Elsevier Editorial System(tm) for International Emergency Nursing
Manuscript Draft

Manuscript Number:

Title: A CROSS-SECTIONAL STUDY OF THE CLINICAL CHARACTERISTICS OF CANCER PATIENTS PRESENTING TO ONE TERTIARY REFERRAL EMERGENCY DEPARTMENT

Article Type: Original Research Paper

Keywords: cancer, oncology, haematology, emergency, time to antibiotic, chemotherapy, radiation

Corresponding Author: Ms Meredith Oatley, Graduate Certificate

Corresponding Author's Institution: Royal North Shore Hospital

First Author: Meredith Oatley, Graduate Certificate

Order of Authors: Meredith Oatley, Graduate Certificate; Marg Fry, PhD, RN; Lesley Mullen, RN, B.A.Sc. (Nursing) Grad Dip (Critical Care)

Abstract: Introduction
There is increasing evidence of cancer patients presenting to emergency departments (ED). The study aim was to analyse the characteristics of adult cancer patients' presenting to one ED. Understanding cancer patient presentations could assist in the development of new models of care.

Methods
A 12 month retrospective audit was conducted of a random sample of cancer patients. Demographics and characteristic variables were analysed using descriptive, comparative and correlational statistics.

Results
The presentation rate for adult cancer patients was 1,110 (2.4%) with 290 sampled. The common symptoms were fever (n=54:18.6%), abdominal pain (n=34:11.7%), and shortness of breath (n=32:11%). The majority of patients were allocated a Triage Category 2 (n=94:32.4%) or Triage Category 3 (n=131:45.2%). The majority of patients presented between 2 and 15 times. For patients administered antibiotics the average time was 119.8 minutes (SD +/- 85.5). The average ED length of stay was mean 8.08 hours with 271 patients (93.4%) admitted to hospital. Of the 290 patients, 105 (36.2%) had died within 12 months of ED presentation.

Conclusion
The study has shown that while cancer patients are only a small percentage of ED presentations the vast majority are allocated high triage codes, have high admission rates and high mortality rates.

Cover Letter

Thursday, 5 March 2015

Dear Editor,

Thank you for the opportunity to submit our manuscript to your journal, International Emergency Nursing. Our research manuscript is titled 'A cross-sectional study of the clinical characteristics of cancer patients presenting to one tertiary referral emergency department.

We look forward to hearing of the outcome of the review process.

Regards Meredith

Meredith Oatley Grad Cert (Cancer Nursing)

Clinical Nurse Consultant Oncology

Royal North Shore Hospital

Reserve Road, St Leonards, NSW, 2065

Email: meredith.oatley@health.nsw.gov.au

Telephone 0402158169

***Title page with Author details**

TITLE: A CROSS-SECTIONAL STUDY OF THE CLINICAL CHARACTERISTICS OF CANCER PATIENTS PRESENTING TO ONE TERTIARY REFERRAL EMERGENCY DEPARTMENT

AUTHORS

Meredith Oatley Grad Cert (Cancer Nursing)
Clinical Nurse Consultant Oncology
Royal North Shore Hospital
Reserve Road, St Leonards, NSW, 2065
Email: meredith.oatley@health.nsw.gov.au

Margaret Fry RN, NP, B.A.Sc., MEd, PhD
Director Research and Practice Development NSLHD
Adjunct Professor of Nursing, University of Technology
Conjoint Professor of Nursing, University of Sydney
Email: margaret.fry@uts.edu.au

Lesley Mullen RN, B.A.Sc. (Nursing) Grad Dip (Critical Care)
Clinical Nurse Educator
Emergency Department
Royal North Shore Hospital
Reserve Road, St Leonards, NSW, 2065
Email: lesley.mullen@health.nsw.gov.au

Key words: cancer, oncology, haematology, emergency, time to antibiotic, chemotherapy, radiation

A CROSS-SECTIONAL STUDY OF THE CLINICAL CHARACTERISTICS OF ONCOLOGY PATIENTS PRESENTING TO ONE SYDNEY TERTIARY REFERRAL EMERGENCY DEPARTMENT

Introduction and Background

Cancer is currently the leading cause of death worldwide and it is expected that 8 million more cancer cases will be diagnosed within the next two decades (WHO, 2014). It is estimated that 28,000 Australians will be diagnosed with cancer in 2014 (Australian Institute of Health and Welfare, 2014). The number of cases of cancer in Australia has doubled in size since 1991 and is the second most common cause of death. The risk of being diagnosed with cancer in Australia is 1 in 2 in males and 1 in 3 in females by the age of 85. The World Health Organisation Global Action Plan was launched in 2013 and aimed to reduce mortality from cancer by 25 per cent (WHO, 2014).

Cancer is a chronic disease which contributes significantly to the burden of disease on society (Australian Institute of Health and Welfare, 2014). Emergency Departments (ED) are often the first point of entry for cancer patients requiring urgent care. The advancements in cancer treatments and subsequent improved survival rates has led to an increase in ED presentations (Vandyk et al., 2012).

From 2012 data Australian Hospital EDs had 6.5 million admissions per year demonstrating an increase of 4.2 per cent between the years of 2007-2008 and 2011-2012 (Australian Institute of Health and Welfare, 2012-2013). Many authors (Ahn et al., 2012; Royal College of Physicians, 2013; Ruegg, 2013) have suggested that cancer patients could seek appropriate treatments in alternative care models rather than accessing EDs. Therefore, the aim of the study was to explore the trends and characteristics of cancer patient presentations to one ED.

Aim

The primary aim of the study was to explore the prevalence and characteristics of adult cancer patients presenting to a tertiary referral hospital ED within the state of New South Wales, Australia.

Methods

This was a 12 month (1st January 2012 – 31st December 2012) retrospective cross-sectional study of cancer patients. This multi-method audit involved two phases to achieve the proposed research objectives. Phase

one included data that was extracted from First Net©, the ED Computer Software Program. The data retrieved included: patient demographic (age, medical record number, gender) and clinical information (arrival time to ED, triage code, doctor seen time, mode of arrival, diagnosis, nurse initiated protocols, admitting doctor, length of stay and discharge disposition).

Phase two included a random sample that was selected from phase one. The sample size was identified using a 95% CI and 5% margin of error requiring a minimal sample of 286. A medical record audit of adult cancer patients from the ED data set was conducted. Medical records were manually reviewed and the data retrieved included: clinical information (nurse initiated protocols, time to antibiotics, pain score, time to analgesia, date of last chemotherapy and radiotherapy treatment, personal protective equipment, central venous access devices, and discharge disposition).

Data was stored electronically in a security password protected Excel database accessible only by the chief investigators. Descriptive, comparative and correlational statistical analysis was performed with the aid of the IBM SPSS program (IBM SPSS v.21, Chicago IL USA).

Ethical Approval

Ethical approval was obtained from the Northern Sydney Local Health District Human Research Ethics Committee. The ethical conduct of research was maintained during and after the research. All data sources were stored in password protected file and stored in a locked cupboard only accessible by the chief investigators. All patients were immediately de-identified and re-coded to ensure confidentiality, beneficence and privacy.

Results

For the 12 month study the ED presentation rate was 62,919 including adults (n=47,164: 75%) and paediatrics (n=15,755: 25%). There were 24,048 females (51%) and 23,116 males (49%). The cancer presentation rate was 1,110 (2.4%). The medical record audit comprised 290 patients (Table 1). The majority of patients were oncology (255:87.9%) compared with haematology (n=35:12%). The majority of patients (n=183:63%) arrived by private transport and one third of patients (n=99: 34.1%) arrived by ambulance.

Of the 290 patients the average age was 65.3 years and gender was evenly split across the groups (female n=146:50.3%). The three most common symptoms on presentation were fever (n=54:18.6%), abdominal pain (n=34:11.7%) and shortness of breath (n=32:11.0%) (Table 2). Patients were also found to present due to abnormal test findings (n=29:10%). The majority of patients (n=231: 79.7%) presented between Monday and Friday and between business hours of 0800-1700 (n=173:59.7%). The majority were allocated Triage Category 2 (n=94:32.4%) or Triage Category 3 (131:45.2%). There was no statistical difference in triage code allocation and time of day (p=.282) or weekday presentation and gender (p=.931) comparing cancer patients with ED presentations.

The average time for nurse initiated interventions was 25 minutes (SD +/-18.5). The most common nurse initiated intervention was pathology and cannulation (n=117:40.3%) followed by the administration of analgesics (n=54:18.6%) and or antiemetic (n=8:2.8%).

For those arriving in pain 52 (18%) had a pain score greater 50mm (Table 1). The average time to nurse initiated analgesia was 30.7minutes (SD +/-40.9). There was no statistical difference in time to analgesia for gender. There was no difference between the time to analgesia when comparing haematology and oncology patients (p=0.292: CI 95%). There was a statistical difference when comparing triage code and time to analgesia (X^2 274.224: p=.000). There was a weak correlation between triage code and time to analgesia (Spearman's rho -.047 p=.638). There was no statistical difference when comparing day (p=.094) or time (p=.078) of presentation for time to analgesia.

For patients receiving antibiotics the average time was 119.8 minutes (SD +/- 85.5). There was statistical difference when comparing triage code and time to antibiotics (X^2 274.224: p=.000). The time to antibiotics for oncology patients (125.6min: SD +/- 87.36) was longer than for haematology patients (mean 88.3min: SD +/-69.21). There was no difference between time to antibiotics when comparing febrile neutropenia and the other diagnostic groups (p=.908: CI 95%). There was no statistical difference when comparing day (p=.044) or time (p=.68) of presentation for time to antibiotic.

There were 96 patients (33.1%) who received chemotherapy within one week of presentation and 44 (15.2%) who received chemotherapy within one day. Of the 96 patients the majority (n=68; 71.0%) were allocated Triage Category 2. Of the 44 patients, 34 (77.3%) presented during the work week with 10 (22.7%) presenting over the weekend (p=.001). Of the 44 patients fever (n=12: 27%), dyspnoea (8:18.2%) abdominal

pain and vomiting (n=8; 18.2%) were the most common symptom presentation. There was no statistical difference noted between groups (X^2 p=.350)

Of the 96 patients that had received chemotherapy within one week of ED presentation there was documented evidence of cytotoxic personal protective precautions being used for 33 (34.3%) patients. Within 12 months of ED presentation 41 (14%) patients had received radiotherapy, and of that group 15 (36.5%) had received radiotherapy within four weeks.

There were 27 (9.3%) patients that had a central venous access implanted device (CVAD) documented in the medical record. Of the 27 patients with an implanted CVAD, 15 (55.5%) patients had their device accessed in the ED. Six patients (22.2%) had a cannula inserted despite the presence of a CVAD.

Over 12 months the majority of patients (n=162:56%) presented on average 3.4 times. Haematology patients (mean 3.7) presented slightly more frequently than the oncology group (mean 3.3). The length of stay for cancer patients was greater (mean 8.08 hours SD +/- 20 minutes) than the ED length of stay (mean 5:06 hours: SD +/- 15minutes) for total presentations.

The majority of patients (n=271; 93%) were admitted to hospital. Nine (3.10%) were discharged with three (1.03%) transferred to another hospital. Five (1.72%) patients were transferred to a critical care area with two (0.69%) dying in the ED. The average hospital length of stay for the cancer group was 7.1days.

Of the 290 patients, 70 patients (24.1%) presented once to the ED over the study period. There were 58 (20%) patients that presented twice with the majority of patients (n=162; 56%) presenting more than three times. There were 201 patients that presented between two and seven times and 19 that presented between eight and 15 times.

Of the 290 cancer patients, 105 (36.2%) died within 12 months of ED presentation. There was no correlation between presentation day and death rate (p=.641)

Discussion

This study has demonstrated that cancer patients visiting the ED had a high acuity and that the majority of patients were admitted (93%). Of the study sample 36% of patients had died within 12 months of ED presentation. This finding is supported by a population study that analysed patterns of cancer patients presenting to New South Wales EDs, which found 32.21% died within 12 months (Bureau of Health

Information, 2014). This study suggests that an ED presentation for cancer patients could be a high predictor of mortality rate.

Patients that are undergoing chemotherapy are at a high risk of developing febrile neutropenia (Naurois et al., 2010; Penack et al., 2010). Febrile neutropenia (FN) is one of the serious complications of cancer therapy and is a major cause of mortality. The diagnosis of febrile neutropenia was made in 10.6% of patients in this study and all required antibiotics. The study highlighted that cancer patients had an average time to antibiotic of 119.8 minutes. International guidelines state that the administration of intravenous antimicrobials within the first hour should be the goal of therapy (Dellinger et al., 2013). EDs need to develop fast tracking protocols of antimicrobial treatments for febrile neutropenic patients to ensure a rapid response when a patient is suspected of this diagnosis (Naurois et al., 2010). While requiring antibiotics is an appropriate reason for presenting to Australian EDs the time delay experienced by cancer patients in our study warrants service reform and further research.

Our findings identified that cancer patient's visit the ED frequently within a 12 month period. The vast majority presented between two and 15 times. These findings suggest that the current model of care may not be providing an appropriate support to meet the needs of cancer patients. Globally, different models of care have been introduced to reduce ED presentations, overcrowding and admission rates for cancer patients (Royal College of Physicians, 2013).

A study by Ahn (2012) in Korea explored the impact of opening a cancer emergency room in the ED. This study demonstrated a significant reduction in ED admission rates and hospital savings of 10.89%. Furthermore, in the USA, Ruegg (2013) argues for Nurse Practitioner led oncology urgent care centres to provide specialty cancer services to alleviate ED overcrowding (Ruegg, 2013). Again in the UK an acute oncology medical service was established to provide advice, timely assessment reviews, symptom management and alternative admission processes to reduce ED overcrowding, presentations and admissions (Royal College of Physicians, 2013). These models need to be further explored to determine the potential utility and impact for the Australian context.

A large proportion of cancer patients receive chemotherapy at some stage during their illness (McKenzie et al., 2011). Chemotherapy is well documented for causing side effects that can be distressing for patients (Aprile et al., 2013). In our study 44 (n=290) patients presented within 24 hours of receiving chemotherapy.

Today, over 90% of cancer patients receive chemotherapy treatment in the ambulatory care setting. For many people with cancer managing the side effects of treatment can be challenging in the home setting. Better integrated ambulatory oncology services with home management plans and community support could potentially reduce ED presentations for symptom relief of cancer treatment (McKenzie et al., 2011).

International research identified strategies that have been implemented to improve supportive care of people with cancer. In the UK a 24 hour cancer telephone support service has been established to improve symptom related cancer management for those patients in the community (Royal College of Physicians, 2013). Similarly, in the USA cancer patients have access to comprehensive educational resources which are also linked to social media forums (National Comprehensive Cancer Network, 2015). These strategies have been shown to better support healthcare decision-making and selection of appropriate services to meet individual patient needs. Future Australian research needs to explore the role of help lines, social media and community support for cancer patients.

Fever, abdominal pain and shortness of breath accounted for the majority of cancer presentations to the ED in this study. It was found that cancer patients presented for symptoms associated with treatment and cancer type. Globally these findings are consistent across EDs (Ahn et al., 2012; Bureau of Health Information, 2014; Leak et al., 2013; Sadik et al., 2014; Vandyk et al., 2012).

Internationally and nationally cancer patients often present to the ED in the terminal phase of illness (Ahn et al., 2012; Bureau of Health Information, 2014; Leak et al., 2013). Our study identified that 36% of patients died within 12 months of ED presentation. A New South Wales report identified that 75% of cancer patients attended an ED within 180 days of dying (Bureau of Health Information, 2014). Further research into end of life care and ED utilisation is needed to explore new palliative care models to assist patients in the terminal phase of illness.

Conclusion

The study has shown that while cancer patients are only a small percentage of total ED presentations the vast majority are allocated high triage codes, have high admission rates and a high mortality rate. Timely and appropriate emergency care needs to target vulnerable groups such as febrile neutropenia to optimise outcomes and reduce morbidity and mortality rates.

Appropriate community based symptom management care models for cancer patients needs to be established to reduce ED presentation rates for this group. New ED models of care need to be investigated to determine how we can better support people with cancer during all stages of illness.

Role of the funding source

The research study was funded by a Ramsay Nursing & Midwifery Scholarship. The funding organisation had no role in the conduct of the research nor the preparation of the manuscript.

Conflict of Interest

There was no conflict of interest in relation to financial and or personal relationships with other people or organisations in completion of this research study.

References

Ahn, S., Lee, S., Lim, K. & Lee, J. 2012. Emergency department cancer unit and management of oncologic emergencies: experience in Asian Medical Center. Support Care Cancer, 20, 2205-10.

Aprile, G., Pisa, F.E., Follador, A., Foltran, L., De Pauli, F., Mazzer, M., Lutrino, S., Sacco, C.S., Mansutti, M. & Fasola, G. 2013. Unplanned presentations of cancer outpatients: a retrospective cohort study. Supportive Care in Cancer, 21, 397-404.

Australian Institute of Health and Welfare 2012-2013, Australian hospital statistics 2012-13: emergency department care, no 52, Canberra: AIHW.

Australian Institute of Health and Welfare 2014, Australian hospital statistics 2012-13, Australian Government, viewed 10 June 2014 <http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129547000>.

Bureau of Health Information, 2014. Emergency Department utilisation by people with cancer, Ministry of Health.

Dellinger, R.P., Levy, M., Rhodes, A., Annane, D., Gerlach, H., Opal, S., Sevransky, J., Sprung, C., Douglas, I., Jaeschke, R., Osborn, T., Nunnally, M., Townsend, S., Reinhart, K., Kleinpell, R., Angus, D., Deutschman, C., Machado, F., Rubenfeld, G., Webb, S., Beale, R., Vincent, J.-L. & Moreno, R. 2013. Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock, 2012. Intensive Care Medicine, 39, 165-228.

Leak, A., Mayer, D.K., Wyss, A., Travers, D. & Waller, A. 2013. Why do cancer patients die in the emergency department?: an analysis of 283 deaths in NC EDs. Am J Hosp Palliat Care, 30, 178-82.

McKenzie, H., Hayes, L., White, K., Cox, K., Fethney, J., Boughton, M. & Dunn, J. 2011. Chemotherapy outpatients' unplanned presentations to hospital: a retrospective study. Supportive Care in Cancer, 19, 963-9.

National Comprehensive Cancer Network 2015, When to go to the emergency room, Fort Washington, <http://www.nccn.org/>.

Naurois, J., Novitzky-Basso, I., Gill, M., Marti Marti, F., Culklen, H., Royler, F. & ESMO Guidelines Working Group 2010. Management of febrile neutropenia: ESMO Clincial Practice Guidelines. Annals of Oncology, 21, 252-6.

Penack, O., Buchheidt, D., Christopiet, M., von Lilienfeld-Toal, M., Massenkeil, G., Hentrich, M., Salwender, H., Wolf, H. & Ostermann, H. 2010. Management of sepsis in neutropenic patients: guidelines from the infectious diseases working party of the German Society of haematology and Oncology. Annals of Oncology, Doi:10.1093/annonc/mdq442.

Royal College of Physicians, 2013. Acute care toolkit 7: acute oncology medical unit October 2013, Royal College of Physicians, London.

Ruegg, T. 2013. A Nurse Practitioner-led urgent care centre: Meeting the needs of the patient with cancer. Clinical Journal of Oncology Nursing, 17, E52-7.

Sadik, M., Ozlem, K., Huseyin, M., AliAyberk, B., Ahmet, S. & Ozgur, O. 2014. Attributes of cancer patients admitted to the emergency department in one year. World J Emerg Med, 5, 85-90.

Vandyk, A., Harrison, M., Macartney, G., Ross-White, A. & Stacey, D. 2012. Emergency department visits for symptoms experienced by oncology patients: a systematic review. Support Care Cancer, 20, 1589-99.

WHO 2014, Cancer, World health organization, viewed 11 June 2014 <http://www.who.int/mediacentre/factsheets/fs297/en/>.

Table

Table 1: Characteristics of cancer patient presentations to the ED (n=290)

Group	N	Oncology	Haematology	
Gender				
Female	146 (50.4%)	128 (50.20%)	18 (51.43%)	
Male	144 (49.6%)	127 (49.80%)	17 (48.57%)	
Age				
Mean Years (SD)	65.3 (15.3)	65.9 (14.8)	61.3 (16.7)	
Triage code				
1	6 (2.07%)	6 (2.07%)		
2	94 (32.41%)	82 (28.28%)	12 (4.14%)	
3	131 (50.59%)	115 (39.66%)	16 (5.52%)	
4	54 (18.62%)	47 (16.21%)	7 (2.417%)	
5	5 (1.72%)	5 (1.72%)		
Top diagnostic groups				
Cancer non defined	104 (35.86%)	104 (35.86%)		
Febrile neutropenia	31 (10.6%)	29 (10.0%)	2 (0.69%)	
Pancreatic cancer	20 (6.9%)	20 (6.9%)		
Lung cancer	17 (5.86%)	17 (5.86%)		
Bowel cancer	12(4.14%)	12(4.14%)		
Leukemia	10 (3.45%)		10 (3.45%)	
Hodgkin’s lymphoma	10 (3.45%)		10 (3.45%)	
Arrival by day				
Weekday	231 (79.7%)			p=.001 X2
Weekend	59 (20.3%)			
Monday	51			
Tuesday	40			
Wednesday	49			
Thursday	47			
Friday	44			
Saturday	23			
Sunday	36			
Time of day				
8.00-17.00	173	(59.7%)		

1701.7.59	117 (40.3%)		
Time to antibiotics			
TTABs minutes mean (SD)	119.8 (85.5min)	125.6 (87.36)	88.3 (69.21)
Pain Scores			
Presenting with pain	155 (74.1%)		
<50mm	103 (34.5%)		
>50mm	52 (18%)		
Time to Analgesia			
TTA minutes mean (SD)	47.5 (42.3)	29.9 (41.1)	36.7 (39.6)
Disposition			
Admitted to hospital	271 (93%)	124 (68%)	34 (97.1%)
Transfer to critical care area	5 (1.72%)	1(0.5%)	
Died in ED	2 (0.69%)	2 (0.78%)	
Transfer to another hospital	3 (1.03%)	2 (0.78%)	1(2.86%)
Discharged from ED	9 (3.5%)	9 (3.53%)	

Table 2: Presenting symptoms for cancer patients in ED (n=290)

Group	N (%)
Fever	54 (18.62%)
Abdominal pain	34 (11.72%)
Shortness of breath	32 (11.03%)
Abnormal blood tests	29 (10.0%)
Other	26 (8.97%)
Vomiting	16 (5.52%)
Pain	14 (4.83%)
Falls	13 (4.48%)
Dyspnea	8 (2.76%)
Lethargy	8 (2.76%)
Nausea	7 (2.41%)
Diarrhea	6 (2.07%)
Mobility	6 (2.07%)
Headache	5 (1.72%)
Dehydration	4 (1.38%)
Myelosuppresion	3 (1.03%)
Constipation	3 (1.03%)
Dizziness	3 (1.03%)
Allergy	2 (0.69%)
Fungal infection	2 (0.69%)

***Highlights (for review)**

Core Findings

- Cancer patients visiting the Emergency Department had a high acuity with the majority admitted to hospital for an average length of stay of seven days
- Timely emergency care needs to target vulnerable groups to optimise outcomes and reduce morbidity and mortality rates
- Appropriate community care models need to be established to reduce ED presentation rates and to better support people with cancer during all stages of illness
- A cancer patient emergency presentation could be a high predictor of mortality