

Interventions for reducing the use of adult Emergency Department services by cancer patients

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An **Evidence Check** rapid review brokered by the Sax Institute for the Cancer Institute NSW

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1 EXECUTIVE SUMMARY

The purpose of this commissioned review is to inform future development and implementation of best practice models for cancer care by the Cancer Institute of NSW (CINSW). The review examines current knowledge, practice, and experience in relation to cancer patients' utilisation of Emergency Departments. The review will complement other research being conducted by the CINSW examining administrative and linked data sets on patterns of utilisation of Emergency Departments by cancer patients. Three questions guided the review:

1. Which factors are associated with, or predict, the avoidable use of Emergency Department services by cancer patients?
2. Which interventions have been effective in reducing avoidable use of Emergency Department services by cancer patients?
3. What is the potential application of the review findings (Questions 1 and 2) to the NSW setting?

1.1 Key findings

Few quality studies were identified for this review. The research is primarily retrospective and descriptive. A key limitation of the current literature is the limited capacity for this to inform knowledge on Emergency Department (ED) utilisation by cancer patients, the reasons for this, and the extent to which these may be avoidable.

- A. Drawing on the small number of papers that examined reasons for ED presentation in cancer patients, potential risk factors for ED utilisation for cancer patients include stage of disease, receiving chemotherapy as an outpatient, older age and, potentially, lower socioeconomic status
- B. Cancer patients attend EDs to seek medical care for a range of clinical concerns, including symptoms associated with their diagnosis and or side effects of treatment
- C. The most common symptoms reported in the studies were pain, respiratory symptoms including dyspnoea, and chemotherapy-induced nausea and vomiting. Disease progression was identified as a precipitating factor for ED presentation
- D. A number of studies investigated appropriate management of febrile neutropenia in EDs, with significant gaps in care identified. This may reflect publication bias with only those studies with negative result being accepted
- E. Lung cancer patients featured strongly in ED utilisation including having the highest ED use in last two weeks of life.
- F. There is a need for local data to develop a better understanding of the number of ED occasions of care for cancer patients, reasons for these and outcomes. The extent to which cancer patients ED utilisation is avoidable or inappropriate is unknown. It is recommended that unscheduled presentations to other oncology clinical settings be included to provide a more complete picture of unplanned presentations across cancer patient groups
- G. No studies were found that investigated the patient/carers experience of attending EDs, nor the antecedents and decision making from the patient/carer perspective. This is a

gap that needs to be addressed, including developing a better understanding of the process prior to admission, and decision making for patient and family carer

- H. There is no consensus among either cancer or ED clinicians in relation to defining/describing inappropriate ED presentations
- I. No published papers were identified to reduce inappropriate ED utilisation.

A small number of ongoing intervention studies were identified, with anticipated completion dates in late 2013. Monitoring the outcomes of these studies will be an important consideration in developing alternative models for Australia.

2 Background and introduction

This rapid review was commissioned by the Sax Institute on behalf of the Cancer Institute of NSW (CINSW) to identify evidence informed interventions for reducing inappropriate utilisation of Emergency Departments by adult cancer patients. Emergency Department (ED) utilisation and performance has been a priority area for most Western countries in the past decade. Emergency departments provide emergency “*treatment of injury or acute illness*”.¹ The past decade has seen an increase in ED utilisation across Australia, with many factors contributing to this trend. The increase in the number of Australians attending EDs has had a negative impact on the delivery of acute services, including access to emergency care, time to treatment, and the development of “*bed block*” and “*ambulance bypass*”, all of which impact on the provision of urgent healthcare. A range of factors have influenced the ongoing increase in ED utilisation. For individuals in NSW diagnosed with cancer, the ED can be critical to their care; equally it can be the least optimal place for aspects of their cancer management.

The purpose of this commissioned review is to inform future development and implementation of best-practice models for cancer care by the CINSW. The review examines current knowledge, practice, and experience in relation to cancer patients’ utilisation of EDs. The review will complement other research being conducted by the CINSW examining administrative and linked data sets on patterns of utilisation of EDs by cancer patients. Three questions guided the review.

1. Which factors are associated with, or predict, the avoidable use of ED services by cancer patients?
2. Which interventions have been effective in reducing avoidable use of ED services by cancer patients?
3. What is the potential application of the review findings (Questions 1 and 2) to the NSW setting?

2.1 Emergency care in NSW

There are 185 EDs in NSW, with each department classified according to the complexity of care able to be provided.² A Level 1 ED is the lowest complexity level, with these primarily located in small rural communities and based within the Multi-Purpose Services (MPS), through to Level 6 ED able to provide services for the most complex cases. In NSW there are 11 Level 6 EDs; nine are located in metropolitan Sydney and two are located at the two metropolitan paediatric acute services. Two regional Level 6 EDs are located at John Hunter Hospital in Newcastle and Wollongong Hospital.³ Patients attending EDs are triaged by a nurse based on the severity of their medical condition, with 1 being the most urgent and 5 the least urgent (see side bar). The triage classification sets a time period within which the patient is to be reviewed medically.^{2,4} Figure 1 is a summary of patient journey through ED in NSW in 2010 by Triage Score.¹

Triage categories:

1. **Resuscitation:**
immediate
(within seconds)
2. **Emergency:**
within 10
minutes
3. **Urgent:**
within 30
minutes
4. **Semi-urgent:**
within 60
minutes

Box 1: Triage categories

Activity: Emergency departments in NSW

Summary of patient journeys through NSW emergency departments

The thickness of each arrow is approximately proportional to the number of NSW emergency department patients in each category. The arrows are coloured by triage level.

- Triage 1 Immediately life threatening
- Triage 2 Imminently life threatening
- Triage 3 Potentially life threatening
- Triage 4 Potentially serious
- Triage 5 Less urgent

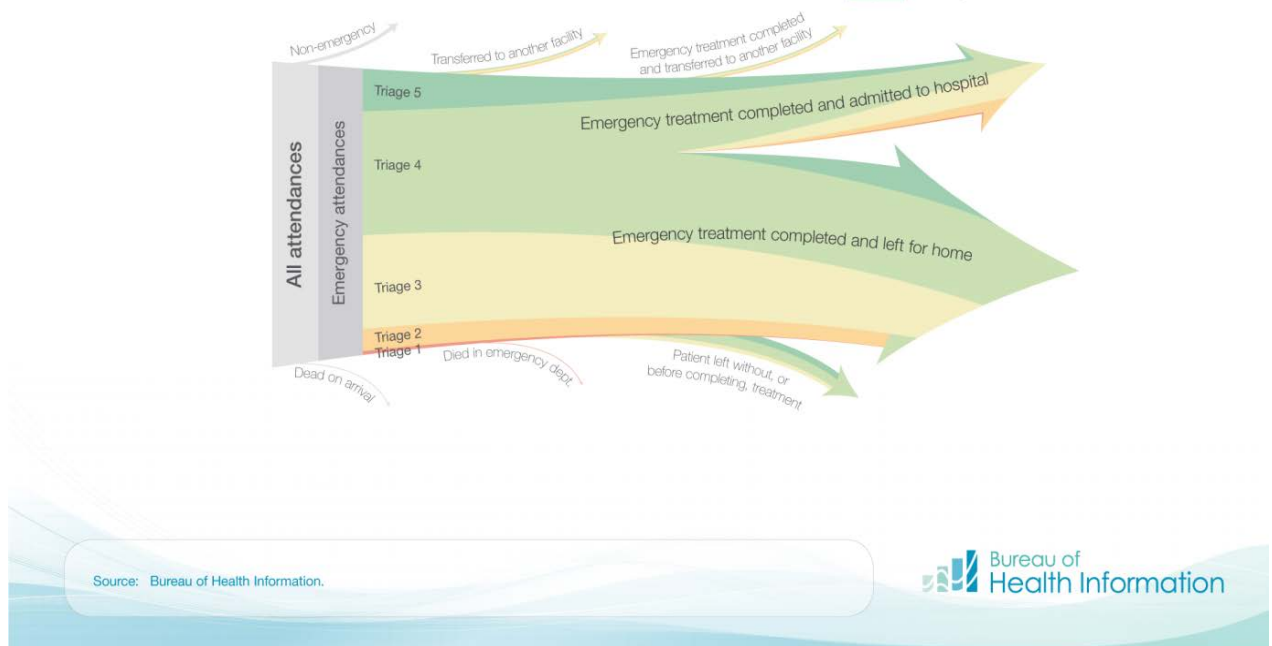


Figure 1: NSW attendance ED by triage category and outcome. Source: Bureau of Health Information¹

In 2010–2011 there were almost 2.5 million ED visits across NSW. The number of cancer patients who present to EDs was unable to be sourced within the time frame for this review. This information and detail on reasons for presentation is an important gap that needs to be addressed for future planning. Cancer accounted for 6.4% of all hospitalisations for the same period and 8% of total bed day utilisation.¹ This data is based on primary ICD codes and may not accurately reflect all cancer related admissions.

Unplanned admissions to hospital are costly to the individual and health providers. Preventing unplanned admissions is not possible in many cases, however, it has been recognised that improved care could reduce the number. In the UK more than two million unplanned admissions a year occur in people over 65 years, accounting for 68% of hospital emergency bed days and the use of more than 51,000 acute beds at any one time.⁵ In Australia this figure is lower; however, older Australians and those with mental health concerns and chronic disease are recognised to be seen more frequently in EDs.⁶

In the past decade ED services in NSW have implemented a number of new initiatives to improve the patient’s experience and outcomes in EDs, and reviewed the model of ED care. The NSW Health Models of Emergency Care (MOC)² outlines the different models in practice in NSW for delivering emergency care with core outcomes across all models. Successful innovations include clinical initiative nurse roles⁷, direct referral/admission to specialist services, and early senior emergency medical review. Underpinning the different models for emergency care for NSW Health are the core principles for an ‘ideal patient journey’ (see Figure 2).

1. Getting the right **patient** to the right **place** for their care that is supported by the right **resources** to ensure the smooth flow of patients through the ED
2. The smooth flow of patients through the ED
3. Early assessment and streaming to an appropriate MOC both within the ED and outside the ED
4. Designated specialty MOC for patient cohorts
5. A team approach to patient care
6. Ensuring tasks are performed by the provider who can most efficiently perform the task
7. Coordinated patient care including between specialist consultants, diagnostics services and community care
8. Strong monitoring and evaluation measures
9. Adherence to the principles of the new models of care

Box 2: Ideal Patient Journey in ED (from NSW Health, Emergency Department Models of Care 2012:6)

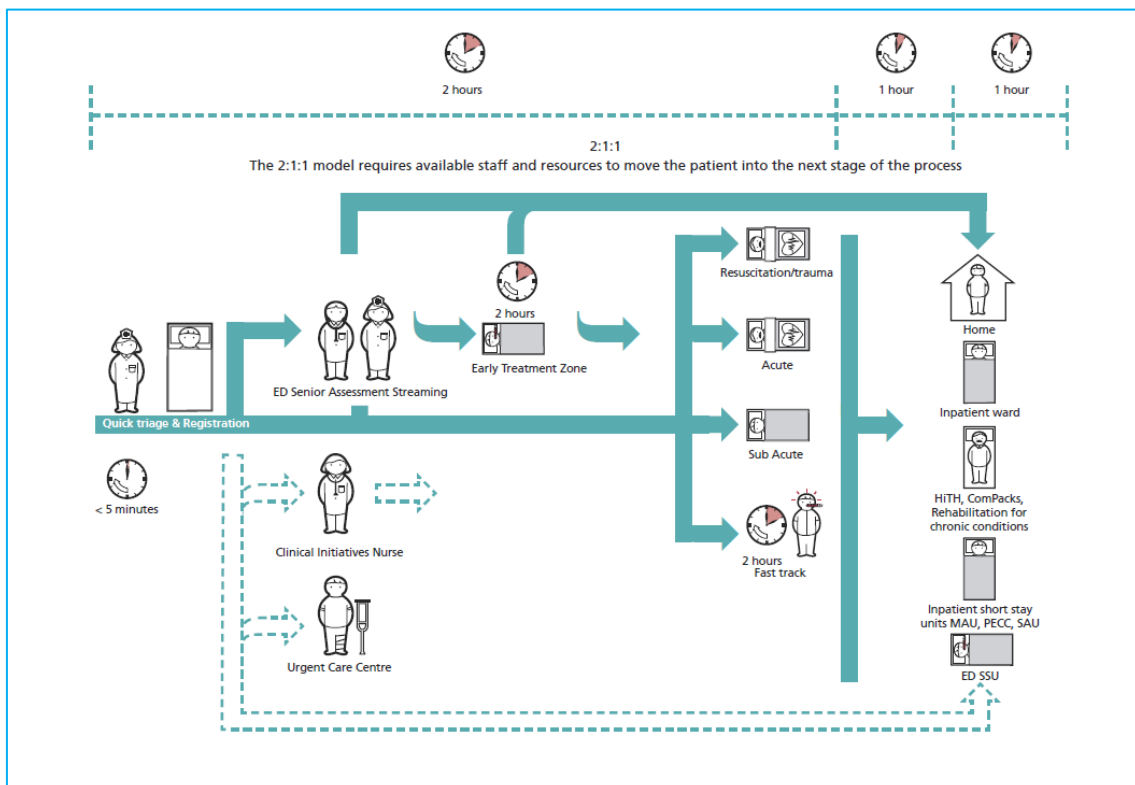


Figure 2: The Ideal Patient Journey with streaming to models of care within ED and external to ED (from NSW Health, Emergency Department Models of Care 2012:8)

ED Performance Measures

- National Emergency Access targets
- % ED presentations treated within benchmark times
- Transfer of care time < 30 minutes
- Presentations staying in ED > 24 Hours
- ED Length of Stay
- Did not wait
- Staff and patient satisfaction

Measures of ED performance focus on outcomes such as time to receiving care, time to discharge from ED, and readmission/representation rates. The increase in ED utilisation across most developed countries has not been shown to lead to improvements in health outcomes. The ED has become the first point in what has been described as the 'bottleneck' in accessing acute health services. Both within Australia and in other developed countries, a significant focus of ED health service research has been the examination of appropriate/inappropriate utilisation of EDs, identification of patient groups at risk of multiple presentations and exploration of alternative models for providing emergency health services for those with non-life-threatening presentations. Examples can be found primarily in the UK, where a number of alternative models for providing low level emergency health services have been developed, primarily outside the cancer area.

Box 3: ED Performance Measures

In addition to the performance measures listed above, ED presentations are classified by type of visit⁶, which describes the reason the patient presented to the ED. The type of visit is categorised as follows:

- Emergency presentation: attendance for an actual or suspected condition which is sufficiently serious to require acute unscheduled care
- Return visit, planned: presentation is planned and is a result of a previous ED presentation or return visit
- Pre-arranged admission: patient who presents at the ED for either a clerical, nursing or medical process to be undertaken, and admission has been pre-arranged by the referring medical officer and a bed allocated
- Patient in transit: the ED is responsible for care and treatment of a patient awaiting transport to another facility
- Dead on arrival: a patient who is dead on arrival at the ED.

2.2 Inappropriate/avoidable admissions to EDs

As outlined in the review scope, avoidable is defined as use of ED services for care which is unplanned, preventable, or otherwise able to be better managed by an alternative appropriate/effective care pathway (e.g. general practitioner, self-management). While at first glance this seems straightforward, in application to the review process it is harder to apply. In examining the literature on EDs it was apparent there is no agreed definition of 'inappropriate ED utilisation', in part due to a lack of consistency in defining appropriate utilisation.⁸ The extent to which an ED presentation leads to an 'inappropriate admission to hospital' is also debated in the literature.⁹ While the purpose of the review was not to examine the outcomes of ED presentations by cancer patients, the reviewers did note a high admission rate when this was reported in the studies.

Of note for the review team in examining research and published reports on ED utilisation was how infrequently cancer patients appeared in studies investigating causes of either frequent or inappropriate presentations to ED. Across developed countries older age, mental health, and those with chronic and multiple medical problems are the most common groups to present to

EDs. This may be a reflection of the type of data captured within EDs, but it highlights the limited knowledge regarding ED utilisation by cancer patients, reasons for ED presentation and the extent to which this might be available.

Research in the past ten years related to EDs has focused heavily on managing 'bed block' and reducing waiting times. Absent from many of the reports is an examination of individual decision making to present to the ED and what factors may influence this. For many individuals in the community, including those diagnosed with cancer, the ED is a place that is for critical or emergency medical problems. For others, the ED provides access to medical care out of hours. The extent to which access to afterhours medical care for cancer patients may or may not influence their decision is not known.

A model for the determinants/factors of ED use was proposed by Padgett and Brodsky¹⁰, focusing on three types of factors (predisposing, enabling and need) and three stages of decision making (problem recognition, decision to seek help, and decision to use the ED rather than a GP). These authors argue that attendance at the ED is likely a complex interaction between both of these. Guthertz and Shira¹¹, drawing on this model, examined 30 patients who presented to EDs with non-urgent medical concerns, reinforcing that predisposing factors are an important component of the decision. Cancer patients receiving chemotherapy are specifically informed to present to EDs after hours if unwell, and this may be a significant predisposing factor to ED utilisation.

2.3 Risk factors for ED presentation: non-cancer

As noted earlier, risk factors or potential predictors of frequent or high ED utilisation have been found to be consistent across developed countries. Older age (over 65 years) is the group consistently reported as the most frequent presenters to EDs, followed by complex chronic or multiple comorbid conditions, mental health concerns and lower socioeconomic groups. Cancer is predominantly a disease of the older adult with those over the age of 65 years accounting for 57% of the new cancer diagnoses in NSW in 2008.¹² It could be argued that these risk factors remain valid in the cancer patient group.

2.4 Interventions to reduce inappropriate/avoidable ED presentations in non-cancer patients

As noted above, a number of interventions or new models of care have been evaluated to reduce ED utilisation among high users of EDs. Most commonly these have focused on the elderly, or those with chronic and multiple comorbidities and longer-term mental health concerns. Interventions have included chronic disease management^{13,14}, specialist clinics (heart failure)¹⁵, case management¹⁶, home support initiatives such as the *hospital in the home program*¹⁷, specialist community care and improved discharge planning. Evidence to support these interventions is limited and, at times, contradictory. A Cochrane review of ten studies of the *hospital in the home program* in the elderly and the impact on hospital utilisation undertaken by Shepperd and colleagues¹⁷ concluded that while *hospital in the home* may be provided at reduced cost, hospital admission may increase towards end of life, and there was a lack of evidence that these programs have a positive impact on quality of life or improve function. The impact of these programs on carers has not been examined and this may have implications for cancer patients. Studies investigating the impact of advanced practice nurses in primary care case-managing have been inconclusive, in part due to the different outcomes being examined. The findings from an Australian study in innercity Melbourne of implementation of multidisciplinary team (MDT) case management for frequent attenders to EDs reflects that the issues around ED utilisation are complex.¹⁸ Following implementation of the MDT case management there was an

increase in access to improved primary and community care services; however, there was also an increase in ED presentations among this group.

A number of studies have examined the role of specialist follow up clinics in heart failure patients in reducing ED utilisation and rapid readmission to hospital.¹⁵ Overall these studies are positive, with those that attend having longer periods between admissions and sustained improvement in cardiac function. A recent study investigated the role of primary care health professionals in anticipatory care planning in patients with chronic conditions. It found where GPs had increased involvement in care planning there was a significant reduction in unplanned admissions.¹⁴

A number of alternative models for providing unscheduled ambulatory care have been developed, with mixed results. The text box below (box 4) lists those that have been or are being implemented in NSW. In addition to the *connecting care program* for individuals with chronic disease

(http://www0.health.nsw.gov.au/cdm/severe_chronic_disease_management_program.asp), the Chronic Care for Aboriginal People program provides support to Aboriginal peoples in NSW (http://www0.health.nsw.gov.au/initiatives/chronic_care/aboriginal/index.asp).

Community models to provide access to unscheduled ambulatory care

- Urgent care centres: pilot program underway in five NSW Hospitals (www.ecinsw.com.au)
- Advice lines: *Healthdirect Australia*
- Connecting care program (chronic disease)
- After hours GP clinics co-located within ED

Box 4: Alternative models to provide ambulatory ED care

3 Search and selection methods

Three questions have guided the review:

Question one: Attendance at ED services

Which factors are associated with, or predict, the avoidable use of ED services by cancer patients? A key focus underlying this question was identification of avoidable ED utilisation.

“Avoidable” was defined within the brief as use of ED services for care which is unplanned, preventable, or otherwise able to be better managed by an alternative appropriate/effective care pathway (e.g. GP, self-management).

Question two: Identifying effective interventions

Which interventions have been effective in reducing avoidable use of ED services by cancer patients?

Question three:

What is the potential application of the review findings (Questions 1 and 2) to the NSW setting?

4 Criteria for considering studies for this review

4.1 Types of studies

Research studies and systematic reviews conducted from 2000 through to October 2012 which addressed ED utilisation in cancer patients were considered. Given the absence of prospective and intervention studies, retrospective audits and similar quality research have been examined. Specific areas of focus that guided the search included:

- Incidence of ED utilisation by individuals with a cancer diagnosis
- Examination of risk factors for ED presentation. This included but was not limited to: disease type or stage; individual characteristics such as age, gender; symptoms; treatment type; comorbidities
- Interventions to prevent/reduce ED presentation and/or unscheduled presentations.

Studies investigating interventions for the prevention were limited to randomised and /or controlled trials and observational studies. Where an English language abstract was available foreign language articles were examined and the abstract included. Reports of single case reports were excluded. Editorial papers and those that reported no clinical results were also excluded.

4.2 Types of participants

Studies that examined adult cancer patients (solid tumour and haematological malignancies) were included. As the use of EDs by palliative care patients is being undertaken in a separate review, these studies were excluded. Paediatric cancer patients were not within the remit of this review. However, as adolescents and young adults can move across both adult and paediatric cancer settings, this group may also have been excluded.

4.3 Types of interventions

Any intervention that aimed to prevent unplanned admission or unscheduled presentation to EDs.

4.4 Quality review

Consistent with review methodology, quality assessment was undertaken using *Grading of Recommendations Assessment, Development and Evaluation Guidelines* (GRADE)¹⁹, a recognised and established grading system. Four levels of quality score can be applied, ranging from very low quality through to high quality. The absence of intervention studies and randomised controlled trials, and the predominance of descriptive and retrospective studies reflects in the overall low level of evidence that has been identified. It had been the intent to assess level of evidence using EPIC Levels of Evidence for Intervention Studies; however, the descriptive style of the studies precluded this.

5 Search strategies

Search strategies were developed for core areas of cancer and EDs, with terms expanded and 'tw' added. Limits were applied for the time period specified, English language including abstract and adult. Following consultation with staff from the CINSW, additional search strategies were developed related to potential risk factors such as tumour type, complications from treatment such as febrile neutropenia, and complications from disease such as haemorrhage or embolism. Additional search terms were identified from papers, discussion with ED and cancer staff or staff from CINSW, e.g. after hours, acute oncology, unplanned/unscheduled admission. Individual searches were run for each area prior to combining with the two central strategies, e.g. cancer + unplanned admissions, cancer + febrile neutropenia + ED.

All searches were run in Medline, CINAHL, databases of abstracts of reviews of effectiveness, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews and PubMed electronic data base.

Studies identified through these searches that were clearly not relevant to the clinical issues under review were eliminated. Citations were independently assessed for eligibility by two reviewers. Those thought to fulfil the selection criteria were retrieved in full. Where a judgement could not be made based on the citation, or when consensus could not be reached regarding eligibility, the full article was obtained to enable a more comprehensive assessment. Appendix 1 provides an overview of the search strategies used: table 1 provides an overview of initial individual search strategies and table 2 provides examples of combined search strategies. Of these, 152 articles were identified. On closer examination 120 were excluded. Records of all articles identified from the search strategies were kept and managed using EndNote.

5.1 Grey literature

In addition to published research, a limited grey literature and hand search of key journals was undertaken (appendix 2).

5.2 Exclusion criteria

Articles were excluded if:

1. Abstract was not available in English
2. Single case reports
3. In a paediatric population
4. In a country or health care setting so different from Australia that relevance is unlikely; reasoning must be noted
5. Do not relate to ED presentations and/or subsequent hospitalisations
6. Not in a cancer patient population, unless an intervention deemed relevant.

6 Consultation with key health professionals

The initial searches for the review identified significant gaps in published literature related to the three review questions. In addition to meeting with staff from CINSW, a number of ED and cancer clinical staff were approached to explore their perspective of ED utilisation by cancer patients. The information from these meetings was used to guide additional searches. While this did not result in new studies being identified, it raised questions regarding the contrast between what these clinicians identified as common reasons for cancer patient presentation to ED, perception cancer patients have low levels of inappropriate presentation to ED, and the main area of ongoing concern for ED staff was the unmet need for rapid access to palliative care services. While cancer was not addressed specifically in any of the state based reports on ED care, it was outlined that changes and new models had benefited this group of ED patients. Three examples of recent changes in ED models of care that were thought to have an impact on cancer patients were: reclassification of febrile neutropenia to category 2, with associated increase in education and development of clinical pathways²⁰ and awareness among ED staff; early assessment by senior ED staff; and direct referral to specialist services for patients requiring admission. It is not the intent of the authors to suggest these conclusions are evidence based, nor generalise to all ED/cancer centres. This information may inform future review or research questions. Attempts were made to follow up with authors of papers/posters from conference proceedings. Five authors were contacted and two replied, but at this time papers were still in preparation. In searching websites of key national organisations a number of reports were identified that, while not directly related to the three questions, provide important contemporary information on health policy and planning related to ED use.

7 Data extraction

A standard data extraction form was developed. Data extraction from the papers selected for review was performed independently by two reviewers, without blinding to authorship or journal publication, and results confirmed. If differences were identified they were resolved by discussion or referral to a third member of the team. Data from grey literature such as websites is presented with caveats regarding the evidence.

8 Results

Thirty-two papers were identified for inclusion and reviewed. Few papers were identified that focused specifically on review questions one or two. The extent to which the results can be generalised is limited by type of studies, limited intervention studies in this population and the intent of research. The findings in the reviewed papers are primarily descriptive, retrospective and collected from medical records. This information does not provide a complete picture of ED utilisation and reasons for this in cancer patients. Several of the studies identified examine a specific patient, treatment or symptom group only. These studies have been included as they provide information that could be incorporated into future research. A critical limitation of the review findings is the limited information that addresses whether the ED presentations were avoidable. For this reason we have taken a broad approach to inclusion of data on reasons for presentation and this will be discussed further in this review. No studies were identified that focused on rural or Indigenous populations, and only one paper examined culturally and linguistically diverse (CALD) background patients' utilisation of EDs. Article summaries are provided as appendix 3.

8.1 Question 1: Attendance at Emergency Department services

Which factors are associated with, or predict, the avoidable use of ED services by cancer patients?

High risk factor profiles of interest include:

- Disease-related factors, e.g. symptoms, advanced disease type/stages, including symptoms relating to the palliative/terminal phase of illness
- Treatment-related factors, e.g. complications and side effects, serious adverse events, pain
- Patient-related factors e.g. demographics, psychosocial, disease comorbidities (such as diabetes and COPD); culturally and linguistically diverse communities; Aboriginality; rural/remote location.

There is insufficient quality evidence to specify the risk factors for preventable ED utilisation in cancer patients. The findings from the descriptive studies highlight trends or factors that could guide more detailed examination related to tumour type, stage of disease, treatment modality or individual characteristics. Caution is needed in limiting consideration of risk factors to those identified to date.

Disease-related factors associated with ED presentations have been identified in a small number of the papers. Ellis-Brookes and colleagues²¹ examined paths to diagnosis for 739,667 newly diagnosed cancer patients between 2006–2008 using data-sets on hospital utilisation, cancer registry, and screening programs in the UK.²¹ Of the eight paths described, ED presentation accounted for 24% of the total number. Emergency department presentations leading to diagnosis of cancer included individual patient presentation and urgent referral to EDs by GP or specialist due to suspected malignancy. The incidence of diagnosis through ED presentation increased with age. Tumour type most likely to be diagnosed in EDs includes CNS tumours (62%), pancreatic cancer (50%) and lung cancer (39%).²¹ Across all tumour groups those diagnosed via an ED presentation had significantly poorer overall survival at one year. In response to this paper, the review team searched for studies that examined location of cancer diagnosis. No other

papers were identified that specifically focused on ED as a path to diagnosis. The National Cancer Intelligence Network (NCIN) UK has established a method for examining pathways to diagnosis²², and this is a key indicator for cancer care in the UK. The most recent NCIN report for the period 2006–2008 identified 24% of new cancer cases were diagnosed in EDs, and these patients had poorer survival overall.²³ As age increased, the number presenting to EDs also increased. Consequent to this report a number of local health networks have commenced projects to reduce the number of cancer diagnosed in EDs (<http://www.ncin.org.uk/home.aspx>).²⁴ No data on location of diagnosis was able to be sourced for Australia.

Beatty and colleagues²⁵ investigation of lung cancer patients' presentation to EDs in NZ found a high proportion of lung cancer patients were diagnosed in EDs, with ethnicity and advanced stage of disease increasing the chance of initial diagnosis occurring in EDs. These authors also noted that an initial presentation to ED led to faster access to lung cancer treatment. Across tumour groups, lung cancer featured most commonly among the studies reviewed. Lung cancer was either the primary focus of the study^{25,26}, or identified as having a higher presentation rate, mainly due to associated symptoms such as dyspnoea.^{27–29}

Four studies examined reasons/symptoms that led to cancer patients' presentation to ED. Three were retrospective and one was a prospective study. Fever, pain, chemotherapy-induced nausea and vomiting (CINV) and dyspnoea were the most common symptoms leading to presentation. Ferrer-Perez and colleagues²⁹ prospective study of 251 cancer patients found fever, tumour-related pain, dyspnoea, and nausea and vomiting were the most common symptoms leading to presentation; lung, colorectal and breast were the main primary tumours seen (American Society of Clinical Oncology (ASCO) abstract). In this cohort the majority of patients had metastatic cancer and nearly half were receiving active chemotherapy at time of presentation. Almost half (48%) required hospital admission post-presentation. As will be explored below, type of cancer treatment influenced the symptoms patients presented with. Based on the small number of studies, pain and dyspnoea appeared to be the most common potentially disease-related symptoms that led to patients presenting to EDs, though this distinction was not a focus of the papers.

Most common symptoms associated with presentation to ED

- Fever
- Pain
- CINV
- Dyspnoea

Treatment-related factors associated with chemotherapy and related toxicities, such as fever, febrile neutropenia (FN) and CINV, were identified in a number of the studies included in the review. Febrile neutropenia and the management of this complication of chemotherapeutic treatments was the most common topic in the papers reviewed. Of note, haematology patients were only included in these studies of emergency management/prevention/risk reduction of FN.

Febrile neutropenia is considered a potential oncological emergency. Individuals with FN can rapidly deteriorate and can die if not treated promptly. The standard instruction to patients is to present to an ED if they experience a significant fever. This was clearly reflected in the papers, with the focus on timely assessment and intervention upon arrival to an ED examined in three studies. André and colleagues³⁰ prospectively examined FN management in 47 EDs across France in a six-month period, examining patient group and treatments instigated. The reported clinical standard for use of prophylactic granulocyte colony-stimulating factor (G-CSF) was greater than one risk factor for FN. Only 40%¹⁹ of the EDs had written protocols for FN management, and only 15 of these had been reviewed by oncology/haematology departments. The authors report that only 7% of 198 patients who presented and were treated for FN, received appropriate management according to the national French guidelines. Septic shock was reported in 45% of the patient cohort. Less than a quarter received first dose of antibiotics within 90 minutes and 18 patients required admission to an intensive care unit (ICU).

The study authors report that individuals with less severe FN were more likely to receive appropriate management or be over treated.

A second study of patients receiving treatment for haematological malignancy presenting to EDs found long wait times before patients were seen and treatment instigated.³¹ This American study found patients with fever presented late to EDs, and further delays occurred after arrival, with an average of 75 minutes before review and 210 minutes before antibiotics commenced. This contrasts significantly with an Australian study of two large metropolitan cancer centres in Victoria. Livingstone and colleagues examined ED presentations for FN in patients receiving chemotherapy in a 12-month period.³² Using retrospective audit, the researchers identified 200 presentations for FN to EDs in the nominated period, with a median wait time of ten minutes. Nearly all 200 patients were classified as Australian Triage Score 2 or 3; however, only 60% were seen within the recommended time. While few admissions to ICU were required, when these did occur cost of care was increased. There was also a trend to increased costs for treatment for FN associated with individuals from lower socioeconomic and CALD backgrounds. Victorian studies of ED utilisation have also identified increased attendance among those of CALD background.³³

Within the broader literature on FN secondary to chemotherapy, debate exists in relation to the prevention of FN through use of prophylactic use of colony growth-stimulating factors and early use of oral antibiotics as outpatients, and reducing costs associated with FN. While no studies specifically examined these areas in relation to ED utilisation, it is evident that there is strong interest in this area that warrants further consideration in planning future projects.

Analysis of a population-based data set of FN in adult cancer patients from 92 Victorian hospitals found the cost of treating FN was higher in patients with haematological malignancies, especially multiple myeloma.³⁴ Patients with solid tumours accounted for 40% of 2599 FN episodes, and nearly a third of the FN episodes led to hospitalisation of longer than 15 days. Lingaratnam and colleagues³⁵ (authors of the Australian consensus guidelines for management of neutropenic fever in adult cancer patients) in a second paper examined ambulatory management of low-risk FN from morbidity data from Victorian hospitals. These authors concluded that ambulatory management for low-risk FN was safe and significantly cheaper to the health service. The authors caution that further work is needed before moving to this approach, including examination of potential additional resource implications.

Two studies were identified that reported radiotherapy treatments and ED utilisation. Murphy and colleagues examined healthcare utilisation associated with mucositis in patients receiving radiotherapy for head and neck cancer.³⁶ While ED utilisation was not an outcome, hospitalisation due to radiotherapy side effects was reported. Murphy and colleagues found 37% of patients were hospitalised during treatment, with the average length of stay five days. The more severe the mucositis the more health care resources used. An abstract from an annual meeting was identified, and given the limited research has been included in the report.³⁷ The authors were contacted regarding subsequent publications of this study, but this has not been completed to date, though is in train. Results reported in the published abstract show that approximately 20% of the 500 patients treated with external beam radiotherapy had an unplanned admission to hospital, with pain, and respiratory and neurological symptoms being the most common reasons. The authors report that palliative intent of treatment, concurrent chemotherapy and not being married increased the risk of an unplanned presentation. No conclusions should be drawn from this brief description.

One study on surgical intervention for cancer and ED utilisation was included. This was a significantly smaller number than the team anticipated, despite extending search terms to include 'readmission post-surgery', and variations of this term. There is a body of published research focused on 30-day readmission post-surgery that focuses on non-malignant conditions. It is possible that in some of these studies cancer patients may be included without being the key focus of the paper, or analysed separately. A number of studies were identified that investigated

feasibility of shorter length of stay, fast-track surgery and day-only admissions in surgery for cancer. All of these studies reported low ED readmission rates and did not address the specific review question. Fauci³⁸ examined readmission rates and reasons for women's post-surgery for ovarian cancer. Of the 33 out of 207 patients who had a readmission within 30 days of surgery, bowel obstruction, wound complications, and venous thromboembolism (VTE) were the main reasons. The study authors report higher comorbidities among those that required readmission.

Vandyk and colleagues³⁹ completed a systematic review of symptoms that might predict ED use with cancer patients. Data was extracted from 18 studies; 12 were retrospective cohort studies and six were prospective cohort. Sixteen of the 18 studies reported patient admission as a key outcome, with FN the most common cause for admission. However, this was also the focus of several of the included studies.

Other chemotherapeutic-related causes for ED presentation were identified in this review, most commonly CINV.^{27,29,33,39-41} In a NSW retrospective study of unplanned presentations to EDs and cancer centres among patients receiving chemotherapy, 469 unplanned presentations were identified within the 12-month period.⁴¹ Of these, 253 were within four weeks of receiving chemotherapy and 87% of this group required admission to hospital. Reasons for unplanned presentation were CINV (45%), pain (27%) and FN (23%). Patients reported symptoms had been present for several days prior to admission. In women receiving chemotherapy for breast cancer in Europe, 34% were reported to experience grade 4 CINV.⁴² A US study also highlighted the impact CINV has on healthcare utilisation.⁴³ The research found two out of three unplanned hospitalisations occurred within the first two cycles of chemotherapy, with CINV and infection the predominant reason. Chemotherapy-induced nausea and vomiting has been a focus for research and clinicians, with new anti-emetic agents leading to improvements in management. These studies suggest, however, that CINV remains a problem for cancer patients and leads to increased healthcare utilisation. It is unclear from any of the studies what factors may also have influenced the incidence of CINV, such as access to medications, adherence to prescribed anti-emetic regimens and tailoring treatment to individual risk factors.

In contrast to these studies, an Australian study that investigated change in breast cancer hospitalisation over a ten-year period in a regional treatment centre, presents a more positive picture.⁴⁴ The notable changes included reduced hospitalisation for adjuvant treatment; decline in FN events; decline in admissions for supportive care, including pain management, hypercalcaemia, and palliative care. An increase was seen in the number of patients with cerebral secondaries. ED presentations are not reported. The suggested improvement in supportive care is promising and reflects the evolution of new supportive care treatments. The extent to which the supportive care needs are being managed optimally in the community, and the patients' experience, remains unknown.

Patients in the palliative care phase of their illness that present to EDs have been examined in a large number of papers and several systematic reviews.^{27,45-50} A limited review of end of life and palliative care and ED was undertaken as this area is currently being examined in detail in an associated project. Symptoms such as pain, dyspnoea and weakness featured strongly in reasons for presentation to ED. In addition, new symptoms associated with progressive disease can precipitate an ED presentation. In Leaks' study on 283 cancer patients who died in EDs, for 71% it was their initial presentation.²⁷ Respiratory distress was the most common reason for ED presentation, and more than one-third of those who died had lung cancer. In a systematic review of place of death, haematology patients were found to be twice as likely to die in an acute setting and less likely to die in a hospice setting.⁵¹ This descriptive review covered more than 40 years, drawing on data from the past 10-20 years in reporting findings.

ED visits among Canadian cancer patients at end of life confirms the increased ED utilisation among individuals diagnosed with lung cancer.⁵² This retrospective cohort identifies high ED utilisation among cancer patients; 76,759 of 91,561 patients attended ED during the last six

months of life and 31,076 in the last two weeks of life. Lung cancer was the most prevalent group in the last two weeks of life and the second most common in last six months of life. The authors suggest a number of preventable conditions led to ED presentation, such as constipation. Of note, 77% of patients who presented within the last two weeks of life died in the acute setting. Comorbidity such as dementia and increasing age were identified by Legler as factors that influenced ED admission.⁵³

No publications of any type were found that examined ED utilisation in cancer patients in rural and regional areas, Indigenous Australians or specific comorbidities. Two studies examined the impact of being from a CALD background on ED presentations. Beatty (2009)²⁵ examined diagnosis of lung cancer in NZ among Pasifika groups, finding this was most likely to occur in EDs, and that patients would present with more advanced disease. The initial presentation via ED was likely affected by: stage of disease (advanced>early) and ethnicity (Pasifika>other). Craike and colleagues examined ED use among cancer patients from CALD backgrounds in two Victorian health services.³³ Cancer patients from CALD backgrounds were found to be more likely to present to EDs, more likely to present on more than one occasion, and appeared to experience more physical concerns such as CINV, fever and cardiac comorbidities. This retrospective audit was unable to examine possible reasons for this variation. McKenzie's study⁴¹ in NSW found CALD background was not a predictor of ED utilisation.

8.2 Question 2: Identifying effective interventions

Interventions are defined as strategies or models of care which aim to reduce inappropriate presentation of cancer patients to EDs, including education; access to alternative care pathways; care coordination strategies; emergency bypass pathways; and care pathway technologies. Few studies have been completed that test the alternative pathways. In Australia care coordination for cancer patients has been rolled out across most states and territories. However, to date there is no consistent approach to data collection to determine whether this role has had an impact on ED utilisation. Currently a number of studies are underway in the UK and Canada evaluating alternative models to provide acute services for cancer patients and reduce ED utilisation. The results of these studies are likely to become available in late 2013–early 2014. The studies being undertaken in Canada are focusing on ED utilisation overall, incorporating rapid assessment of the elderly, nurse practitioners in ED coordinating care and exploration of models for end-of-life care.

Risk assessment

As noted earlier, the focus of studies has predominantly been on chemotherapy patients, with a strong emphasis on FN, need for rapid assessment, and management of this potentially life-threatening side effect. Guidelines for risk assessment for FN have been established by Multinational Association of Supportive Care in Cancer (MASCC).⁵⁴ Despite the obvious benefit in identifying those at risk, the uptake of this tool into clinical settings has been very small. Donohue⁵⁵ examined the impact of implementing routine risk screening and treatment algorithm for preventing chemotherapy-induced neutropenia in a community oncology practice in the US. In this small retrospective study of 35 patients, risk assessment was undertaken and GCSF was prescribed to patients at higher risk as per the local evidence guidelines. The number of treatment delays due to neutropenia decreased significantly post implementation of risk screening. The extent to which risk screening for FN is undertaken routinely within Australian cancer settings is unknown. The Australian consensus guidelines for the management of neutropenic fever in adult cancer patients⁵⁶ recommend risk stratification, though the low uptake of this in Australian centres should be noted.

CINV was identified as a common reason for ED presentations. The MASCC anti-emetic assessment tool has been shown to directly impact patient outcomes related to CINV through early identification of a patient's individual risk factors, enabling treatment teams to modify a prophylactic anti-emetic regimen in response to the identified increased risk.^{57,58}

Prevention of complications/reducing treatment related toxicities

In addition to risk assessment, FN guidelines outline that for those at high risk of developing FN, prophylactic GCSF should be administered. As noted by Lingaratnam and colleagues⁵⁹, this appears to have a low and variable uptake among Australian centres. It is unclear the extent to which GCSFs are used prophylactically in any country, and there is variability about recommendations in consensus guidelines.

Prevention of high-risk complications such as VTE with prophylactic anticoagulants has been implemented across Australia by the NHMRC, with initial feedback reporting adoption of these guidelines within specialist centres.

Primary community pathways

A randomised controlled trial of a nurse-led home-based education and support program for patients receiving oral chemotherapy improved patients' quality of life, but also reduced unplanned appointments and admissions.⁶⁰ This was the only paper that examined primary care-based interventions to reduce hospital utilisation.

Acute Oncology Unit

In the UK, in response to a review of cancer deaths secondary to FN, alternative models for providing out-of-hours access to medical care for cancer patients are being examined. The Acute Oncology Unit is one example currently funded by McMillan until late 2013. The Acute Oncology Unit is collocated but separate to the ED at a regional hospital. It has four beds and is staffed by oncology-experienced nurses and a registrar. Patients attend the unit instead of the ED unless there is a life-threatening or non-cancer-related reason for presentation. The team leader, Dr Elaine Lennon, reports that initial feedback has been positive, with the unit providing rapid access to medical review and timely intervention for patients with FN. A similar model has been established in NSW, though staffing numbers are significantly lower.⁶¹ Formal evaluation of this model was not able to be sourced for the review but is being undertaken.

In March 2013, an Acute Assessment Area was opened at a Melbourne cancer centre.⁶² The four-bed area is located near an ICU and staffed by clinical nurses, and is open 24/7. Patients making unplanned admission and requiring treatment can be seen in this centre. No further information was available at this time.

8.3 Question 3: Applicability to the NSW setting

The team are unable to comment on the applicability of alternative models of providing ED care for the NSW setting due to the lack of research evidence to support recommendations at this time. Risk assessment for both FN and CINV are applicable to the NSW cancer setting. It is not known to what extent these tools are currently being used.

8.4 Reflections on the literature

There are a number of limitations to this descriptive rapid review that have led to the lack of evidence based recommendations. As previously identified, studies included in this review were descriptive and mainly retrospective. The overall quality of the included studies was inconsistent and not high, making rating difficult. Due to the paucity of quality research, papers and conference abstracts have been included as they provide some guidance or information to inform next steps, as opposed to meeting the standards for inclusion in a systematic review.

The core questions that guided this review remain, in part, unanswered, highlighting a number of gaps in current knowledge or limitations to the review findings. The extent to which cancer patients' access ED services, if this is appropriate utilisation of ED services and leads to the best outcome for the cancer patient, is unknown. No evidence was found to determine what proportion of cancer patient utilisation of ED services was preventable.

Only a small number of papers included patients with haematological malignancies, and these primarily focused on management of FN. A larger number of studies overall focused on palliative care, end-of-life care and cancer patients who died in ED. Studies from the US often focused on cost and insurance and access to hospice services, which are time limited. No studies were identified that examined either patient or carer reasons for attending EDs, or the perspective of primary health care professionals. To date there is no published research on alternative models to EDs for cancer patients, though these studies are underway. A key focus of the alternative models appears to be optimising timely access to treatment for FN.

Examination of ED utilisation for any group of patients frequently focuses on approaches to prevent 'inappropriate presentations'. What constitutes an 'avoidable or inappropriate' presentation to EDs is difficult to define within the context of cancer patients. This is potentially easier for patients in the palliative care phase of their cancer illness. As highlighted in several of the studies, however, for lung cancer patients the presentation to an ED can be both where the initial diagnosis is made and their last admission. This has broader implications for examining pathways to diagnosis for this, and potentially other, groups of patients. Only one of the included studies identified a presenting symptom that could have been managed outside of the ED.

The emergency department is one entry point to the acute sector for unplanned/unscheduled presentations. Two of the papers reviewed identified cancer patients who made unplanned presentations to other departments. The extent to which this should be a consideration is dependent on the research question and overarching aim. The broad scope of this review was ED utilisation by cancer patients. Alternatively, it could have been the reasons for unplanned/preventable presentations by cancer patients. The current literature does not reflect the number of out-of-sequence unscheduled presentations patients may make to ambulatory care units, outpatient departments or other acute clinical areas. ED utilisation provides information of only one entry point for unplanned admission.

What has not been examined in any of the studies are the many other factors that may influence an individual cancer patient to present to the ED. Presentation to the ED may occur due to a complex interplay of personal, practical and emotional factors, in addition to the physical concerns. External factors that can influence presentation to the ED could include advice given by the treating team; availability of alternative healthcare service or out-of-hours care; condition not amenable to treatment by primary care team; and patient/carer safety. These aspects and the gaps in knowledge have guided the recommendations outlined below. The recommendations may alter based upon the analysis of ED utilisation in NSW and reasons for these. The review team would welcome the opportunity to discuss these in detail at a later date, if appropriate.

9 Recommendations

9.1 Address key knowledge gaps

1. CINSW has planned to examine utilisation of EDs by cancer patients in NSW. It is recommended that consideration is given to including:
 - Number of cancer-related presentations to EDs, outcomes, triage classification
 - Number of cancer patients who made more than one presentation to ED
 - ED centre and residential postcodes
 - Inclusion of at least one regional and one rural site
 - In addition to demographic and cancer-specific data: age, reasons for presentation, and consideration of data extraction including comorbidities, social history, ethnicity and CALD background
 - Time between presentation and date of last cancer treatment
 - Frequency of presentations
 - Patient outcome, potentially including time between ED presentation and death
 - If patient was receiving cancer treatment at the time
 - Reasons for presentation classified by treatment-related, disease-related, comorbid conditions, including referral to ED (i.e. patient/carer decision, treating team, cancer nurse coordinator, GP)
 - Subgroup analysis of area with high local population from CALD backgrounds
 - If feasible, subgroup analysis of ED as a pathway to cancer diagnosis
 - Studies in non-cancer populations have identified risk factors for ED attendance including age, comorbidities and social isolation
2. Prospective investigation with cancer patients and family on decisionmaking regarding attending ED and antecedents, including exploration of barriers and facilitators to attending ED and primary care health professionals. Exploration of patient expectations and experience of ED attendance could also be included
3. As ED presentations provide only one aspect of unplanned presentation, give consideration to investigating frequency and reasons for **all unplanned** presentations made by cancer patients

9.2 Febrile neutropenia

4. A clinical audit of current approaches to risk assessment for FN, and local policies at cancer centres in NSW, would provide a better understanding of current practice, and could inform subsequent implementation strategies
5. Develop an audit tool kit for reviewing the management of FN in EDs that can be undertaken by the ED or cancer department on a regular basis as a quality improvement activity. This information could be submitted de-identified to a central data base to provide ongoing reporting on implementation of the Australian consensus guidelines for the management of neutropenic fever in adult cancer patients.

9.3 *Avoidable presentations to EDs*

6. The CINSW consider approaches to develop an agreed taxonomy for avoidable presentations in collaboration with clinicians. An initial focus on palliative care may provide a starting point for this potentially complicated project and build on the work currently being undertaken in palliative care
7. In conjunction with the NSW Ministry of Health ED Taskforce, obtain senior ED medical and nursing staff perspective of ED utilisation by cancer patients, areas of concern and potential strategies
8. Examine the potential role of other healthcare providers in preventing admission to EDs, including primary health care (GP, practice nurse and community nurse)
9. Examine the role and contribution cancer nurse coordinators could make in ED utilisation
10. Consideration be given to identifying key priority areas or patient groups. The absence of many cancers in the review outcomes was of note

9.4 *Management of CINV*

11. In collaboration with senior cancer and haematology nurses, eviQ and/or translation research centres, examine current risk assessment and screening for CINV and approaches to improve baseline assessment and ongoing monitoring, and documentation

9.5 *Risk assessment*

12. Consider potential role of non-cancer risk assessment instruments and the potential for adaption following analysis of NSW ED data

9.5 *Alternative models*

13. Monitor the progress and outcome of ongoing projects in the UK and Canada through CINSW

9.6 *Palliative care*

14. The outcomes of the review of palliative care patients' health care utilisation have the potential to inform next steps. As pain and dyspnoea were the main symptoms identified as precipitating an ED presentation, these symptoms are specifically examined in the concurrent work being undertaken in palliative care.

10 Conclusion

This rapid review has confirmed that little formal research has examined cancer patients' ED utilisation. The extent to which any presentation is avoidable remains unknown and requires further exploration. Analysis of NSW ED data for cancer patients would provide clarity and important utilisation information to guide the development of interventions to reduce inappropriate ED utilisation. Physical symptoms such as pain, fever, weakness and CINV have been identified as antecedents to an ED presentation. If confirmed in the review of ED data, opportunities to improve the management of symptom management will be able to be developed.

11 Appendices

Appendix 1: Search strategies

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Appendix 4: Cancer & ED rapid review

Appendix 1: Search strategies

Table 1: Results individual search strategy

Number	Search	Search strategy (all terms exploded and tw included)
1	Health service use (general terms only)	Utilization review, hospitalization, hospitals, hospital utilisation, health service utilization, emergency department utilization, after hours, service utilization Search returned: 253,884 results
2	CINV	antineoplastic agents, antineoplastic combined , chemotherapy protocols, chemotherapy, chemotherapy induced nausea, cinv, cytotoxic, cytotoxic therapy, dehydration, induced, nausea therapy, vomiting Search returned: 813,091 results
3	VADs	Access, cath catheter, catheter-related infections, catheterization, central venous, catheterization, peripheral central, central line, device, device\$, hickman, hickman catheter, hickman\$, implanted lines peripheral, peripheral access device, picc port, vascath, vascular, venous Search returned: 19,884 results
4	Acute oncology	Acute, acute oncology, acute oncology service\$, oncology, service\$ Search returned: 12 results
5	After hours care	Admission, after, after-hours care, cover, hours, of, out, out of hours, recurrent Search returned: 2168 results
6	Cancer	Cancer emergencies, h#ematology, hematologic, neoplasms, malignan\$, neoplasm\$, neoplasms, oncolog\$, patient\$, radiotherapy, radiotherapy, adjuvant Search returned: 2,613,827 results
7	Dyspnoea	Breath, dyspn#ea, dyspnea, dyspnoea, effusion of pleural, pleural effusion, shortness Search returned: 56,437 results
8	Emergency medicine/ED	Department, emergency, emergency department , emergency medical services, emergency service, hospital presentation\$, emergency room, emergency service, emergency telephone, telephone, triage, triage, urgent, utilization (all expanded, tw) Search returned: 136,243 results
9	Febrile neutropenia	Febrile, neutropeni\$, neutropenia, neutropenia\$, neutropenic, neutropenic sepsis, sepsis, Search returned: 30,129 results
10	Head and neck cancer	head.mp. and neck cancer.tw. [mp=title, abstract, original title, name of substance word, subject heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] Cancer, head neck Search returned: 11,667 results
11	Lung cancer	lung cancer, lung neoplasms malignancy pulmonary, pulmonary cancer Search returned: 173,202 results

Number	Search	Search strategy (all terms exploded and tw included)
12	Pain	Cancer, chronic, emergency, malignant, pain Search returned: 479,233 results
13	Palliative care	Care, dying, end, ill, life of palliative, palliative care, patient, terminal, terminal care, terminally, terminally ill Search returned: 73,737 results
14	Patient outcome/prediction	Outcome, outcome\$, patient, prediction Search returned: 606,574 results
15	Spinal cord compression	Compression cord, cord compression spinal, spinal cord compression, spinal cord neoplasms, spinal neoplasms Search returned: 27,352 results
16	Triage	Triage, triage assessment Search returned: 11,417 results
17	Unplanned admissions	Admission, admissions, appointments, length of stay, non-scheduled, patient discharge, patient readmission, readmission unplanned, unplanned admission, unscheduled Search returned: 72,989 results
18	MOCs	Care, clinical, critical pathways, models of pathway\$, pathways, patient care team, period ,shared, shared care, treatment Search returned: 72,133 results
19	Outpatient	Outpatient, outpatient\$, outpatient Search returned: 105,936 results
20	Self-care/prevention ('secondary prevention' term)	prevention, secondary prevention, self-management, Self Care Search returned: 357,188 results
21	Self-care/prevention ('tertiary prevention' term)	Prevention, tertiary prevention, self-management, Self Care Search returned: 357,510 results
22	Bowel obstruction	Bowel obstruction Search returned: 26,576 results
23	Pulmonary embolism	pulmonary embolism, pulmonary embol\$, deep vein thrombosis, Venous Thrombosis Search returned: 78,844 results

Table1. Results individual search strategy

Table 2: Examples of combined search strategies

Search combination
Cancer + unplanned admission
Cancer + unplanned admission + ED
Cancer + health utilisation
Cancer + ED
Cancer + ED + triage
Cancer + ED + health service use + unplanned admission
<i>Related articles</i>
Febrile neutropenia + MOC
Spinal cord compression + cancer + ED
Spinal cord compression + cancer + health service use
FN + self-care/prevention (both prevention searches)
Outpatient + cancer + self-care/prevention
Acute oncology + MOC
Outpatient + ED + unplanned
Triage + cancer
VAD + cancer
Bowel obstruction + cancer + unplanned admit + health service utilisation
Bowel obstruction + cancer + ED
Febrile neutropenia + ED + cancer
Spinal cord compression + ED + cancer
VAD + ED + cancer
VAD + ED
Pulmonary embolism + cancer
Pathological fracture + cancer + ED
Pulmonary embolism + cancer + ED

Appendix 2

Summary table 3: Grey literature search

Websites	Care Search NSW Health reports related to ED Nuffield Trust Kings Trust MacMillan Australasian College for Emergency Medicine (ACEM) Australian Australian Resource Centre for Healthcare Innovations (ARCHI) American College of Emergency Physicians
Conference proceedings	American Society of Clinical Oncology COSA Annual Scientific Meeting Cancer Nurses Society Australia International Society Cancer Care Nurses
Hand search key journals	Medical Journal of Australia AustralASIAN Emergency Nursing Journal BMJ Australian Journal of Rural Health Rural and Remote Health Journal
Government departments Australia, UK, Canada, US	AIHW Cancer Australia NSW Health BHI NHS Cancer Research UK Cancer Care Ontario Access to Care (Canada) NCCI US Cancer Councils of Australia CINSW

Appendix 3: Article summaries

Summary table 4: Cancer patients' ED utilisation and reasons

Article number	Author/ year/ country	RQ/topic	Study design/pop	Findings	Comments
Cancer patient: reason for ED presentation					
007 ⁶³	Bottle 2012 UK	Diagnosis of cancer in the ED	Evaluation study using national databases All patients with first admissions with primary diagnosis of cancer from 2007–2009, excluding those with any prior admission in past 3 years with cancer diagnosis	While nearly all practices recorded new cancer diagnosis, 67% always reviewed patients with cancer diagnosis in last 18 months Unadjusted analyses: Asian patients, patients >=85 years, women had highest odds of unplanned primary admission for cancer Variation across cancer type associated with area socioeconomic status (SES) and rurality Adjusted analyses: Only area-level SES for patients, practices where no GPs had UK primary medical qualifications remained significant	SES, some GP characteristics appear important for patients getting cancer diagnosis in ED. May also want to consider the other factors (age, ethnicity, rurality, gender) in the Australian setting
111 ⁴⁰	Yates 2009 UK	Assessment of reason for ED admission for cancer patients	Prospective audit. 1 hospital (catchment population 750,000), acts as network cancer centre and district general hospital	Reasons for admission: pain, shortness of breath, abdominal swelling, swallowing inability, loss of consciousness, chemotherapy induced nausea and vomiting (CINV)	Some admissions appear preventable with improved supportive care
029 ⁶⁴	Mayer 2009 US	Assessment of cancer patients who present to ED	Descriptive report. State of North Carolina. Data from all but two EDs in the state (110/112 EDs participate in the database program). Presentations during 2008	37,760 ED visits by cancer patients/4,190,911 ED visits state-wide (27,644 patients with cancer visited EDs) Primary complaints across all cancer patients: pain, respiratory, gastrointestinal (GI) . Respiratory most common complaint for lung cancer patients. Majority (63%) visits resulted in hospital admission. Lung cancer patients more likely to be admitted Nearly half of ED visits that resulted in discharge were during clinic hours	Symptom management/lack thereof appears to be associated with many ED visits. Implications for intervention. Also, high percentage of patients who visited during clinic hours suggests that ED may be being used as a backdoor to see oncologist i.e. have to be admitted through ED?

Article number	Author/ year/ country	RO/topic	Study design/pop	Findings	Comments
Cancer patient: reason for ED presentation					
024 ²⁹	Ferrer-Perez 2009 Spain	Reasons for cancer patient presentation at ED at large tertiary hospital	Prospective study. Cancer patients who present to ED	251 patients presented average 12 weeks Fever, tumour-related pain, dyspnoea, nausea and vomiting (n&v) most common symptoms leading to presentation Lung, colorectal, breast main primary tumours seen Most patients had metastatic cancer, nearly half receiving active chemotherapy at time of presentation Nearly half (48%) required hospital admission post-presentation	Some symptoms (dyspnoea, n&v) associated with presentation appear preventable and so presentations may be avoidable. Of concern is that many patients required admission post presentation
012 ³³	Craike 2010 Australia	Influence of CALD backgrounds (CALDB) on ED presentations	Retrospective audit. Patients receiving chemotherapy as day oncology patients in two Victorian health services who presented to ED between first treatment date and one month after final treatment date	CALDB more likely to present to ED than non-CALDB , adjusting for SES, gender, age CALDB also more likely to present to ED on multiple occasions , adjusting for other factors CALDB patients had more n/v/dehydration, cardiac problems and fever vs. Australian-born or from English-speaking countries	CALDB patients had higher odds of presenting to ED, including multiple presentations, and some of these presentations appear avoidable
097 ²⁵	Beatty 2009 NZ	Assessment of characteristics of patients presenting to secondary care through ED with lung cancer	Retrospective study. Auckland-Northland region. Contains four District Health Boards (DHB) (Area Health Service equivalents) and a regional oncology service. Patients with diagnosis of primary lung cancer in 2004 who received secondary care in a DHB in the region	Likelihood of initial presentation via ED affected by: stage of disease (advanced>early), ethnicity (Pasifika>other). GP referral to ED varied with ethnicity (Pasifika<other). Faster treatment if initial presentation was via ED. Presenting symptoms largely respiratory (67%), but few had haemoptysis. Nearly all (93%) presenting cases got palliative treatment	High rate of presentation to ED as first diagnosis for lung cancer patients , and patients largely admitted with advanced disease (unclear why; possibly due to advanced stage of disease). Need to look at diagnosis in primary care as possible factor, particularly for CALDB patients

Summary table 5: Cancer treatment modality, side effects and ED utilisation

Article number	Author/ Year/ Country	RQ/topic	Study design/pop	Findings	Comments
Surgical cancer patients					
076 ³⁸	Fauci 2011 US	Assessment of risk factors for 30-day hospital readmission after surgery for ovarian cancer	Retrospective review readmission rates in 207 patients 30 days post-surgery for ovarian cancer	33/207 patients readmitted within 30 days of surgery. Higher number of comorbidities in readmission group. Reasons for readmission bowel obstruction/ileus/wound complications, VTE	Authors recommend nurse telephone followup could reduce number of unplanned readmissions
Chemotherapy related admissions to ED					
070 ⁴¹	McKenzie 2011 Australia	ED and cancer centre unplanned presentations by chemotherapy outpatients	Retrospective study. NSW, tertiary Sydney hospital. Outpatients with solid tumours (non-haematology) receiving chemotherapy at hospital's cancer centre within six months before unplanned presentation	469 unplanned presentations from 316 patients 253/363 presentations (69.7%) were within 4 weeks getting chemo, largely within first two weeks post-treatment 318/363 (87.6%) led to admission, median length of stay (LOS) 5 days Estimated cost \$380 per ED visit, \$1188 bed-cost/day for hospital Most presentations related to side effects (SE): n/v (45.2%), pain (27%), and fever/FN (23.4%). Patients usually had SE for 2–7 days prior to presentation	Help seeking delayed, presentations for CINV may be preventable
048 ³⁶	Murphy 2009 USA	Examination of mucositis-associated health care utilisation by head and neck cancer (HNC) patients	Prospective multicentre study. Patients with HNC receiving radiotherapy (RT) as primary therapy or post-op therapy and did not have prior RT. Six cancer centres; size, location unspecified	37% patients hospitalised during study. Estimated 30% resulted directly from mucositis Mean LOS in hospital 4.9 days. Difference for patients by soreness severity: mean LOS 3d for patients with max score of 'no' severity vs. mean LOS 5.2 days for patients with max score 'quite a lot/extreme' severity Higher healthcare utilisation more generally for patients with higher soreness scores, including nutritional visits	Mucositis-related admissions appear prevalent and costly. Potential area for intervention i.e. symptom management

Article number	Author/ Year/ Country	RQ/topic	Study design/pop	Findings	Comments
Chemotherapy related admissions to ED					
146 ⁴²	Schwenkglenks 2009 Europe (several countries)	Risk factors for CINV in breast cancer patients	Prospective study. Breast cancer patients (subset of study which also included non-Hodgkin lymphoma or Hodgkin lymphoma)	<p>34% patients had grade 4 CIN</p> <p>CINV grade 4 most common in patients with taxane-containing sequential regimens</p> <p>Most chemotherapy-induced nausea (CIN) grade 4 events during first treatment cycle; small percentage patients had no CIN at all. Also saw CIN less than grade 4</p> <p>G4 CIN associated with dose delays, dose reductions, reduced relative dose intensity (RDI)</p> <p>Predictors: older age, lower weight, higher planned dose intensity (doxorubicin, epirubicin, docetaxel), more planned cycles, vascular comorbidity, lower baseline white blood cell count, higher baseline bilirubin</p> <p>Model positive predictive value (PPV)/negative predictive value (NPV) varied; 'any cycle' for grade 3 or higher had better PPV than grade 4 CIN 'any cycle' model</p> <p>Baseline bilirubin a predictive factor to consider</p>	Treatment and clinical factors to consider for potential intervention to reduce likelihood of grade 4 CIN in breast cancer patients

Summary table 5: Cancer treatment modality, side effects and ED utilisation

Article number	Author/ Year/ Country	RQ/topic	Study design/pop	Findings	Comments
Chemotherapy related admissions to ED					
01432	Livingston 2011 Australia	Characteristics of newly diagnosed cancer patients receiving chemotherapy as outpatients who present to ED	Retrospective audit. Victoria. Outpatients clinics at two largest metropolitan public health services over one-year period	<p>32.5% patients presented to ED at least once during treatment total of 1364 ED patient visits. Majority of patients presenting (60.9%) presented once</p> <p>Median wait time 18.5 mins (6–60)</p> <p>Median ED LOS 6.3 hrs (3.9–9.8)</p> <p>FN, n/v/dehydration most common discharge diagnosis</p> <p>58.8% ED presentations resulted in hospital admit; median hospital LOS 4.7d (2–8). Hospital discharge diagnosis neutropenia, unspecified cancer complications, chest infection/pneumonia/dyspnoea, diarrhoea/constipation</p> <p>ED discharge diagnosis of FN strongest predictor hospital admission, adjusting for other factors. Other diagnosis associated with highest rate admission: bowel obstruction/anal fissure formation, chest infection/pneumonia/dyspnoea, cancer complications. ED LOS, ED wait time also significant predictors of hospital admission</p> <p>Cancer types most likely to result in hospital admission: lung, stomach, unknown primary</p>	<p>High percentage presentation and re-presentation rate among cancer patients receiving outpatients chemotherapy</p> <p>ED LOS and median wait time as associated with hospital admission</p>

Summary table 6: Symptoms associated with ED presentation

Article number	Author/ Year/ Country	RQ/topic	Study design/pop	Findings	Comments
030 ³⁹	Vandyk 2012 N/A	Symptoms of cancer patients presenting to ED & the hospital admission, mortality rates of these patients	Systematic review Studies published in English or French since 1980, available in databases (MEDLINE, CINAHL, PsycINFO, Embase) or via hand search from references in included studies	1403 retrieved, 1298 potentially eligible, 33 reviewed in full, 18 included Studies mostly retrospective cohort (n=12), prospective cohort (n=6) Most data collected from medical records (n=16). Inconsistencies around symptom definition, especially re fever (inconsistent definitions & parameters) Most common symptoms seen: fever and infection, GI, pain, respiratory, bleeding Most studies (16/18) reported hospital admissions. Admission most common for studies looking at FN Mortality rates varied across studies and not reported by all studies (11/18). Highest rate for neutropaenic enterocolitis	Predominant presenting symptoms identified. Fever a major driver and resulted in many admissions (however this is probably appropriate). Other symptoms e.g. GI, pain, may be preventable through intervention
008 ⁶⁵	Escalante 2008 US	Fatigue in cancer patients presenting to ED	Retrospective chart review. Emergency centre at specialist cancer centre. Patients with cancer diagnosis, record of patients rating of fatigue severity during triage, medical record, emergency centre record included. Analysed every 3rd patient evaluated who met this criteria (non-random sample)	54% patients had severe fatigue during 24 hours prior to ED admission, although fatigue not primary reason for ED presentation. Severe fatigue at triage associated with hospital admission and patient death vs. post-treatment discharge. Women, elderly with solid tumours had significantly higher fatigue levels. Solid-tumour patients had higher fatigue levels than haematology (haem) patients. Fatigue higher in patients with progressive vs. stable disease, likewise worse Eastern Oncology Cooperative Group (ECOG) status patients had higher fatigue and often had acute illness. For haem patients: only dyspnoea significant factor predictive of severe fatigue For solid tumour patients: dizziness, severe pain, poor ECOG performance status, female gender significant factors predictive of severe fatigue	Has identified some potential symptom clusters which can be further examined in other ED populations. Severe fatigue is of concern given association with subsequent admission and problems

Summary table 7: Febrile neutropenia

Article number	Author/ Year/ Country	RQ/topic	Study design/pop	Findings	Comments
Febrile neutropenia					
019 ³¹	Nirenberg 2009 US	Assessment of waiting time in ED for patients with FN	Prospective study Large urban health centre. Adult cancer patients undergoing chemotherapy or RT with FN presenting over one-year period to ED and with new diagnosis acute leukaemia or recent allogenic bone marrow transplant (BMT)	Most patients had haem malignancies (multiple myeloma or non-Hodgkin lymphoma) – however may reflect cancer centre as it specialises in this Mean 21/24 fever prior to presentation, 52% patients in group 3 risk category 75 minutes median waiting time from ED presentation to examination, 210 minutes median time from ED presentation to antibiotics given All patients admitted to hospital; 330 minutes mean time in ED, median 2 days to becoming afebrile Longer wait time between ED admission, lab value posting for higher FN risk patients Longer wait time between ED admission, antibiotic admin for later cancer stage patients	Slow time to present from fever, particularly for advanced cancer patients, is of concern. Assessment x FN risk is of interest and not seen in many other studies

Article number	Author/ Year/ Country	RQ/topic	Study design/pop	Findings	Comments
Febrile neutropenia					
150 ⁶⁶	Livingston 2012 Australia	ED presentation for FN in chemotherapy outpatients & its clinical, economic impact	Retrospective audit. Victoria. Patients who received chemotherapy treatment at outpatients clinics at two largest metropolitan public health services over one-year period (2007)	<p>200 outpatient presentation episodes in 159 patients. 14.7% of 1364 oncology presentations to ED over one-year period</p> <p>82% had only one neutropaenic episode</p> <p>Nearly all classed as Australian Triage Score 2 or 3 but only 60% seen with in recommended time</p> <p>Median wait time 10 minutes(IQR 6–25.75)</p> <p>Median ED LOS 6.8h (IQR 4.2–13.2); median charge \$764.08 AUD (IQR \$463.59–\$1405.80)</p> <p>ED charges significantly associated with ED LOS (positive), SES (negative – lower SES, higher charge), country of birth (negative – non-Australian, higher charge)</p> <p>76.5% presentations resulted in hospital admission \$5640.87 (IQR \$2525.61–\$13,183) charge. Charges sig higher for haem patients than solid tumour patients (had longer inpatient admits though fewer haem patients in dataset than solid-tumour patients)</p> <p>Few ICU admits, however, very expensive when occurred (median \$9434.63)</p> <p>Big cost drivers for FN management: nursing charges, pharmacy costs, med-non-surgical, ED, imaging, pharmacy. Allied health, imaging costs low</p>	<p>Many cancer patients getting outpatient chemotherapy treatment present to ED. In ED, triaging appropriate, however, many patients not seen within clinically recommended period.</p> <p>Patients also spent long time in ED in general and it was costly; cost drivers identified. CALDB and low-SES patients were costlier to treat – possible area for intervention</p>

Summary table 7: Febrile neutropenia

Article number	Author/ Year/ Country	RQ/topic	Study design/pop	Findings	Comments
Febrile neutropenia					
064 ³⁰	André 2010 France	Assessment of FN management in the ED	<p>Prospective multicentre study. 47 EDs across the country, representative of each metropolitan region, over six-month period</p> <p>Median 500 hospital beds/ED, median ED visits for study period 17,679</p> <p>Well-defined study population: patients presenting at participating EDs with FN post-myelotoxic cancer treatment. FN defined as WBCC <1000/microlitres or neutrophils <500/microlitres, core temp above 38.3°C or 38°C on two consecutive occasions. Excluded any patients presenting with FN in non-participating ED setting</p>	<p>19 EDs (40%) had written procedure for FN management, 15 (32%) had 'formalised with oncologists/haematologists'</p> <p>198 patients met criteria (1 case/3930 ED visits)</p> <p>Most patients male, had solid tumour</p> <p>Self-referral to ED common (44%)</p> <p>Granulating colony stimulation factor (GCSF) use: 24% patients treated with GCSF but 88% had ≥1 risk factor which meant prophylactic GCSF should have been used</p> <p>Median time between chemo, ED visit 10 days (range 4–35)</p> <p>Septic shock/severe sepsis seen in 45% (n=89) patients. For these patients, 55% had severity signs recognised by ED doctors, 98% had blood cultures taken, 32% lactate concentrations measured</p> <p>Antimicrobial therapy within 90 minutes for 22% patients. 99% (n=88) hospitalised, of which n=18 went to ICU</p> <p>Appropriate management in only 7% patients. GCSF initiated for 14% patients</p> <p>Patients not in shock/severe sepsis more likely to have adequate management vs. those in it. However adequate management for 32/103 high-risk patients but 1/91 low-risk patients (over treatment for low-risk patients as main reason for inadequate management)</p>	<p>Poor management of FN in EDs, even for patients with severe sepsis/septic shock. Patients with severe illness under treated but patients with mild illness over-treated. Management often does not follow guidelines – possibly due to problems with initial assessment in ED. Cost implications and also ED management implications</p>

Article number	Author/ year/ country	RQ/topic	Study design/pop	Findings	Comments
Febrile neutropenia					
119 ⁶⁷	Okera 2010 UK	A prospective study of chemotherapy-induced febrile neutropenia in South West London	Prospective patient data from seven hospitals of the South West London Cancer Network collected May and August 2007. All new hospital admissions of adult patients undergoing systemic therapy presenting with febrile neutropenia	<p>71 admissions for febrile neutropenia in 64 patients. Breast and lymphoma most common primary site. Symptoms patients reported respiratory (49%) and gastrointestinal (46%). Six (8%) patients presented with severe haemodynamic compromise</p> <p>Chemotherapy had been given with palliative intent in 37 (54%) patients</p> <p>98% patients had risk factors for the development of FN</p> <p>45 (63%) patients were admitted directly to a specialist ward, 21 (30%) ED. The median time for nursing assessment 10 minutes. Median time medical assessment 40 minutes, Median time to antibiotic was 135 minutes (range: 15–550). Nine out of 50 patients received antibiotics within 60 minutes</p>	<p>Older age increased risk of FN</p> <p>Authors argue for increased use of GCSF in high-risk patients</p> <p>Variation in time to be seen by clinicians was high. Patients admitted directly to ward had longer time period for clinician review</p>
Risk identification for FN					
126 ⁵⁵	Donohue 2006 USA	Evaluation of implementation of risk assessment tool for chemotherapy-induced neutropenia (CIN)	Retrospective chart review to assess implementation. Community oncology practice, adult patients receiving new chemotherapy courses	<p>Retrospective chart review (35 patients)</p> <p>Evidence-based tool developed (literature review, guideline use):</p> <p>Checklist focusing on risk factors for all non-leukaemia cancer types</p> <p>Tool used prior to first chemotherapy cycle; depending on risk classification as per tool, given GCSF as per algorithm. Low-risk patients monitored, no GCSF</p> <p>Significantly lower percentage of patients with chemotherapy dose delays after tool implementation, and increase in risk identification</p> <p>Fewer patients with FN, intravenous (IV) antibiotic treatment, hospitalisations; however not statistically significant</p> <p>Significant increase percentage of patients given GCSF treatment post implementation</p>	<p>Tool has potential for classification and improving some treatment outcomes, e.g. chemotherapy dose reduction</p>
Prevention/prophylactic management of FN					

Summary table 7: Febrile neutropenia

Article number	Author/ year/ country	RQ/topic	Study design/pop	Findings	Comments
021 ⁶⁸	Leonard 2012 Austria, Belgium, France, Germany (patients only), Italy, Ireland, Spain, Sweden, UK	Clinical self-reported and patient-reported practice regarding FN & infection prevention for patients undergoing chemotherapy treatment	Anonymous cross-sectional surveys. Nurses: identified by European Oncology Nursing Society from membership database. Surveys advertised via national nursing societies Patients: receiving chemotherapy or had chemotherapy in past 12 months. Contacted by patient advocacy groups	217 nurses (53% oncology nurses) answered; (total number unknown) Nearly all nurses felt preventing FN, other infections very important & that these events could delay chemotherapy or negatively affect treatment effectiveness. Nearly all reported discussing risk of FN/infection with patients. Treated 5–9 FN infections/month Most nurses said local/national guidelines in place for FN management and they were keen to prevent FN. High self-reported level of pt education, use of GCSF 473 patients answered; unknown response rate Nearly half of patients didn't remember or weren't told about FN risk. Felt they were not given simple, comprehensible info on infection & didn't know about potential effects on chemo/treatment Less than 40% patients reported receiving antibiotics or prophylaxis	Appears to be gap between patient, nurse reports of education and prevention. Apparent need for clear, simple prevention instructions for patients
Costs of FN					
115 ³⁵	Lingaratnam 2011 Australia	Cost analysis of FN management	Decision analysis. Victorian hospital morbidity data	The authors argue that ambulatory (outpatient) management for low-risk febrile neutropenia is potentially a safe alternative, with significant cost savings vs. hospital care Outpatient-only strategy has more cost savings vs. early hospital discharge, however, will require some upfront investments and re-admission is a risk	Ambulatory management a safe, cheaper approach for low-risk FN management. Outpatient management has significant promise, however, will require resource investments

Article number	Author/ Year/ Country	RQ/topic	Study design/pop	Findings	Comments
Costs of FN					
116 ³⁴	Lingarajam 2011 Australia	Hospital admissions for FN	Analysis of population-based dataset. Victoria (Vic), adult patients with cancer	<p>2599 episodes for 92 Vic hospitals</p> <p>Most hospitalisations in metro area.</p> <p>40% FN episodes for solid tumours, 29% for leukaemia</p> <p>6–12% patient episodes required ICU admission</p> <p>Small % episodes required complicated, long hospitalisation (nearly 1/3 required >15 days LOS in hospital)</p> <p>Highest cost estimates associated with leukaemia diagnosis</p> <p>Undifferentiated fever, sepsis often coded in associated with FN</p>	FN costliest for haem, especially myeloma and leukaemia, although higher percentage of patients with solid tumours. Very costly subgroup exists in terms of LOS and complicated hospitalisation; also small percentage which requires ICU admission
122 ⁶⁹	Schelenz 2012 UK	Epidemiology, management, econ burden of FN in oncology patients	Prospective observational study. Single cancer centre. Adult oncology patients with solid tumours presenting to hospital with FN	<p>19.4% FN cases per 1000 oncology admissions incidence</p> <p>LOS mean 9.2 days</p> <p>Most patients had severe neutropaenia</p> <p>Nearly all patients had appropriate antibiotic treatment as per hospital guidelines</p> <p>18.6% crude mortality; 12.5% attributable mortality. Elderly patients most likely to die; had more severe disease burden and hypotension</p>	Patient factors a consideration as medium-risk chemotherapy given more commonly in this patient group. Many admitted patients were low risk and so hospital admission may not have been required

Summary table 8: Unplanned hospital admission

Article number	Author/ Date/ Country	RQ/topic	Study design/pop	Findings	Comments
Cancer patients					
043 ⁴³	Hasseett 2008 US	Factors predictive of chemotherapy-related hospitalisation for cancer patients	Comparative study (prospective cohort study with nested case-control cohort study). Community cancer centre providing ambulatory cancer services in a US state. Region served has at least 200,000 people	Infections had longest LOS, cardiac problems shortest 2/3 hospitalisations during first two chemotherapy cycles (44% in first cycle) Comorbidity, creatinine significant predictors of chemo-related hospitalisations	Chemo-related hospitalisations infrequent but potentially costly (median LOS 5 days for admits). GI, infection associated with most hospitalisations, highlighting a potential area for intervention
125 ⁴⁴	Day 2011 Australia	Assessment of change in breast cancer hospitalisations over time in one NSW cancer centre	Retrospective study. NSW, public hospital with only inpatient oncology services for Hunter region (pop 630,000). All patients admitted in 1996, 2006 to hospital for breast cancer management	More new patients referred to unit in 2006 vs.1996, but similar number hospitalisation Significant decline in admissions for adjuvant treatment in 2006 vs.1996; primarily due to decline in FN events in 2006 vs.1996 More hospital admissions related to metastatic disease in 2006 vs.1996, but fewer patients died in hospital or in adjacent hospice post-admission in 2006 Decline for FN and severe mucositis in 2006 vs.1996; however, increase in CNS complications (especially brain metastases) vs.1996 Decline for hypercalcemia, uncontrolled pain as causes of admission in 2006 vs.1996 Tumour histology differences between periods. More ER positive, grade 3 tumours in 2006 vs.1996 Increase in number of patients accessing specialist care palliative care, specialist team (especially neurosurgical, cardiothoracic) consultations in 2006 vs.1996	Improvements indicated, especially around death post admission, palliative care consults, FN and mucositis management. However, concerning increase in CNS complications, something to examine in future studies

Article number	Author/ Date/ Country	RQ/topic	Study design/pop	Findings	Comments
Cancer patients					
11870	Miranda 2011 Brazil	Assessment of how many hospitalisations for cancer patients are due to adverse drug reactions (ADRs)/drug interactions	Retrospective cohort study. Major teaching hospital in a metropolitan area (300-bed, serves >300 million people)	Clinical deterioration and need for supportive care/pain control (30%) the most common cause of unplanned admissions. Of unplanned admissions, 39 (13%) due to adverse drug event; 6/39 from drug/drug interaction and 33/39 from ADR. Common interactions: warfarin & captopril, anti-inflammatories & anticonvulsants. Common ADRs: neutropaenic fever due to chemo	Known potential interactions comprised a significant minority of hospital admissions. Implications for education and management
13271	Lau 2004 Australia	Data on common ADRs	Record review & patient interviews. Vic. cancer centre	Ten common reaction types comprised majority of ADRs: constipation, NV, fatigue, alopecia, drowsiness, myelosuppression, anorexia, dermatological complications, mucositis, and diarrhoea. 88% ADRs predictable, 45% probably preventable, 2% definitely preventable	ADRs are a common problem (however, not clear from the study how many were pre-admission vs. post-admission)
Lung cancer					
104	Kurtz 2006 US	Assessment of service utilisation (doctor visits, hospital admits, ED presentations) by lung cancer patients for first 12 months post-diagnosis	Longitudinal study. One state. Recruitment from 23 sites across state: hospital surg units, outpatient radiation units, medical oncology units. Part of larger study including patients with breast, colon, prostate ca. Patients aged ≥ 65 yrs enrolment within six weeks of incident diagnosis of lung ca. 1200 patients for larger study, 277 were lung cancer patients	52 patients died in 1st 6 months, 42 died after six months Negative association: symptoms, physical function (more symptoms with worse function). Modest correlation with symptoms & hospitalisation, doctor visits during active treatment Patients with worse function also spent more time in hospital, more ED visits during active treatment and continuing care periods Men had more time in hospital, more ED visits than women during active treatment Slightly more doctor visits, ED visits during active treatment vs. continuing care	Better symptom management during active treatment a potential area of intervention for this group. Need to look at physical function as well, though authors note this may be disease-related and so harder to manage

Summary table 8: Unplanned hospital admission

Article number	Author/ Date/ Country	RQ/topic	Study design/pop	Findings	Comments
Elderly					
06972	Lindquist 2011 US	Risk factors for healthcare utilisation (including ED presentations) and mortality for elderly patients with myelodysplastic syndromes (MDS)	Retrospective analysis using population-based Surveillance Epidemiology and End Results (SEER) registry during study period (2001–2002) has 26% population coverage, approx 17 states. Patients age ≥ 66 yrs with MDS diagnosis, no previously recorded cancer diagnosis	<p>All types cytopaenia (anaemia, neutropaenia, thrombocytopaenia) assoc with higher HCU</p> <p>High % hospital (62%), ED (42%) attendance within three-months diagnosis, primarily due to bleeding or fever</p> <p>Predictors of hospitalisation & ED visits: cytopaenia all types, older age (>80 vs. 66-69), rural residence (vs. large metro), comorbidities (≥ 1 vs. 0)</p> <p>Hospitalised patients: 8% first hospitalised for bleeding event, 5% for fever, other reasons: lymphoma/non-acute leukaemia with complications, RBC disorders, simple pneumonia & pleurisy with complications, heart failure and shock</p> <p>Mortality predictors: prevalent or incident cytopaenia all types (OR for thrombocytopaenia highest), female gender, hospitalisation for any reason, ED visits</p> <p>Specific causes of death: malignant cancer, in situ/benign/unknown behaviour cancer, heart diseases</p> <p>Patients diagnosis in inpatient/outpatient settings with cytopaenia prior to MDS diagnosis</p>	High presentation/hospitalisation rate for bleeding, fever shortly after diagnosis; these factors also associated with mortality. Implications for management and possibly palliative care

Summary table 9: Interventions to reduce ED utilisation in cancer patients

Article number	Author/ Date/ Country	RQ/topic	Study design/pop	Findings	Comments
Prophylaxis					
082 ⁷³	Agnelli 2012 47 countries	Assessment of clinical benefit of anti-thrombotic prophylaxis	RCT. Adult patients scheduled to receive chemotherapy treatment for metastatic/locally advanced cancer (lung, pancreas, stomach, colon, rectum, bladder, and ovary)	Semuloparin associated with reduced risk deep vein thrombosis (DVT), fatal and nonfatal pulmonary embolism (PE). No effect on overall survival Slightly higher incidence clinically relevant bleeding in semuloparin patients vs. placebo patient	Benefit as VTE prophylaxis although no effect on overall survival. Must bear in mind higher risk of clinically relevant major bleeding with semuloparin use
047 ⁶⁰	Molassiotis 2009 UK	Effectiveness of Home Care Program in symptom management for patients receiving oral chemotherapy	RCT 164 patients (colorectal 110) breast (54) receiving oral capecitabine. Nurse-delivered home care program versus standard care	Significant improvements in intervention group related to symptom management. Unplanned health service utilisation lower in home care group, and reduction of inpatient days (57 vs.167 days)	Intervention adaptable to Australia. Test in other patient groups

Summary table 10: ED utilisation End of Life (EOL)

Article number	Author/ Date/ Country	RO/topic	Study design/pop	Findings	Comments
ED Utilisations by Cancer patients at EOL					
009 ⁵²	Barbera 2010 Canada	ED visits at EOL by cancer patients	Retrospective cohort study. EDs throughout province of Ontario Patients with cancer diagnosis aged 20 yrs or older who made ED visits during last six months and last two weeks of life	76,759/91,561 patients visited ED during last six months of life and 31,076/91,561 visited during last two weeks of life Lung cancer second main reason for visiting during last six months of life, main reason for visiting during last two weeks Abdominal pain, dyspnoea, pneumonia, malaise, fatigue, pleural effusion common reasons for visits during both periods Change for some symptoms: cardiac incidence, pall care, dehydration, altered level of consciousness more frequently reported in last two weeks vs. last six months Clearly avoidable visits were a small percentage: constipation, technical reasons (i.e. lab visits, follow up) – total 2.8% for final six months, 1.2% for final two weeks Pain, failure to cope common during last six months, last two weeks life, suggestion of other avoidable visits 71.9% visits in last two weeks led to admission, just 20.7% discharge to place of residence. 77% patients visiting in last two weeks of life died in acute care bed, just over 11% died in long term care or at home	Identification of avoidable ED visits at EOL and associated factors can help identify ways to minimise this

Article number	Author/ Date/ Country	RQ/topic	Study design/pop	Findings	Comments
ED utilisations by cancer patients at EOL					
013 ⁵³	Legler 2011 US	How comorbidity affects health care use for EOL patients	Cross-sectional national study. Patients >=65 yrs who use hospice care	<p>Patients with high comorbidity more frequently admitted to ED, ICU, hospitalised, died in hospital</p> <p>Patients with comorbid dementia more frequently admitted to ED, hospitalised</p> <p>About 1/5 hospice users with cancer have comorbid dementia</p>	Elderly patients with cancer and comorbidities, especially dementia, are higher ED and health care users
010	Barbera 2011 Canada	Active care in hospitals for lung cancer patients at EOL	<p>Retrospective cohort study. Sample of hospitals (random selection of teaching hospitals, large non-teaching hospitals, small/rural hospitals) throughout province of Ontario</p> <p>Patients who died of lung cancer identified in Ontario cancer registry aged 20 yrs or older</p>	<p>Majority patients died in acute care bed, 32% had at least one ED visit during last two weeks of life</p> <p>For both patients who died at hospital and outside hospital, shortness of breath main admitting complaint. Other big problems: pain, could not cope at home, altered consciousness level. More pain seen on admission in patients who died in hospital. Admitting diagnosis for most patients in general was progressive chest disease, though higher percentage in patients who died in hospital</p> <p>Treatment-related toxicity a reason for admission in a minority of patients (<15% for either group)</p> <p>No in-hospital treatment differences between groups. ICU admission, chemotherapy injection rates similar to those in general cancer population</p> <p>DNRs more frequent in patients who died in hospital</p> <p>Patients who died at home similar to those who died in hospital; active local disease, pain more commonly reported in latter group</p>	High rate of death in hospital for lung cancer patients; need for better symptom management at EOL, even for patients who don't die in hospital

Summary table 10: ED utilisation End of Life (EOL)

Article number	Author/ Date/ Country	RQ/topic	Study design/pop	Findings	Comments
ED Utilisations by Cancer patients at EOL					
027 ²⁷	Leak 2012 US	Characteristics of cancer patients who die in ED	State of North Carolina. Data from all but 2 EDs in the state (110/112 EDs participate in the database program). Patients with cancer who visited EDs in 2008 where these visits resulted in death	283/37,760 ED visits by cancer patients resulted in death 71% patients who died in ED died on first visit 36.7% visits resulting in death had lung cancer diagnosis Primary chief complaints: respiratory, GI, neurological. Respiratory most common complaint for lung cancer patients Lung cancer patients older (65), male	Respiratory distress a common problem for patients who die in ED. Need to look at PE/VTE because of this. Symptom management a possible area for intervention
100 ⁵¹	Howell 2010 N/A	Place of death for haem cancer patients vs. other cancer patients	Systematic review. No requirements re study type, language. Accepted studies published from 1966–2009. Studies included if population was adults >=18 yrs information on place of death retrieved from routine morbidity/mortality data, had results specific to haem patients. Two searches of PubMed plus hand search of references of identified articles	Haem patients more likely than solid-tumour patients to die in hospital (2x as likely) Haem patients less likely than solid-tumour patients to die in hospices Results consistent across haem tumours generally, however rates highest for acute myeloid leukaemia and chronic lymphocyte leukaemia vs. acute lymphoblastic leukaemia, Hodgkin. Percentage for these two similar to some solid - tumour percentages Place of death appears to be influenced by disease symptoms, chemotherapy side effects, complicating factors , i.e. anaemia, bleeding, need for transfusion. Research limited in these areas, needed Australia: limited haematologist/palliative care links may be a factor (note that data for this is fairly old – studies from 1990s and early 2000s)	Haem patients appear more likely to die in hospital than solid-tumour patients. Consider factors such as SE, complicating factors. Possible Australia-specific issues such as haematologist/palliative care links could be investigated (if still relevant given age of data)

Summary table 11: Outcomes grey literature search

Source	Author/ Date/ Country	RQ/topic	Study design/pop Focus of activity/project/review	Findings	Comments
ASCO published abstracts (74)	Barbera Canada 2012	Patient-reported symptoms predict ED visits	Data linkage of Edmonton Symptom Assessment Scale (ESAS), ED utilisation	1732/45,118 patients (3.2%) had an ED presentation Worsening symptoms led to increase in ED utilisation (2–12% as scores increased). Pain, shortness of breath, drowsiness, anorexia with moderate scores on ESAS were associated with an increase in ED attendance.	
ASCO published abstracts	Yucel Turkey 2012	Characteristics of cancer patients who present to ED	Retrospective audit	468 ED admissions of 336 cancer patients were reviewed. 54% of patients had metastatic disease. Main reasons for ED presentation were: cancer progression 40%, cancer-related S&S, 43% and treatment-related symptoms 16%	Limited information. No replay to email contact
ASCO published abstracts	Arastu 2012 US	Unanticipated admissions for patients receiving radiotherapy, with and without chemotherapy	Retrospective audit 500 patients' electronic medical records in 2010. Admissions within 90 days of treatment commenced reviewed	Unanticipated admissions occurred in 20% (101/500) of patients, mean LOS was 4 days (range 1–16), and mean interval between the start of RT and admission was 32 days (0–86 days) Reason for admissions: pain (19%), respiratory distress (15%), neurologic symptoms (13%) 33% of patients treated for palliative intent were admitted (vs. 16% of curative intent) 26% of patients receiving concurrent chemotherapy (vs. 17% receiving RT alone)	Concurrent chemotherapy Palliative intent Not married were identified as potential risk factors
CINSW website ⁶¹	Della-Fiorentina 2012 Australia	Oncology patient emergency assessment outside of ED	Development of standardised clinical pathways for patients receiving chemotherapy and or radiotherapy who present with: fever, mucositis, oesophagitis, diarrhoea SCC	2008–2011 2360 occasions of service Reduction in time to be seen, time to treatment, and time to ward admission High patient satisfaction	Limited detail available from abstract

Appendix 4: Cancer and ED rapid review – Summary form for Included Articles

Author:

Article Number:

Article is included because:
Article gives information about (highlight all that apply) <ul style="list-style-type: none">• Factors associated with/predictive of ED attendance• Interventions minimising/reducing avoidable ED attendance• Factors/issues specific to NSW cancer patients
Type of article (highlight all that apply) <ul style="list-style-type: none">• Descriptive report• Intervention study (non-RCT)• Other evaluation study• Comparative study• RCT• Other (specify)
Study setting (describe)
Study population (describe)
Study methods (summarise)
Study findings (summarise)
Study implications for review (summarise)

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