Jennings-Sanders et al 2005* | Nurse case manager | 3 |
| Wang et al 2011 | Fast track recovery | 1 |
| Fann et al 2009 | Collaborative care | 1 |
| Sakaguchi & Okamura 2015 | Collage activity and life review | 1 |
| Roulston et al 2012 | Outpatient clinic | 1 |
| *Hempenius et al 2013, Hempenius et al 2016* | Geriatric liaison | 2 |
| Lapid et al 2007 | Quality of life intervention | 1 |
| Mantovani et al 1996 | Psychotherapy & social support | 1 |
| *McCorkle et al 1998, McCorkle et al 2000* | Home-based nursing | 2 |
| Loh et al 2018 | Home-based app |  |
| O’Toole 2009 | Primary care physician | 1 |
| Xue et al 2015 | Complementary therapy | 1 |
| Nipp et al 2018, Whitman et al 2018, Yeoh et al 2012 | Medications management | 3 |
| *Italics denote papers from the same study* | Total | 62 |

**Table 3. Patient Population by Cancer, Treatment and Age**

* *Gastrointestinal (5)*
* *Breast (5)*
* *Lung (3)*
* *Prostate (1)*
* *Head & neck (1)*
* *Acute Myeloid Leukaemia (1)*

|  |  |  |
| --- | --- | --- |
|  | **Patient Population** | **Studies (N=62)** |
| **Cancer Type** | Specific cancer type | 16 |
| Multiple cancer types | 40 |
| Cancer type not specified | 6 |
| **Cancer Stage** | Advanced | 9 |
| Early stage | 2 |
| Multiple | 27 |
| Cancer stage not specified | 24 |
| **Treatment Type** | Chemotherapy or other SACT a | 15 |
| Hormone | 1 |
| Radiotherapy | 1 |
| Surgery | 8 |
| Multiple | 13 |
| Treatment type not specified | 24 |
| **Age Range** | ≥40 years | 1 |
| ≥50 years | 1 |
| ≥ 60 years | 6 |
| ≥ 65 years | 23 |
| ≥ 70 years | 20 |
| ≥ 75 years | 4 |
| Other (‘Older’ or ‘elderly’) | 7 |

a SACT: Systemic Anti-cancer treatment

**Table 4. Study design**

|  |  |
| --- | --- |
| **Design Type** | **N (62)** |
| Randomised trial | 22 |
| Cohort study (prospective) | 29 |
| Cohort study (retrospective) | 5 |
| Service development | 6 |

**Table 5. Outcome of interest**

|  |  |  |
| --- | --- | --- |
| **Outcomes type** |  | **N (62)** |
| ***Process measures*** | **Oncological treatment decision alterations** | 11 |
| **Clinical action recommended/ implemented** | 6 |
| **Feasibility measures** | 2 |
| ***Outcome measures*** | **Toxicities/complications/mortality/survival** | 9 |
| **Symptom improvement** | 5 |
| **Quality of life/wellbeing** | 5 |
| **Functional ability/dependence** | 5 |
| **Perceptions of care** | 2 |
| ***Other*** | | 6 |
| ***Descriptive measures*** | | 8 |
| ***None stated*** | | 3 |

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