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Taking care of our own: A narrative review of cancer care services-led models of care providing emergent care to patients with cancer

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ABSTRACT

Purpose: To synthesise available evidence on cancer care services-led models of care in the acute care setting that aim to reduce emergency presentations and/or hospital admissions for patients with cancer.
Methods: A narrative review of studies describing models of care for patients with cancer and emergent healthcare needs was undertaken. Four databases were searched using keywords to identify primary research or quality improvement articles published between January 2005–June 2017.
Results: After a systematic search, 22 studies were included in the review. The methodological quality of the included studies was poor when assessed using the Mixed Methods Appraisal Tool. Most studies were retrospective and set in a single centre. The overarching outcomes associated with the most commonly described models of care (telephone advice services and/or unplanned care and assessment units) were improved coordination of care/continuity of care, prompt access to specialist care, reduced utilisation of emergency departments, fewer hospital admissions and reduced cost. At the time of this review, evaluation of Nurse Practitioner-led services and acute oncology services had been limited.
Conclusions: Findings indicate several models of care reduce emergency presentations and/or hospitalisations for those living with cancer and improve patient outcomes. What remains unclear is which underlying mechanisms reduce emergency presentations and/or hospitalisations for patients with cancer and whether successful models of care are uniquely suited to specific contexts of care or applicable across different healthcare settings. More research is needed to assist healthcare services to develop and evaluate models of care to address the emergent needs of people with cancer.

1. Introduction

The number of people diagnosed with cancer each year is projected to rise to 23.6 million cases worldwide by 2030; an increase of 68% from 2012 (Bray et al., 2013). People with cancer often develop new and acute problems, caused by cancer or its treatment, which require an urgent response (Royal College of Physicians and Royal College of Radiologists, 2012). Relatively few studies have examined the overall number of emergency presentations by cancer patients, however some single-site studies report 43–96.2% of cancer patients present to emergency departments (EDs) at least once per year (Mayer et al., 2011; Sadik et al., 2014; Swenson et al., 1995). This places a considerable burden on acute care services and hospital budgets (Courtney et al., 2007; Navani, 2014).

The management of acutely unwell patients with cancer in the ED is often complex, due to several factors. Increasing service demands and overcrowding of EDs can lead to significant delays in providing care to people with cancer (Derlet, 2002; Forero et al., 2010; Gabriel, 2012; Lowthian et al., 2010; Weiland et al., 2015). Such circumstances can be distressing and exhausting for patients and their families and may pose a serious risk to patient safety, as patients wait for prolonged periods of time to be examined, receive treatment and/or be admitted to hospital (Barbera et al., 2010; Courtney et al., 2007; Hwang et al., 2008; Livingston et al., 2012; Nirenberg et al., 2004; Rowe et al., 2006). A visit to the emergency department can also cause unnecessary suffering for patients with cancer and their family, as they find themselves in an

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unexpected situation, receiving care in an unfamiliar environment from health professionals who were not previously involved in their case and who may not be familiar with how best to manage and explain cancer-related matters to patients, families and the healthcare team (Royal College of Physicians and Royal College of Radiologists, 2012; Weiland et al., 2015).

Patients experiencing side-effects of anti-cancer treatments or disease-related complications require specialist care from a range of healthcare professionals (Navani, 2014; Royal College of Physicians and Royal College of Radiologists, 2012). However, the lack of experience of medical teams in managing cancer or treatment-related complications, combined with insufficient communication between oncologists and admitting teams can lead to difficulties making timely and appropriate decisions in the ED setting (Mort & MRCGP, 2008; Navani, 2014). In some cases, these difficulties can negatively impact on the experiences of patients and carers and/or lead to unplanned and avoidable hospital admissions (Mort & MRCGP, 2008; Navani, 2014; Royal College of Physicians and Royal College of Radiologists, 2012).

Innovative models of care (MoCs) are required to respond to these issues effectively (Royal College of Physicians and Royal College of Radiologists, 2012; Weiland et al., 2015). Internationally, increasing attention has been given to establishing MoCs that address deficiencies in the management of emergency presentations of people with cancer, with a focus on improving care delivery and the patient experience (Navani, 2014; Royal College of Physicians and Royal College of Radiologists, 2012). A wide range of models have been described, including: unplanned care and assessment units; telephone advice services; Nurse Practitioner (NP) -led models, oncologist-led or nurse-led MoCs in emergency or oncology departments; acute oncology services; supportive care services and mixed MoCs. One published rapid review examined the factors associated with the avoidable use of EDs by cancer patients and the effectiveness of interventions to reduce or prevent unscheduled presentations by cancer patients (White et al., 2013). The review included papers, grey literature and abstracts published during 2000–2012 and evaluated two MoCs only (a primary community-based intervention and acute oncology units) based on the findings of a randomised control trial, conference abstract and newsletter article (White et al., 2013). The review describes several ongoing studies and models of care that had not been formally evaluated at the time of the review. Due to the paucity of research and limitations of available studies, the authors concluded that there was insufficient evidence to make definitive recommendations. An updated global review with a broader scope is needed to describe and evaluate all published evidence on existing and emerging cancer care services-led MoCs that aim to reduce emergency presentations and admissions for patients with cancer.

2. Rationale for this review

This review provides healthcare services with a summary of current evidence on the efficacy of cancer care services-led MoCs to inform service planning and delivery.

3. Aims

The aim of this review was to synthesise the available evidence on cancer care services-led MoCs primarily focused on preventing or reducing unplanned emergency presentations and/or hospital admissions for patients living with cancer.

4. Methods

A narrative review was undertaken to evaluate the outcomes associated with cancer care services-led MoCs in the acute care setting for patients with a cancer diagnosis who had emergent healthcare needs. This review was developed using *a priori* inclusion criteria following Green et al. (2006) narrative review methodology.

5. Inclusion criteria

- Studies that described and/or evaluated cancer care services-led MoCs that primarily aimed to prevent or reduce unplanned admissions and/or presentations by cancer patients to EDs
- Quality improvement studies, qualitative and/or quantitative methods irrespective of research design
- Studies published between January 2005–June 2017
- Studies published in the English language
- Studies describing care provided to adults (≥18 years old) with cancer
- Studies conducted in the acute care setting and/or in a specialist cancer care centre

6. Exclusion criteria

- Letters to the editor, conference abstracts and grey literature
- Studies where aim/s of MoC were not explicitly reported

7. Key terms

For the purposes of this review, a “cancer care services-led model of care” was defined as an intervention led by cancer care services which primarily aimed to reduce presentations and/or hospital admissions of cancer patients via EDs. “Emergent care” referred to unplanned, additional care provided in response to a patient's evolving healthcare needs. “Telephone advice service” was broadly defined as the provision of healthcare advice by cancer nurses and/or physicians in response to oncology/haematology patients with emergent care needs. “Unplanned care and assessment unit” was defined as an out-patient unit staffed by medical oncologists, physicians, cancer nurses and/or administration staff who provided unscheduled or unplanned care to oncology/haematology patients (with or without admitting rights) with the goal of reducing ED presentations and hospital admissions. “Acute oncology services” were defined as a MoC that aims to improve the care of cancer patients with emergent healthcare needs by providing early access to specialist oncology input, rapid identification and prompt assessment of severe disease or treatment-related complications (e.g. acute oncology services can include oncologists, oncology nurse specialists, palliative care specialists and/or haematologists) (Navani, 2014; Pugh et al., 2015; Young et al., 2016). “Oncology medical homes” referred to standalone specialist cancer centres staffed by oncologists, physicians and nurses that provide services to support patient needs from diagnosis to survivorship in a community setting (Kuntz et al., 2014; Page et al., 2015; Sanghavi et al., 2015; Sprandio, 2010). To date, this model of care has only been described in the USA, where it has been designed to provide after-hours care and/or specialist care in conjunction with selected private oncology practices (Kuntz et al., 2014; Page et al., 2015; Sanghavi et al., 2015; Sprandio, 2010). Oncology medical home services include diagnostic imaging, lab services, telephone advice service, specialist treatment planning, care coordination, symptom management program, patient portal with educational materials, evidence-based standardised treatment pathways, chemotherapy administration, advance care planning and/or assistance with transition to palliative and hospice care where appropriate (Kuntz et al., 2014; Page et al., 2015; Sanghavi et al., 2015; Sprandio, 2010). Using customized software, oncology medical homes also function as a registry providing real-time reports on guideline adherence, quality measures, patient and family satisfaction, rates of emergency department presentations and admissions to inform service delivery (Kuntz et al., 2014; Sanghavi et al., 2015; Sprandio, 2010).

8. Literature search strategy

EMBASE, CINAHL, PubMed and The Cochrane Library were systematically searched for relevant research and quality improvement

Table 1
Terms used in search strategy.

(**cancer** OR myeloma OR haem* OR haem* OR lymphoma OR leukaemia OR oncolog* OR “advanced cancer” OR neoplasm* OR carcinom* OR tumo?r* OR malignan* OR "solid tumo?r*" OR neuroblastom* OR rhabdomyoscarcom* OR teratom* OR hepatom* OR hepatoblastom* OR medullobastom* OR retinoblastom* OR meningioma* OR gliom* OR "terminal cancer" OR "oncology nursing" OR "cancer care nursing" OR "cancer nursing") AND
(“**model of care**” OR Nurs* OR “Oncology nursing” OR “Cancer care nursing” OR “Cancer nursing” OR “Emergency bypass pathway*” OR “Alternative care pathway*” OR “Acute oncology unit*” OR “Acute oncology” OR “Oncology Acute Toxicity Unit*” OR “unplanned care and assessment unit” OR “Acute assessment area*” OR “Telephone helpline” OR “Telephone advice” OR “Telephone consultation” OR “Telephone triage” OR “telephone-linked care” OR “nurse-led models” OR “Nurse Practitioner” OR “acute oncology liaison” OR “acute oncology servic*” OR “case management” OR “neutropenic fevers”) AND
(**hospital** OR acute OR outpatient OR inpatient OR ward OR unit OR clinic OR “cancer centre” OR “cancer centre”) AND
(admit* OR **admission*** OR readmi* OR re-admit OR re-admission* transit* OR **present*** OR **"unplanned care"** OR “unplanned hospital admission” OR emergent OR “outpatient admission” OR “clinic admission” OR “DEM admission” OR "hospital avoidance" OR "avoidable admission" OR "unplanned admission" OR “avoidable hospitali*” OR “Admitting diagnosis” OR “preliminary diagnosis”) AND
(**"emergency department"** OR "department of emergency" OR "emergency" OR “accident and emergency” OR “emergency presentation” OR “DEM presentation”)

studies. Key search terms included: *cancer*, *model of care, hospital, admission, presentation, unplanned care* and *emergency department* (see Table 1). These search terms were combined with Medical Subject Headings to ensure all relevant articles were identified. Handsearching of reference lists of relevant papers ensured a thorough review of the literature was completed.

9. Results

9.1. Systematic search results

The search results were reported in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) (see Fig. 1) (Moher et al., 2009). Twenty-two studies were deemed relevant for inclusion.

9.2. Characteristics of included studies

Table 2 summarises the study characteristics and findings of the 22 included studies: five case studies (Cox et al., 2013; Preston-Jones, 2005; Sanghavi et al., 2015; Sprandio, 2010; Waters et al., 2015); five retrospective pre- and post-implementation studies (Antonuzzo et al., 2017; Kuntz et al., 2014; Leary and Baxter, 2014; Lipitz-Snyderman et al., 2015; Singh and Warnock, 2013); two retrospective chart reviews (Kuo et al., 2017; Mason et al., 2013); three short reports (Page et al., 2015; Putt and Jones, 2014; Sprandio, 2012); two observational cohort studies (Majem et al., 2007; Terzo et al., 2017); two surveys of oncology nurses, patients and families (Stacey et al., 2007, 2015); a MoC description (Feber, 2011); quasi-experimental pre- and post-implementation study (Brooks et al., 2016); and a clinical audit (Groves, 2005).

The methodological quality of studies in this review was poor when assessed using the Mixed Methods Appraisal Tool (MMAT) (Pluye et al., 2011). Most studies were retrospective and set in a single centre (n = 11) where results were dependent on the quality of documentation in patient records (Antonuzzo et al., 2017; Groves, 2005; Kuntz et al., 2014; Kuo et al., 2017; Leary and Baxter, 2014; Lipitz-Snyderman et al., 2015; Mason et al., 2013; Sanghavi et al., 2015; Singh and Warnock, 2013; Sprandio, 2010, 2012). All included studies were set in developed countries, although the MoC outcomes reported varied. The overarching outcomes associated with

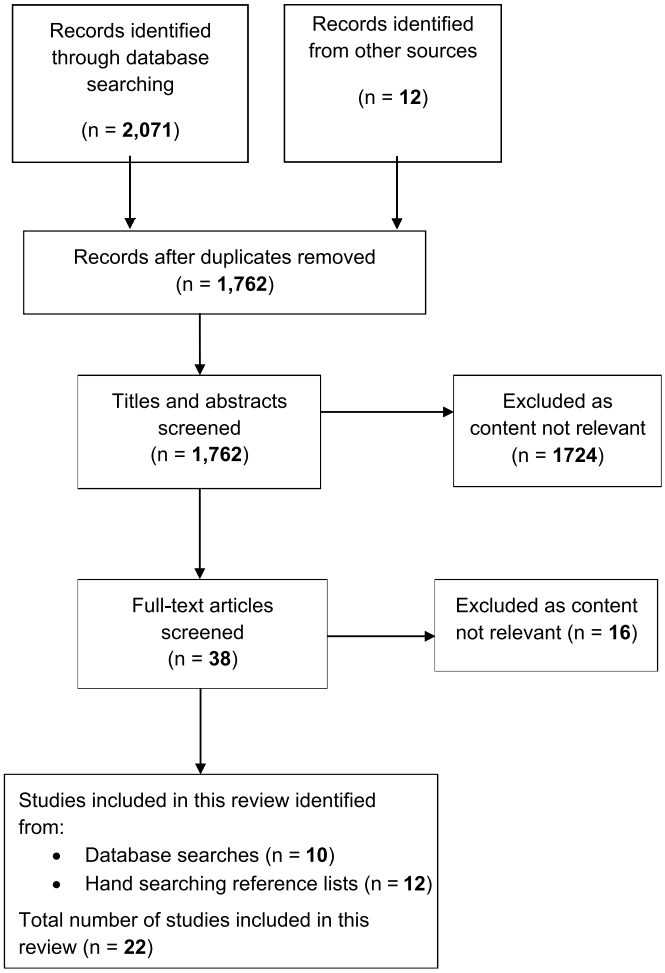

Fig. 1. Preferred reporting items for systematic reviews and meta-analyses flow diagram for inclusion of studies.

the most commonly described MoC (telephone advice services and/or unplanned care and assessment units) within the included studies were improved coordination of care/continuity of care (Groves, 2005; Preston-Jones, 2005; Sprandio, 2010; Stacey et al., 2007, 2015); prompt access to specialist care (Majem et al., 2007; Page et al., 2015; Preston-Jones, 2005; Sprandio, 2010; Stacey et al., 2015; Waters et al., 2015); reduced utilisation of EDs (Majem et al., 2007; Page et al., 2015; Sanghavi et al., 2015; Sprandio, 2010, 2012; Stacey et al., 2007; Waters et al., 2015); reduced hospital admissions (Lipitz-Snyderman et al., 2015), improved patient satisfaction (Majem et al., 2007; Page et al., 2015; Singh and Warnock, 2013; Stacey et al., 2015; Waters et al., 2015); and reduced cost (Kuntz et al., 2014; Page et al., 2015; Sprandio, 2010). Telephone advice services and/or unplanned care and assessment units achieved these outcomes by undertaking quality improvement benchmarking, evaluating patient, family and staff experiences and investing in resources, healthcare professional training, education and infrastructure to deliver data-driven care. These outcomes were defined and measured differently in each of the included studies, making it difficult to compare study results. Only three studies had described and/or evaluated the outcomes of NP-led services (Cox et al., 2013; Mason et al., 2013; Terzo et al., 2017) and two studies described acute oncology services (Feber, 2011; Putt and Jones, 2014).

9.3. Telephone advice services

Four studies (Groves, 2005; Singh and Warnock, 2013; Stacey et al., 2007, 2015) described telephone advice services exclusively, which aimed to provide prompt access to specialist advice and direction

Table 2
Summary of study characteristics.

Author (yr.) Country	Methods, Aim, Setting & Sample	MoC evaluated and outcome measures	Major Findings
Telephone advice services			
Groves (2005) UK	• Audit (two-week period) • To identify the amount and type of calls received by a chemotherapy telephone triage (TT) service, during business hours and after hours • Single rural centre, England, catchment area of over two million people • n = 178 calls to TT service	MoC: telephone advice service for chemotherapy-related toxicities. Service provided by registered nurses in day unit and in-patient chemotherapy ward. Operational hours: 24hrs per day, 7 days per week. Outcomes: utilisation of telephone advice service; number of calls; reasons for call.	During two-week audit period: • the in-patient ward received 50% (n = 42/85) of calls during after- hours; • the day unit received 84% (78/93) of calls during business hours. Future recommendations for service: • need to implement designated chemo TT nurse role to co- ordinate service during business hours on weekdays; • need to provide additional staffing during after-hours to manage TT calls; • provide all staff with training to manage chemotherapy-related TT calls; • author states that the implementation of post-audit changes has resulted in better coordination of care and continuity of care; • plan to develop Chemo Alert Card (details chemo) for patients to use when they become unwell.
Stacey et al. (2007) Canada	• Prospective descriptive survey • To explore and describe the characteristics of telephone- based nursing services provided through ambulatory oncology programs • Ambulatory oncology programs providing telephone advice services in Ontario • n = 39 ambulatory oncology programs	MoC: telephone advice service provided by cancer nurses. Three modes of delivery: primary nurses, centralised triage approach, mixed model. Operational hours: most programs provided services during office hours, Monday – Friday only. Outcomes: identify the type of telephone-based nursing service; types of services provided; identified areas for improvement.	Outcomes of telephone advice service: • avoided unnecessary hospital visits; • provided prompt follow-up call (within the day); • reinforced teaching and provided consistent information; • provided patients with sense of security; • nurse respondents perceived patients felt supported by their oncology team, less anxious and were satisfied with services; • enhanced continuity of care, between community providers and oncology team; • triaging of calls minimised unnecessary visits to physicians, emergency and prevented hospitalisations; • specialised expertise provided by certified oncology nurses.
Singh and Warnock (2013) UK	• Retrospective pre- and post-implementation study • To evaluate range and scope of the telephone advice service, use of revised telephone assessment tool and guidelines, and appropriateness of advice given by nurses providing service • Single centre, regional area, wide catchment area • n = 129 telephone assessment tools completed (October 2009); n = 291 telephone assessment tools completed (October 2010).	MoC: telephone advice service provided by designated oncology nurse. Operational hours: 24hrs per day, 7 days per week. Outcomes: utilisation of telephone advice service; reasons for call; call outcomes; appropriateness of advice given; compliance with telephone assessment tool and guidelines.	Outcomes of telephone advice service: • non-significant change to ED workload; • valuable service; • high call volume suggests patients find service useful; • most patients using the service received appropriate advice and support.
Stacey et al. (2015) Canada	• Descriptive survey of patient and family experiences with telephone advice service • To assess patient and family member experiences with telephone cancer treatment symptom support • 3 ambulatory cancer programs in Nova Scotia, Ontario and Quebec • n = 105 patients and family members who received telephone cancer treatment support	MoC: telephone advice service provided by nurses. Operational hours: weekdays during business hours only. Voicemail available during after-hours; messages followed up next business day. Outcomes: utilisation of telephone advice service; patient and family experiences with telephone advice service	Participants were satisfied with: • the way call was handled (91.5%); • comments included: pleased with the service in general; obtained a prompt response; provided access to a familiar nurse; access to physician on-call outside regular hours; and was a reliable service. Participants were dissatisfied with: • wait times before speaking to a nurse or physician (14.3%); • the way the initial phone call was handled (11.4%); • getting through on the telephone (10.5%); • treatment or advice given (8.6 %); • explanation given about problem (4.8%); • manner of the nurse or physician (3.8%); • comments were categorised as insufficient explanation of the problem; call not returned; long wait; inappropriate manner from staff; and partial messages transcribed by clerk.

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Table 2 (*continued*)

Author (yr.) Country	Methods, Aim, Setting & Sample	MoC evaluated and outcome measures	Major Findings
Unplanned care and assessment units			
Lipitz-Snyderman et al. (2015) USA	• Retrospective pre and post-implementation study • To assess the impact of an observation unit (OU) on hospital use for patients with cancer who presented to Urgent Care Centre (UCC) • The OU is a virtual unit, composed of 11 in-patient beds at a single academic healthcare centre • Non-surgical cancer patients who presented to the UCC over six- month period: pre- implementation (n = 10,186); post-implementation (n = 10,593).	MoC: OU within UCC staffed by midlevel providers and supervising attending physicians. OU aims to provide frequent re-assessment for patients with specific acute problems that can be evaluated, treated and/or monitored in out-patient setting. This unit aims to discharge patients within 24hrs of presentation and reduce unnecessary in-patient hospital admissions. Operational hours: 24hrs per day, 7-days-per-week, allocated 11 beds within UCC (ED of study site). Outcomes: proportion of UCC visits that resulted in admissions; length of OU stay; length of hospital stay; rate of re-admissions within 72hrs of hospital discharge; rate of presentations to UCC within 72hrs of UCC discharge.	After OU implementation: • fewer UCC visits resulted in hospital admissions ($p < 0.001$); • reduction of 28.8 admissions per 1,000 UCC visits post- implementation of OU; • there was no significant difference in the rate of re- admissions to hospital or repeat presentations to UCC within 72hrs of discharge; • during 6-month intervention period, 36% (n = 356/980) patients placed in OU were admitted to hospital; • most common reasons for OU placement – pain management, nausea & vomiting, fluid & electrolyte imbalance, dyspnoea and neurological concerns.
Acute oncology services			
Feber (2011) UK	• MoC description • To describe the development of a nurse consultant role in acute oncology • Single centre, district general hospital • Nil sample size reported	MoC: nurse consultant providing acute oncology services:(i) TT, (ii) assessment by nurse consultant in chemotherapy unit, (iii) support to in- patient nursing and medical teams, (iv) additional clinical activities, such as central line insertion and chemotherapy delivery, (v) metastatic spinal cord compression coordinator role. Operational hours: full-time position, no weekend cover. Outcomes – planned for future evaluation: comparison of effectiveness, economic analysis and feasibility of nurse consultant-led VS oncologist-led service; effectiveness of TT in reducing ED admissions and presentations	• author states new MoC has been received positively; • author states nurse consultant- led MoC provides good value for money, when compared to oncologist-led model. No economic evaluation provided.
Putt and Jones (2014) UK	• Short report • To describe the role and skills of specialist acute oncology nurses • Four acute oncology services in hospitals across UK • Nil sample size reported	MoC: Acute Oncology Service MoC differs based on local needs and whether an ED or acute assessment unit is present. It may include any or all of following components: (i) dedicated acute oncology assessment areas; (ii) acute oncology nurse providing; (iii) TT; (iv) initial assessment of patients with oncological or haematological conditions in ED; (v) pager alert system notifies specialist acute oncology nurse of ED presentations; (vi) in-patient follow up, monitoring and review for patients with cancer; (vii) teaching and skills development for other healthcare professionals about providing acute oncology care. Operational hours: operational hours not reported.	• by introducing a dedicated acute oncology assessment area, the University Hospital of North Staffordshire avoided patient admissions, reduced length of stay and improved overall satisfaction for patients with cancer attending the ED; • nurse-consultant led acute oncology service at Harrogate District Hospital is considered good value for money when compared to oncologist-led model.

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Table 2 (*continued*)

Author (yr.) Country	Methods, Aim, Setting & Sample	MoC evaluated and outcome measures	Major Findings
		Outcomes: no outcome measures were reported.	
Medical oncologist embedded in ED			
Brooks et al. (2016) USA	• Quasi-experimental pre-implementation/post- implementation study • To pilot test an intervention (medical oncologist embedded in ED) to reduce hospital admission rate among cancer patients presenting to ED • Single site, tertiary care hospital • Eligible patients with solid tumours presenting to ED: pre- implementation: (n = 390); post- implementation (n = 418).	MoC: medical oncologist embedded in ED. Operational hours: medical oncologist in ED, 5–11pm, 6-nights per week (Sunday – Friday) for 5- week period only. Intervention facilitators: 6 board-certified or board-eligible medical oncologists delivered intervention. Outcomes: rate of ED presentations; rate of ED admissions; proportion of patients who were hospitalised within 2 days of ED presentation; proportion of patients who received additional acute care within 5 days of ED presentation; ED length of stay; hospital length of stay.	• the intervention of a medical oncologist embedded in ED during evening hours did not significantly reduce hospital admissions ($p = 0.62$); • no change in the proportion of patients who received additional acute care within 5 days of ED presentation (pre-implementation = 21% vs post-implementation = 23%; $p = 0.65$); • study limitations included lack of evaluation of staff and patient satisfaction with introduction of new MoC, limited evaluation period, intervention design limited time medical oncologist support was available and further time was needed to evaluate modified interventions that may aid the integration of medical oncologists into workflow of ED.
Proactive case management by clinical nurse specialists			
Leary and Baxter (2014) UK	• Retrospective pre and post-implementation study using workload analysis and needs analysis • This study aimed to: (i) to assess how the lung Clinical Nurse Specialist (CNS) role was performing against national standards in lung cancer and supportive care; (ii) to measure whether the re-designed lung cancer CNS role resulted in fewer hospital admissions for symptom control in lung cancer patients with progressive disease. • Single site • Adult lung cancer patients admitted over six-month period: n = 69	MoC: pre-implementation: lung cancer CNS (n = 2) provide support to patients with lung cancer, report on diagnosis and treatment targets and fulfil non-clinical administration responsibilities. Post-implementation: lung CNS worked towards providing proactive case management to meet current and future healthcare needs of lung cancer patients. Operational hours: full-time positions, no weekend cover. Outcomes: • lung cancer patients: rate of ED admissions; reason for admission; length of stay; • lung cancer CNS: workload analysis; estimate cost savings.	By re-designing the lung cancer CNS role, nurses were able to engage in proactive case management - providing symptom management, psychosocial interventions, end-of-life care and engaging in shared management approaches with other services in community setting. Proactive case management model: • reduced avoidable ED admissions per month (pre = 4 per month; post = 0.3 per month); • fewer ED admissions for non- acute issues: symptom control and end-of-life care; • based on previous admission rates, proactive case management resulted in 33 less admissions over 9 months, saving an average of 198 bed days. This represents a total saving of 66500 pounds per year, based only on number of admissions avoided.
Nurse-led assessment units			
Cox et al. (2013) Australia	• Case study (description only) • This study evaluates the oncology NP role in a chemotherapy unit • Single centre, major metropolitan public hospital • Unscheduled presentations of cancer patients (n = 87) to chemotherapy unit during July–December 2011	MoC: NP-led supportive care management in oncology out-patient setting. Aims to provide: (i) telephone advice service, (ii) more timely and effective specialist care, (iii) reduce unscheduled presentations to oncology clinics and ED. Operational hours: not reported. Outcomes: number of presentations to NP; type of presentation; presenting problem; number of hospital admissions; whether medical advice was sought; time spent providing care; second review required in 7 days; admitted within 7 days.	• most presentations to NP (n = 52, 60%) did not require hospital admission; • most presenting problems were moderate or severe (n = 73, 84%) and yet NP only sought medical advice on 30% of occasions of service.
Mason et al. (2013) USA	• Retrospective chart review • To determine whether improved monitoring through close follow- up with a NP could enhance treatment compliance and decrease frequency of hospitalisations • Single centre, National Cancer Institute-designed centre • 45–65yrs old patients with stage III or IV head and neck cancer receiving chemoradiotherapy: pre-implementation (n = 50); post-implementation (n = 51)	MoC: weekly NP-led symptom management clinic for patients with oropharyngeal cancer receiving chemoradiotherapy. Clinic staffed by NPs, registered nurses and medical assistants. Operational hours: not stated. Outcomes: rate of hospitalisation, chemotherapy dose deviations and chemotherapy treatment completion.	• post-implementation of NP-led clinic, there were lower rates of: - hospitalisation for toxicity (16% reduction; $p = 0.05$); - chemotherapy dose reductions (42% reduction; $p < 0.001$). • after the clinic was implemented, there was also a 44% increase in number of patients who completed chemotherapy treatment ($p < 0.001$); • patients who attended the NP- led clinic reported nausea, vomiting, mucositis and pain less frequently than those who received standard care.

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Table 2 (*continued*)

Author (yr.) Country	Methods, Aim, Setting & Sample	MoC evaluated and outcome measures	Major Findings
Terzo et al. (2017) USA	• Longitudinal observational cohort study • To evaluate whether a nurse/NP- led symptom management clinic for patients with head and neck cancer would reduce ED presentations and unplanned hospital admissions • Single site • High risk patients for an unscheduled ED presentation or admission: n = 49	MoC: weekly nurse/NP-led symptom management clinic for patients with head and neck cancer receiving radiation therapy, classified high risk for an unplanned ED presentation or admission. Clinic staffed by oncology-certified registered nurses and NPs. Patients were not billed for the NP reviews. The symptom management NP-led clinic was an extra weekly clinical review two days before or after the weekly physician clinical review. Operational hours: Monday – Friday only, (hours not listed). Outcomes: rate of ED presentations; rate of ED admissions during radiation treatment or within 90 days post-treatment.	• it is estimated this MoC prevented six ED presentations and four unplanned hospital admissions, which equates to USD $176, 848 cost savings; • there was a non-significant change (p = 0.1) in ED presentation rates for high risk head and neck cancer patients before (n = 16/81, 20%) and after (n = 10/69, 14%) the introduction of symptom management clinic; • no significant changes occurred in rate of unplanned hospital admissions after intervention, when compared to historic data (p = 0.3); • only 56% of eligible head and neck cancer patients were compliant with attending the symptom management clinic weekly.
Supportive care service for cancer out-patients			
Antonuzzo et al. (2017) Italy	• Retrospective pre and post-implementation study • To evaluate whether a supportive care service for cancer out- patients reduced the number of hospitalisations and presentations to ED • Single site, tertiary referral centre • Patients accessing day hospital services for anticancer therapy over two-year period: pre- implementation (n = 1275); post- implementation (n = 1358).	MoC: supportive care service for cancer out-patients. Service provided by medical oncologists, nurses, psychologist and spiritual assistant. Operational hours: Monday – Saturday (hours not listed). Outcomes: rate of unplanned hospitalisations, rate of ED presentations, rate of ED admissions, length of stay, cost of hospitalisations.	• post-implementation of supportive care service: - number of unplanned admissions reduced by 3.2%; - number of ED presentations reduced by 5%; - length of stay reduced by 15.1%; - cost of hospitalisations reduced by 2.2%. • these outcomes were achieved despite a 6.5% increase in number of presentations to the centre, between 2011 and 2012; • review data also indicated that the introduction of a supportive care service influenced the reason for hospitalisation from 2011 to 2012. After the introduction of this service, admissions for palliative support, pulmonary, vascular and cardiac complications were less frequent. However, there was an increase in the number of hospitalisations due to surgical complications.
Mixed MoCs			
Preston-Jones (2005) UK	• Case study • To describe an oncology triage system in Wales • Single centre, rural area • Nil sample size reported. Catchment area of 650,000 people.	MoC: telephone advice service Unplanned care and assessment unit. Staffed by triage nurse and nurses in day oncology unit. Operational hours: not listed. Outcomes: coordination/continuity of care; patient safety; access to specialist care.	Outcomes of MoC: • triage nurse can provide uninterrupted care to patient on unit; • creates a safer working environment (nurses delivering chemo not interrupted); • allows for more effective/efficient side effect assessments; • emergency reviews attended earlier; • treatment commenced earlier on unit; • easily accessible service provided to patients over-the- phone.
Majem et al. (2007) Spain	• Observational cohort study • To provide an outpatient facility to improve management of chemotherapy toxicity in cancer patients. • Single cancer-referral centre, catchment area of 1,100,000 residents. • Sample: n = 2007 patient contacts to Oncology Acute Toxicity Unit (OATU); made by 1126 patients.	MoC: telephone advice service (for management of chemotherapy- related toxicities) and unplanned care and assessment unit (OATU). Combined services provided by medical oncologist and nurses. Operational hours: Monday – Friday, 8am – 5pm. Chemotherapy toxicities: fever, bleeding, mucositis, uncontrolled emesis or diarrhoea, allergic reactions and extravasation. Outcomes: utilisation of telephone advice service; call outcomes; patient and family experiences; impact on workload of ED; access to specialist care; staff experiences; identified areas for improvement.	Effectiveness of telephone advice service: • 48% cases resolved over the phone; • 52% required OATU consultation; • of patients who presented to OATU, 40% were admitted; • OATU provides prompt access for medical oncology patients seeking management of their toxicities; • OATU optimises out-patient facilities and reduces unnecessary ED use. Other Outcomes: • helpline “valuable tool” to patients and families during chemotherapy treatment; • telephone advice ensures patient avoids unnecessary travel to ED without specialists; • beneficial to medical oncologists and ED; • out-patient specialist treatment is prompt; intervention is early and consequently reduces duration and severity of toxicity. Prevents subsequent complications (if issue were not addressed appropriately);

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Table 2 (*continued*)

Author (yr.) Country	Methods, Aim, Setting & Sample	MoC evaluated and outcome measures	Major Findings
			• OATU reduces interruptions to scheduled clinic appointments; • reduces ED congestion; • OATU "enthusiastically accepted" by patients and families.
Sprandio (2010) USA Note – conflict of interest: The author has an ownership interest in both the practice, CMOH, and Oncology Management Services Ltd.	• Case study • To describe services provided by oncology patient-centred medical homes (OPCMHs) and outcomes achieved since inception • Single centre, supports three healthcare systems in south- eastern Pennsylvania • Nil sample size reported	MoC: OPCMH is a physician-led MoC. OPCMHs assume primary responsibility for coordination of all cancer-related services from diagnosis to survivorship phase of care. OPCMH consists of telephone advice service (utilises customised symptom management algorithms), unplanned care and assessment unit, electronic medical records & information systems, registry functions, referral tracking and advanced electronic communications. Staffed by medical oncologists, physicians and nurses. Operational hours: not listed. Outcomes: call outcomes; OPCMH outcomes: measured impact on standardising care, payer collaboration, EMR data management & sharing practices, patient access to specialist care, communication & coordination of care.	OPCMH outcomes: • the current practice average is less than one ED visit per patient per year; • achieved a 16% reduction in overall hospital admissions in fiscal year 2009; • reduced number of dehydration- related and diarrhoea-related presentations; • reduced incidence of delayed post-treatment nausea and vomiting. Telephone advice service outcomes: • over 75% of calls to nurses resulted in the management of patient symptoms at home; • approximately 10% of calls resulted in an unscheduled office visit within 24 h; • less than 5% of calls resulted in ED evaluations.
Sprandio (2012) USA Note – conflict of interest: The author has an ownership interest in both the practice, CMOH, and Oncology Management Services Ltd.	• Short report • Evaluation of oncology patient- centred medical home MoC • Single centre, supports three healthcare systems in south- eastern Pennsylvania • Nil sample size reported	MoC: OPCMH consists of telephone advice service and unplanned care and assessment unit. Staffing details not listed. Operational hours: not listed. Outcomes: outcomes of oncology- patient centred medical home.	OPCMH outcomes: • lowered ED visits by 68%; hospital admissions per patient treated with chemotherapy per year by 51%; and the length of stay for admitted patients by 21%; • 22% reduction in out-patient visits per patient per year in the general haematology and oncology patient population; • 12% reduction in out-patient visits per patient per year in the chemotherapy subpopulation.
Kuntz et al. (2014) USA Note – conflict of interest: Some authors were compensated by ION Solutions© for their work.	• Retrospective pre- and post-implementation study • To evaluate the first-year results of the Michigan Oncology Medical Home Demonstration Project (MOMHDP) • Single oncology medical home, supporting four independent oncology practices • Patients receiving chemotherapy for cancer diagnosis at participating practice: pre- implementation (three-year data from historical control group, n = 434); post-implementation (year one data, n = 85)	MoC: MOMHDP is a free-standing multi-practice medical oncology home supported by payment reform. MOMHDP consists of telephone advice service (nurse-led phone triage using evidence-based guidelines to guide decisions) and unplanned care and assessment unit (can provide appointment at centre within 48hrs, based nurse-led phone triage assessment). Staffed by oncologists, physicians, nurses and administration staff. Operational hours: not listed. Outcomes: number of ED visits; number of in-patient admissions; cost savings; compliance with evidence- based guidelines (outcomes of MOMHDP project).	Outcomes of MOMHDP project: • reduced costs associated with unnecessary emergency room visits and in-patient admissions, with an average estimated cost savings of USD $550 per patient; • the overall savings associated with reducing in-patient admissions was USD $41,735, and USD $4,492 for reducing ED visits, for overall savings of USD $46,227.
Page et al. (2015) USA Note – conflict of interest: The author has an ownership interest in both the practice, CMOH, and Oncology Management Services Ltd.	• Short report • To describe the payment reform models, performance measures and concepts that informed the development of oncology medical homes and evaluate outcomes • Three oncology medical homes in USA • Nil sample size reported	MoC: patient-centred medical home in oncology contains: telephone advice service and unplanned care and assessment unit. Combined services provided by oncologists, physicians, nurses and administration staff. Operational hours: most provide 24/7 access. Outcomes: patient-centred medical home in oncology outcomes; financial viability; identified areas for improvement.	Community Oncology MEdical HOME (COME HOME) outcomes: • patient care was improved, and patient outcomes were better (lower ED visit rate, lower in- patient admission rate, fewer in- patient days) with consistently high patient satisfaction, all at an equal or often lower cost than local comparator groups; • provided triage pathways to ensure patients receive the right care in the right place at the right time for symptoms related to cancer and cancer treatment; • provided quality improvement benchmarking, real-time quality data; • participating practice sites have shown a 23%–28% reduction in the percent of patients with ED visits. OPCMH outcomes: • ongoing, cumulative reduction in ED utilisation rates of 78% and reduction in hospitalisation rates

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Table 2 (*continued*)

Author (yr.) Country	Methods, Aim, Setting & Sample	MoC evaluated and outcome measures	Major Findings
			of 50% per patient on chemotherapy per year (2007–2013); • improved patient engagement and enhanced access.
Sanghavi et al. (2015) USA	• Case study • This study aims to: (i) describe impact of COME HOME MoC on quality of care, patient experience, cost of care and hospital utilisation; (ii) explore how healthcare providers can enable sustainability of oncology medical home MOCs • Single integrated community cancer centre • Nil sample size reported	MoC: COME HOME model is an independent, free-standing, integrated community cancer centre providing needs-based care. Telephone advice service (uses triage pathways and therapeutic pathways of care) and unplanned care and assessment unit. Combined services provided by oncologists, physicians, nurses and in-house lab. Operational hours: Monday – Friday, 9am – 8pm; Saturday – Sunday 1–4pm. Outcomes: outcomes of COME HOME model.	Outcomes of COME HOME model: • provides a centrally located hub for services; • provides culture of continuous improvement led by senior management team; • improved triage decision-making support; • lower utilisation of in-patient beds; • lower utilisation of ED; • currently seeking a financial pathway for sustainable delivery reform; • new TT system has enhanced the clinical assessment and decision-making process and standardised the healthcare advice provided.
Waters et al., 2015 USA	• Case study • To describe the COME HOME model and implementation timeline, profile use of key services and level of patient satisfaction • Single oncology medical home • Nil sample size reported	MoC: telephone advice service and unplanned care and assessment unit. Combined services provided by oncologists, physicians, nurses & administration staff. Operational hours: provides 24/7 telephone advice service. Extended clinic hours on weeknights & weekends (hours not listed). Outcomes: early outcomes of COME HOME model.	Early outcomes of COME HOME model: Enhanced patient access & care: • round-the-clock triage phone line; • practice offered patients same- day appointments, including during evening and on weekends; • on-call oncologists responding to emerging situations and directly admitting (not through the ED), enhanced patient access to specialist care. Patient experience: • 92% of patients surveyed were satisfied with care in 2015; • COME HOME model provides highly patient-centric alternative to ED care; • comparison of patients who did and did not use the COME HOME triage line found a strong relationship between failure to use the triage line and ED use.
Kuo et al. (2017) Australia	• Retrospective chart review – comparative design • To assess the efficacy of the Rapid Access Clinic (RAC) in improving delivery of ambulatory care to cancer patients • Single site, tertiary referral hospital • Cancer patients receiving chemotherapy: n = 152 (ED cohort); n = 217 (RAC cohort).	MoC: RAC consists of telephone advice service &, unplanned care and assessment unit. Compared to ED MoC. RAC aimed to provide care to patients receiving chemotherapy or within 3 months of completing treatment. Patients were excluded from RAC presentation if they described or had experienced high clinical acuity symptoms related to haemodynamic instability, septic shock, loss of consciousness, neurological deficits suggestive of cerebral vascular accident, seizure or spinal cord compression, respiratory distress or acute cardiac chest pain. RAC staffed by medical oncology advanced trainee registrar and oncology nurse. Operational hours: Monday – Friday, 9am -5pm. Outcomes: time to medical review, total time spent at the RAC, assessment outcome. Compared rate of hospital admissions and length of stay between models.	Outcomes of RAC VS ED: • reduced rate of hospital admission (RAC = 14.3% vs ED = 69.1%, $p < 0.001$); • shorter in-patient length of stay (RAC = 4 days vs ED = 7 days, $p = 0.013$); • shorter total time spent for review (RAC = 3.1hrs vs ED = 9.7hrs, $p < 0.001$); • TT system affected the type of presentations - majority (56.7%) of RAC presentations were for symptoms not related to chemotherapy.

Note: MoC = Model of care; TT = Telephone Triage; UK = United Kingdom; ED = Emergency Department; USA = United States of America; OU = Observational Unit; UCC = Urgent Care Centre; CNS = Clinical Nurse Specialist; NP = Nurse Practitioner; RAC = Rapid Access Clinic; OATU = Oncology Acute Toxicity Unit; CMOH = Consultants in Medical Oncology and Haematology; OPCMH = Oncology Patient-Centred Medical Home; EMR = Electronic Medical Records; MOMHDP = Michigan Oncology Medical Home Demonstration Project; USD = United States of American Dollars; COME HOME = Community Oncology MEdical HOME.

towards the most appropriate pathway of care. In the included studies, a telephone advice service provided patients and/or their carers with access to cancer nurses who helped to determine the nature and urgency of the care required and advised the most appropriate course of action (Groves, 2005; Singh and Warnock, 2013; Stacey et al., 2007, 2015). Some studies reported the outcomes of mixed MoCs, including telephone advice services and these results are reported separately.

A clinical audit of a chemotherapy telephone advice service, carried out by Groves (2005), found a designated coordinator role provided better continuity and coordination of care.

However, guidelines, care pathways, patient alert cards, staff education and training were also needed to improve services. Similarly, a Canadian study (Stacey et al., 2007) found oncology nursing telephone services were responsive to patients' needs and provided continuity of care, however many healthcare centres lacked comprehensive evaluation of the safety and quality of the telephone advice being provided. The success of these services depends on healthcare providers. Ongoing service evaluation is needed to ensure adequately staffed, well resourced, accurate and effective telephone advice is provided (Groves, 2005; Stacey et al., 2007, 2015).

A descriptive cross-sectional study (Stacey et al., 2015) found 77.3% of calls were resolved over-the-phone and most patients and families (91.5%) were satisfied with the way the call was handled. However, a case study by Singh and Warnock (2013), found the telephone advice service did not significantly reduce the workload of the ED. It is not clear if the resolution of healthcare matters over-the-phone seen in Stacey et al. (2015) are associated with the provision of health services, telephone assessment tools, staff training or clinical experience. There is insufficient evidence to determine the influence of operating hours of telephone advice services on ED utilisation by patients with cancer.

9.4. Unplanned care and assessment units

Unplanned care and assessment units can exist within a designated area (Lipitz-Snyderman et al., 2015; Majem et al., 2007; Preston-Jones, 2005) or be provided as part of the standard services of the out-patient department (Page et al., 2015). Only one study described an unplanned care and assessment unit exclusively (Lipitz-Snyderman et al., 2015). Some studies reported the outcomes of mixed MoCs, including unplanned care and assessment units and these results are reported separately. An American study (Lipitz-Snyderman et al., 2015) at a specialist cancer centre measured the impact of introducing an observational unit within their unplanned care and assessment unit over a six-month period. Patients who did not meet admission criteria upon initial assessment yet required monitoring or short-term treatment (e.g. nausea and vomiting, fluid and electrolyte imbalance and dyspnea) were transferred to the observational unit for care (Lipitz-Snyderman et al., 2015). After the implementation of the observational unit, there was a significant reduction in the number of hospital admissions, with only 36% (n = 356/980) of patients from the observational unit requiring admission to hospital (Lipitz-Snyderman et al., 2015).

9.5. Acute oncology services

Putt and Jones (2014) evaluated the role of an acute oncology nurse at four UK hospitals. This short report found the introduction of the acute oncology nurse role at University Hospital of North Staffordshire avoided patient admissions, reduced hospital length of stay and improved overall patient satisfaction for those who presented to the ED (Putt and Jones, 2014).

Feber (2011) describes a nurse consultant-led acute oncology service introduced at a UK district general hospital. This acute oncology service was multifaceted, providing assessment of patients who needed additional or unplanned care in the chemotherapy unit, telephone advice, support to in-patient nursing and medical teams managing oncology patients, coordinating care for patients with metastatic spinal cord compression and other clinical activities (Feber, 2011). Early reports indicate this MoC may provide good value for money, compared to an oncologist-led model, however a comprehensive comparison of the cost-effectiveness of both models is needed (Feber, 2011; Putt and Jones, 2014).

9.6. Medical oncologist embedded in ED

In the USA, a single tertiary hospital introduced a medical oncologist role within the ED to reduce the rate of hospital admissions and re-admissions for patients with cancer during the evening hours (Brooks et al., 2016). This study found the medical oncologist intervention did not significantly reduce the rate of hospital admissions or re-admissions over a five-week period (Brooks et al., 2016). It is unclear if the unfavourable outcomes reported were due to the timeframe for delivering the intervention (i.e. evenings only), limited evaluation period (five weeks), setting or study design.

9.7. Proactive case management by clinical nurse specialists

A retrospective study (Leary and Baxter, 2014) examined the impact of proactive case management provided by lung cancer nurse specialists on the frequency of emergency admissions for lung cancer patients. Proactive case management included providing symptom management, psychosocial interventions, end-of-life care and engaging in shared management approaches with general practitioners and community services (Leary and Baxter, 2014). Six months after introducing this new MoC, avoidable ED admissions were reduced (admission frequency: pre = 4 per month; post = 0.3 per month) (Leary and Baxter, 2014). Based on previous emergency admission rates, proactive case management resulted in 33 less admissions over nine months, saving an average of 198 bed days and approximately 66500 pounds per year (Leary and Baxter, 2014). More robust pilot testing and economic evaluation of this MoC is needed.

9.8. Nurse-led assessment units

Nurse-led assessment units have also been implemented (Cox et al., 2013; Mason et al., 2013; Terzo et al., 2017) to ensure patients receive treatment from staff best trained to assess cancer and treatment-related complications. Three studies (Cox et al., 2013; Mason et al., 2013; Terzo et al., 2017) described NP-led or nurse-led clinics providing unplanned additional care or symptom management to patients with cancer in the out-patient setting. Cox et al. (2013) evaluated the role of a NP in a chemotherapy unit over a six-month period. This study found 60% (n = 52/87) of unscheduled presentations to the NP-led service did not require hospital admission, despite the moderate or severe nature of most presenting problems (n = 73/87, 84%). However, due to study design, Cox et al. (2013) were unable to assess the impact of this MoC on ED utilisation. Both Terzo et al. (2017) and Mason et al. (2013) examined the impact of providing weekly nurse/NP-led symptom management clinics for patients with head and neck cancer on the rate of emergency presentations and hospitalisations. Mason et al. (2013) found there were lower rates of hospitalisations for toxicity (16% reduction; $p = 0.05$) and greater levels of compliance with completing chemotherapy treatment ($p > 0.001$) post-implementation of the nurse-led clinic. In contrast, Terzo et al. (2017) found no significant changes occurred in the rate of emergency presentations and unplanned admissions for patients who had attended the symptom management clinic over a twelve-month period. However, it is estimated this MoC prevented six emergency presentations and four unplanned hospital admissions, saving the hospital approximately USD $176, 848 (Terzo et al., 2017). It is uncertain whether the differing outcomes between both studies (Mason et al., 2013; Terzo et al., 2017) could be attributed to study design (prospective VS retrospective), timeframe of the evaluation or implementation methods.

9.9. Supportive care service for cancer out-patients

One retrospective chart review (Antonuzzo et al., 2017) measured the impact of a supportive care service for cancer out-patients on unplanned hospitalisations, emergency presentations, cost of hospitalisations and length of stay. Twelve months after the introduction of a supportive care service, unplanned admissions reduced by 3.2%, ED presentations reduced by 5% and cost of hospitalisations reduced by 2.2% (Antonuzzo et al., 2017). Authors also noted that the reason for hospital admission may have been influenced by the supportive care service, as admissions for palliative care support, pulmonary, vascular

and cardiac complications were less frequent post-implementation of the service (Antonuzzo et al., 2017). Larger prospective studies are needed to more comprehensively evaluate the efficacy of this MoC in reducing emergency presentations and hospitalisations.

9.10. Mixed MoCs

Several studies reported the introduction of specialty-led emergency services, such as telephone advice services combined with oncology day units (Majem et al., 2007; Preston- Jones, 2005), rapid assessment clinics (Kuo et al., 2017) or oncology medical homes (Kuntz et al., 2014; Page et al., 2015; Sanghavi et al., 2015; Sprandio, 2010, 2012; Waters et al., 2015). These services were designed to enhance safe and effective care of cancer patients by providing them with access to oncology trained personnel. Nine studies (Kuntz et al., 2014; Kuo et al., 2017; Majem et al., 2007; Page et al., 2015; Preston-Jones, 2005; Sanghavi et al., 2015; Sprandio, 2010, 2012; Waters et al., 2015) described mixed MoCs that provided telephone advice and unplanned care and assessment units for patients with cancer and emergent healthcare needs.

Majem et al. (2007) undertook an observational study in Spain, to evaluate the outcomes of an Oncology Acute Toxicity Unit (OATU). Between February 1999 and August 2001, 2007 calls were received by the OATU with 48% cases resolved over-the-phone; and 52% directed to attend the oncology unit (Majem et al., 2007). Of those directed to attend the OATU, only 21.1% were admitted to hospital, demonstrating that the unit reduced unnecessary use of the ED by patients with cancer (Majem et al., 2007). Another mixed MoC (Preston-Jones, 2005) reported similar findings, citing the introduction of a telephone advice service and unplanned care and assessment unit improved patient access to oncology services and provided more effective and efficient delivery of emergency care. Similarly, an Australian study (Kuo et al., 2017) found the introduction of a rapid assessment clinic and telephone advice service at a tertiary referral hospital significantly reduced the rate of hospital admissions, when compared to historical ED data.

Oncology medical homes were the most prevalent mixed MoCs described in the literature. This MoC has been adopted across the USA to provide access to a centralised hub of cancer care services with the aim of reducing ED utilisation and providing more affordable healthcare to the low-income, under-insured and uninsured (Page et al., 2015; Sanghavi et al., 2015; Sprandio, 2010, 2012; Waters et al., 2015). Oncology medical homes have been shown to improve patient care (Kuntz et al., 2014; Page et al., 2015; Sprandio, 2010, 2012; Waters et al., 2015), patient satisfaction (Waters et al., 2015) and reduce costs (Kuntz et al., 2014). The first oncology patient-centred medical home (OPCMH) standardised processes and introduced a new telephone advice service, an oncology-specific electronic medical record, customised software and a centrally located hub for unscheduled patient presentations (Sprandio, 2010). During 2007–2013, the introduction of this MoC resulted in an ongoing cumulative reduction in ED utilisation by 78% and reduction in hospital admission rates of 50% per patient on chemotherapy per year (Page et al., 2015). Sprandio (2010) reported patients visited the ED (on average) less than once a year, whilst unscheduled visits to the OPCMH have more than doubled within a five-year period. Results from OPCMH suggest that elements of the MoC may have also had a positive effect on patient engagement, access to specialist care, patient satisfaction, patient outcomes and cost to payers (Page et al., 2015; Sprandio, 2010, 2012).

These findings are strengthened by the more recent success of the Community Oncology MEdical HOME (COME HOME) model, which introduced a round-the-clock telephone advice service, extended practice hours and standardised treatment pathways to provide unplanned care to patients with cancer (Page et al., 2015; Sanghavi et al., 2015; Waters et al., 2015).

Early results from the COME HOME model showed patient satisfaction levels exceeded 92%, suggesting this MoC provides a highly patient-centric alternative to ED care (Waters et al., 2015). Since the introduction of the COME HOME model, participating practice sites have also found the rate of ED presentations has reduced by 23–28% (Page et al., 2015), with lower utilisation of in-patient beds and improved triage decision-making support (Sanghavi et al., 2015). Whether this clinically significant reduction in ED utilisation by cancer patients are due to specific elements of the oncology home models or their combined effect has not been established. Oncology medical homes currently receive financial support through project grant support to build medical home infrastructure and implement services not normally billable to USA Medicare or other insurers, relying on a fee-for-service payment structure (Kuntz et al., 2014; Waters et al., 2015). This funding model is not sustainable (Waters et al., 2015). The American Society of Clinical Oncology states payment reform is essential to provide adequate support for complex disease management and allow practices to realise some of the cost savings associated with the reduction in ED utilisation (American Society of Clinical Oncology, 2014).

10. Discussion

This review reports on a wide variety of MoCs associated with differing locations, funding schemes and healthcare systems, yet all were designed to meet the emergent healthcare needs of cancer patients. Mixed MoCs were the most common model described, with nine studies reporting on outcomes associated with telephone advice services combined with unplanned care and assessment units. Current evidence suggests many of these MoCs were developed pragmatically using existing services to address the needs of patients with cancer. This is reflective of how a telephone advice service and unplanned care and assessment unit was developed in Cancer Care Services at the largest quaternary referral hospital in Queensland, Australia. Findings from this review informed a quality improvement project evaluating this model of care and its results will be reported separately.

Overall, findings from this review indicate several models can reduce emergency presentations and/or hospitalisations for those living with cancer and improve patient outcomes. However, methodological weaknesses of included studies and variations in study designs, settings and MoCs mean that any conclusions drawn from the review are tentative at best.

Based on the literature, oncology medical homes have had early success implementing this MoC in four different settings in the USA (Kuntz et al., 2014; Page et al., 2015; Sanghavi et al., 2015; Sprandio, 2010, 2012; Waters et al., 2015). These models have three strategies in common – systematic use of a telephone advice service; extended practice hours; and the use of standardised treatment pathways (Kuntz et al., 2014; Page et al., 2015; Sprandio, 2010; Waters et al., 2015). However, the generalisability of this evidence outside of the USA healthcare system is unclear. Oncology medical homes were designed to support selected private oncology practices by providing stand-alone cancer centres with specialist care available seven days-a-week, including after hours (Kuntz et al., 2014; Page et al., 2015; Sanghavi et al., 2015; Sprandio, 2010). These models invested substantial resources to redesign where care is delivered and how care decisions are made (Sanghavi et al., 2015; Sprandio, 2010). Two oncology medical homes (Kuntz et al., 2014; Sprandio, 2010) demonstrated reduced costs to payers, however all oncology medical homes are currently seeking alternative financial pathways for sustainable long-term delivery (Waters et al., 2015). Healthcare redesign and costs aside, oncology medical homes have demonstrated advantages in providing real-time data-driven healthcare when compared to current quality metrics in oncology (Kuntz et al., 2014; Sanghavi et al., 2015; Sprandio, 2012). However, this MoC was specifically developed to address gaps in service provision and healthcare access in the USA. Consequently, oncology medical homes may not be applicable to meet the emergent healthcare needs of people living with cancer in other countries. Comprehensive prospective evaluation is needed to determine the efficacy of all MoC in reducing ED utilisation by cancer patients in comparison to standard care.

By providing standardised diagnostic and treatment pathways, healthcare providers may be able to simultaneously reduce patient morbidity and resource utilisation (Kuntz et al., 2014; Page et al., 2015; Sprandio, 2010; Waters et al., 2015). Sprandio (2010) developed standardised assessment pathways for potentially avoidable complications for patients with cancer, which resulted in a reduction of dehydration-related and diarrhoea-related presentations and reduced incidence of delayed post-treatment nausea and vomiting.

Similarly, a pilot study (Mooney et al., 2002) found a computer-based telephone communication system optimised patient care by notifying physicians when patients had poorly controlled symptoms via an alert system (Mooney et al., 2002). Early results also indicate electronic patient-reported outcomes of symptoms experienced during routine cancer treatment reduced ED presentations and admissions by patients with advanced cancer (Basch et al., 2016). This intervention may provide a timely and responsive solution to assessing routine patient symptom reporting and preventing adverse events from occurring (Basch et al., 2016, 2017). Whilst the impact of these technological advancements needs further evaluation, healthcare providers should consider their integration into future MoCs for patients with emergent care needs.

Due to the limited evidence available and to provide a broader understanding, all study types that provided a description and/or assessed a MoC that aimed to reduce emergency presentations and hospital admissions for cancer patients were included in this review.

Methodological weaknesses of the included studies and limited published data on this topic meant it is not possible to make definitive conclusions. No multi-site intervention studies have been undertaken to directly compare the impact of these MoCs in similar contexts.

Many of the included studies were small, underpowered studies and employed study designs that are prone to selection bias, which may have influenced the results. Adequately powered prospective multi-centre studies are needed to test the comparative cost-effectiveness of these MoCs to reduce emergency presentations, hospitalisation and ED utilisation by cancer patients. Further research is also needed to explore the applicability of specific MoCs to healthcare systems in developing and developed countries with differing funding and service delivery models. Future studies should place greater value on creating partnerships with patients to be active participants in health service design, delivery and evaluation to ensure MoCs are patient-centred and responsive to the needs of those affected by cancer.

11. Conclusion

Several cancer care services-led MoCs exist, however limited evidence exists about their impact on improving patient outcomes, and reducing emergency presentations and hospital admissions by cancer patients over time. Nine studies evaluated a telephone advice service (Stacey et al., 2007), nurse-led assessment unit (Terzo et al., 2017), supportive care service (Antonuzzo et al., 2017) and/or mixed models of care (Kuntz et al., 2014; Majem et al., 2007; Page et al., 2015; Sanghavi et al., 2015; Sprandio, 2010, 2012) and found these models of care reduced emergency presentations by cancer patients. Thirteen studies reported a telephone advice service, unplanned care and assessment unit, acute oncology service, proactive case management service, nurse-led assessment unit, supportive care service and/or mixed models of care were associated with reduced hospital admissions by cancer patients (Antonuzzo et al., 2017; Kuntz et al., 2014; Kuo et al., 2017; Leary and Baxter, 2014; Lipitz-Snyderman et al., 2015; Mason et al., 2013; Page et al., 2015; Putt and Jones, 2014; Sanghavi et al., 2015; Sprandio, 2010, 2012; Stacey et al., 2007; Terzo et al., 2017). Only six studies found a telephone advice service, acute oncology service, nurse-led assessment unit and/or mixed models of care were associated with improved patient outcomes (Mason et al., 2013; Page et al., 2015; Putt and Jones, 2014; Sprandio, 2010; Stacey et al., 2015; Waters et al., 2015). Oncology medical homes were the only model of care that consistently reported a reduction in emergency presentations and hospital admissions by cancer patients post-implementation (Kuntz et al., 2014; Page et al., 2015; Sanghavi et al., 2015; Sprandio, 2010, 2012), with three studies also reporting improved patient outcomes (Page et al., 2015; Sprandio, 2010; Waters et al., 2015).What remains unclear is which underlying mechanisms reduce emergency presentations and/or hospitalisations for patients with cancer and whether specific MoCs are uniquely suited to selected contexts of care or applicable across different healthcare settings.

12. Implications for practice

The models of care described in our review were conducted in the UK, USA, Canada, Australia, Italy or Spain. Thus, the results of this review are only applicable to healthcare organisations in developed countries with similar funding structures. The studies in this review highlight the importance of comprehensively measuring service performance when evaluating a MoC by considering patient and carer experiences, not just data and dollars. To meet the evolving needs of cancer patients and their families, healthcare organisations need to prioritise regular evaluations of how emergency services are being provided and seek feedback from all key stakeholders.

Healthcare services are encouraged to assess their current MOCs based on the available literature and contribute to the body of knowledge on this important clinical area. In the interim, the studies discussed in this literature review provide preliminary information on MOCs that aim to address the emergent healthcare needs of people with cancer in developed countries.

13. Implications for research

The evaluation of patient and carer experiences is essential to achieve good patient outcomes, drive quality improvement, and identify strengths and weaknesses of healthcare MoCs (Doyle et al., 2013). Nevertheless, to date, there has been limited evaluation of the experiences of patients with cancer and their carers when receiving emergent care (Stacey et al., 2015). It is imperative that future studies explore the experiences of patients with cancer and their carers to provide valuable insights into their perspectives regarding how healthcare should best be delivered.

Prospective multi-centre studies are needed to evaluate the efficacy and cost-effectiveness of all cancer care services-led models in developed countries that aim to reduce emergency presentations and hospitals for those living with cancer. Further research is needed to address these gaps in the literature and ensure healthcare resources are used efficiently and effectively to provide appropriate emergent care to patients with cancer.

Conflicts of interest

Conflicts of interest: none for all authors.

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References

American Society of Clinical Oncology, 2014. Principles to Guide the Evolution of Health Care Payment Systems that Support High-Quality, High-Value Cancer Care: A Joint Statement by the Community Oncology Alliance and the American Society of Clinical Oncology. Retrieved from. http://www.communityoncology.org/pdfs/COA_ASCO_

Payment_Reform_Principles.pdf.
Antonuzzo, A., Vasile, E., Sbrana, A., Lucchesi, M., Galli, L., Brunetti, I.M., et al., 2017. Impact of a supportive care service for cancer outpatients: management and reduction of hospitalizations. Preliminary results of an integrated model of care. Support. Care Canc. 25 (1), 209–212. https://doi.org/10.1007/s00520-016-3403-z.
Barbera, L., Taylor, C., Dudgeon, D., 2010. Why do patients with cancer visit the emergency department near the end of life? Can. Med. Assoc. J. 182 (6), 563–568. https://doi.org/10.1503/cmaj.091187.
Basch, E., Deal, A.M., Kris, M.G., Scher, H.I., Hudis, C.A., Sabbatini, P., et al., 2016. Symptom monitoring with patient-reported outcomes during routine cancer treatment: a randomized controlled trial. J. Clin. Oncol. 34 (6), 557. https://doi.org/10.1200/JCO.2015.63.0830.
Basch, E., Deal, A.M., Dueck, A.C., Scher, H.I., Kris, M.G., Hudis, C., Schrag, D., 2017. Overall survival results of a trial assessing patient-reported outcomes for symptom monitoring during routine cancer treatment. J. Am. Med. Assoc. 318 (2), 197–198. https://doi.org/10.1001/jama.2017.7156.
Bray, F., Ren, J.S., Masuyer, E., Ferlay, J., 2013. Global estimates of cancer prevalence for 27 sites in the adult population in 2008. Int. J. Cancer 132 (5), 1133–1145. https://doi.org/10.1002/ijc.27711.
Brooks, G.A., Chen, E.J., Murakami, M.A., Giannakis, M., Baugh, C.W., Schrag, D., 2016. An ED pilot intervention to facilitate outpatient acute care for cancer patients. Am. J. Emerg. Med. 34 (10), 1934–1938. https://doi.org/10.1016/j.ajem.2016.06.076.
Courtney, D.M., Aldeen, A.Z., Gorman, S.M., Handler, J.A., Trifilio, S.M., Parada, J.P., et al., 2007. Cancer-associated neutropenic fever: clinical outcome and economic costs of emergency department care. Oncol. 12 (8), 1019–1026. https://doi.org/10.1634/theoncologist.12-8-1019.
Cox, K., Karikios, D., Roydhouse, J.K., White, K., 2013. Nurse-led supportive care management: a 6-month review of the role of a nurse practitioner in a chemotherapy unit. Aust. Health Rev. 37 (5), 632–635. https://doi.org/10.1071/AH13069.
Derlet, R.W., 2002. Overcrowding in emergency departments: increased demand and decreased capacity. Ann. Emerg. Med. 39 (4), 430–432. https://doi.org/10.1067/mem.2002.122707.
Doyle, C., Lennox, L., Bell, D., 2013. A systematic review of evidence on the links between patient experience and clinical safety and effectiveness. BMJ Open 3 (1). https://doi.org/10.1136/bmjopen-2012-001570.
Feber, T., 2011. Developing an acute oncology service. Cancer Nurs. Pract. 10, 14–19.
Forero, R., Hillman, K.M., McCarthy, S., Fatovich, D.M., Joseph, A.P., Richardson, D.B., 2010. Access block and ED overcrowding. Emerg. Med. Australasia 22 (2), 119–135. https://doi.org/10.1111/j.1742-6723.2010.01270.x.
Gabriel, J., 2012. Acute oncological emergencies. Nurs. Stand. 27 (4), 35–41.
Green, B.N., Johnson, C.D., Adams, A., 2006. Writing narrative literature reviews for peer-reviewed journals: secrets of the trade. J. Chiropract. Med. 5 (3), 101–117. https://doi.org/10.1016/S0899-3467(07)60142-6.
Groves, E.L., 2005. Auditing a chemotherapy triage telephone service. Cancer Nurs. Pract. 4, 25–29.
Hwang, U., Richardson, L., Livote, E., Harris, B., Spencer, N., Sean Morrison, R., 2008. Emergency department crowding and decreased quality of pain care. Acad. Emerg. Med. 15 (12), 1248–1255. https://doi.org/10.1111/j.1553-2712.2008.00267.x.
Kuntz, G., Tozer, J.M., Snegosky, J., Fox, J., Neumann, K., 2014. Michigan oncology medical home demonstration project: first-year results. J. Oncol. Pract. 10 (5), 294–297. https://doi.org/10.1200/JOP.2013.001365.
Kuo, J.C., De Silva, M., Diwakarla, C., Yip, D., 2017. A Rapid Access Clinic to improve delivery of ambulatory care to cancer patients. Asia Pac. J. Clin. Oncol. 13 (3), 179–184. https://doi.org/10.1111/ajco.12641.
Leary, A., Baxter, J., 2014. Impact of lung cancer clinical nurse specialists on emergency admissions. Br. J. Nurs. 23 (17), 935–938. https://doi.org/10.12968/bjon.2014.23.17.935.
Lipitz-Snyderman, A., Klotz, A., Atoria, C.L., Martin, S., Groeger, J., 2015. Impact of observation status on hospital use for patients with cancer. J. Oncol. Pract. 11 (2), 73–77. https://doi.org/10.1200/JOP.2014.001248.
Livingston, P.M., Craike, M., Slavin, M., 2012. Clinical and economic burden of emergency department presentations for neutropenia following outpatient chemotherapy for cancer in Victoria, Australia. Oncol. 17 (7), 998–1004. https://doi.org/10.1634/theoncologist.2011-0456.
Lowthian, J.A., Curtis, A.J., Cameron, P.A., Stoelwinder, J.U., Cooke, M.W., McNeil, J.J., 2010. Systematic review of trends in emergency department attendances: an Australian perspective. Emerg. Med. J. 099226. emj. 2010. https://doi.org/10.1136/emj.2010.099226.
Majem, M., Galán, M., Pérez, F., Muñoz, M., Chicote, S., Soler, G., et al., 2007. The oncology acute toxicity unit (OATU): an outpatient facility for improving the management of chemotherapy toxicity. Clin. Transl. Oncol. 9 (12), 784–788. https://doi.org/10.1007/s12094-007-0140-2.
Mason, H., DeRubeis, M.B., Foster, J.C., Taylor, J.M., Worden, F.P., 2013. Outcomes evaluation of a weekly nurse practitioner-managed symptom management clinic for patients with head and neck cancer treated with chemoradiotherapy. Oncol. Nurs. Forum 40 (6), 581–586. https://doi.org/10.1188/13.ONF.40-06AP.
Mayer, D.K., Travers, D., Wyss, A., Leak, A., Waller, A., 2011. Why do patients with cancer visit emergency departments? Results of a 2008 population study in North Carolina. J. Clin. Oncol. 29 (19), 2683–2688. https://doi.org/10.1200/JCO.2010.34.2816.
Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Ann. Intern. Med. 151 (4), 264–269. https://doi.org/10.7326/0003-4819-151-4-200908180-00135.
Mooney, K.H., Beck, S.L., Friedman, R.H., Farzanfar, R., 2002. Telephone-linked care for cancer symptom monitoring. Cancer Pract. 10 (3), 147–154. https://doi.org/10.1046/j.1523-5394.2002.103006.x.
Mort, D., MRCGP, F., 2008. For better, for worse?: a review of the care of patients who died within 30 days of receiving systemic anti-cancer therapy: NCEPOD. Retrieved from https://www.ncepod.org.uk/2008report3/Downloads/SACT_report.pdf .
Navani, V., 2014. How has acute oncology improved care for patients? Curr. Oncol. 21 (3), 147–149. https://doi.org/10.3747/co.21.1904.
Nirenberg, A., Mulhearn, L., Lin, S., Larson, E., 2004. Emergency department waiting times for patients with cancer with febrile neutropenia: a pilot study. Oncol. Nurs. Forum 31 (4), 711–715. https://doi.org/10.1188/04.ONF.711-715.
Page, R., Newcomer, L., Sprandio, J., McAneny, B., 2015. The patient-centered medical home in oncology: from concept to reality. In: American Society of Clinical Oncology educational book. American Society of Clinical Oncology. Meeting (pp. e82-9), https://doi.org/10.14694/EdBook_AM.2015.35.e82.
Pluye, P., Robert, E., Cargo, M., Bartlett, G., O'cathain, A., Griffiths, F., et al., 2011. Proposal: A Mixed Methods Appraisal Tool for Systematic Mixed Studies Reviews, vol. 2. Montréal: McGill University, pp. 1–8. Retrieved from. http://mixedmethodsappraisaltoolpublic.pbworks.com.
Preston-Jones, L., 2005. New ways of working: oncology triage. Cancer Nurs. Pract. 4, 30.
Pugh, A., Rogerson, H., Cosh, H., Hart, J., Williams, H., Jenkins, C., 2015. Acute oncology: a developing sub-specialty. Br. J. Nurs. 24. https://doi.org/10.12968/bjon.2015.24.Sup16.S18.
Putt, L., Jones, P., 2014. The role of the specialist acute oncology nurse in the new acute oncology services. Clin. Oncol. 26 (3), 125–127. https://doi.org/10.1016/j.clon.2013.11.025.
Rowe, B., Bond, K., Ospina, M.B., Blitz, S., Afilalo, M., Campbell, S., Schull, M., 2006. Frequency, Determinants, and Impact of Overcrowding in Emergency Departments in Canada: a National Survey of Emergency Department Directors. Technology report (67.3). . Retrieved from https://www.cadth.ca/media/pdf/320c_Overcrowding_tr_e_no-appendices.pdf.
Royal College of Physicians and Royal College of Radiologists, 2012. Cancer Patients in Crisis: Responding to Urgent Needs Report of a Working Party (pp. i-94). London. Retrieved from. https://www.rcr.ac.uk/publication/cancer-patients-crisis-responding-urgent-needs.
Sadik, M., Ozlem, K., Huseyin, M., AliAyberk, B., Ahmet, S., Ozgur, O., 2014. Attributes of cancer patients admitted to the emergency department in one year. World J. Emergency Med. 5 (2), 85–90. https://doi.org/10.5847/wjem.j.issn.1920- 8642.2014.02.001.
Sanghavi, D., Samuels, K., George, M., Patel, K., Bleiberg, S., McStay, F., et al., 2015. Case study: transforming cancer care at a community oncology practice. Healthcare 3 (3), 160–168. https://doi.org/10.1016/j.hjdsi.2014.07.005.
Singh, K., Warnock, C., 2013. Assessing the value of a nurse-led telephone advice and triage service. Cancer Nurs. Pract. 12 (4), 30–35.
Sprandio, J.D., 2010. Oncology patient-centered medical home and accountable cancer care. Community Oncol. 7 (12), 565–572.
Sprandio, J.D., 2012. Oncology patient–centered medical home. J. Oncol. Pract. 8 (3S), 47s–49s. https://doi.org/10.1200/JOP.2012.000590.
Stacey, D., Bakker, D., Green, E., Zanchetta, M., Conlon, M., 2007. Ambulatory oncology nursing telephone services: a provincial survey. Canad. Oncol. Nurs. J 17 (4).
Stacey, D., Green, E., Ballantyne, B., Skrutkowski, M., Whynot, A., Tardif, L., ... Carley, M., 2015. Patient and family experiences with accessing telephone cancer treatment symptom support: a descriptive study. Support. Care Canc. 24 (2), 893–901. https://doi.org/10.1007/s00520-015-2859-6.
Swenson, K.K., Rose, M.A., Ritz, L., Murray, C.L., Adlis, S.A., 1995. Recognition and evaluation of oncology-related symptoms in the emergency department. Ann. Emerg. Med. 26 (1), 12–17. https://doi.org/10.1016/S0196-0644(95)70231-8.
Terzo, L., Fleming, M., Yechoor, A., Camporeale, J., Troxler, M., Roth, E., ... Chera, B.S., 2017. Reducing Unplanned Admissions: focusing on hospital admissions and emergency department visits for patients with head and neck cancer during radiation therapy. Clin. J. Oncol. Nurs. 21 (3), 363–369. https://doi.org/10.1188/17.CJON.363-369.
Waters, T.M., Webster, J.A., Stevens, L.A., Li, T., Kaplan, C.M., Graetz, I., McAneny, B.L., 2015. Community oncology medical homes: physician-driven change to improve patient care and reduce costs. J. Oncol. Pract. 11 (6), 462–467. https://doi.org/10.1200/JOP.2015.005256.
Weiland, T.J., Lane, H., Jelinek, G.A., Marck, C.H., Weil, J., Boughey, M., Philip, J., 2015. Managing the advanced cancer patient in the Australian emergency department environment: findings from a national survey of emergency department clinicians. Int. J. Emerg. Med. 8 (1), 1–10. https://doi.org/10.1186/s12245-015-0061-8.
White, K., Roydhouse, J., O'Riordan, L., Wand, T., 2013. Interventions for Reducing the Use of Adult Emergency Department Services by Cancer Patients:an Evidence Check Rapid Review Brokered by the Sax Institute (http://www.saxinstitute.org.au) for the Cancer Institute NSW. Retrieved from https://www.saxinstitute.org.au/wp-content/uploads/Interventions-for-reducing-the-use-of-adult-Emergency-Department-services-by-cancer-patients.pdf.
Young, A., Marshall, E., Krzyzanowska, M., Robinson, B., Brown, S., Collinson, F., et al., 2016. Responding to acute care needs of patients with cancer: recent trends across continents. Oncol. 21 (3), 301–307. https://doi.org/10.1634/theoncologist.2014-0341.