Emergency Department to Discharge Pathways for Oncology Patients Undergoing Cancer Treatment: A Clinical Audit

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A dissertation presented to the Faculty of Health Sciences in part-fulfilment of the requirements for the Degree of Master of Science (Cancer Care) in Nursing at the University of Malta

30th May 2025

Declaration form

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Abstract

Background: The alarming cancer incidence rates, increased survival, an aging comorbid population, and complications of novel treatments, contribute to a growing demand for emergency and acute oncology services. A pilot acute oncology service pathway was launched in January 2022. This clinical audit was the first to investigate patient pathways from emergency presentation until discharge.

Objective: To analyse the local acute oncology pathway for oncology patients undergoing cancer treatment and leverage findings as a quality improvement initiative, to enhance the acute oncology service aiming for high quality patient care, cost effectiveness and overall improve oncology care delivery.

Methodology: A quantitative, retrospective longitudinal design. Data of all adult oncology patients who received cancer treatment from 1st August 2023 to 31st July 2024 were collected from the oncology electronic health record system. Eligible patients were linked to the patient's administrative system to identify unplanned hospital visits, that occurred within six weeks from treatment. Descriptive and inferential statistics were conducted using SPSS.

Findings: Among 1,514 patients undergoing anti-neoplastic treatments, 828 (54.7%) had 1,510 emergency department visits. On average, 4 emergency department visits and 3 hospitalizations were recorded daily. Common presenting symptoms included fever (20.9%), dyspnoea (11.7%), pain (6.6%), vomiting (6.5%) and abdominal pain/distension (6.5%). Of 1,510 emergency department visits, 1,064 hospitalisations were reported for 638 individuals. 96.1% of admissions were reported in the general acute hospital, with most admissions occurring in general medical wards (40.9%). The mean length of stay was approximately 8 days, and an approximate of 24 hospital beds were occupied by these patients on a daily average.

Conclusion: To address the shortcomings identified along the pathway, a multi-faceted quality improvement plan proposed strategies to identify high-risk for acute care use, enhance accessibility and coordination, ensure standard clinical pathways for symptom management, develop emergency oncology care tactics, and promote early palliative care.

Keywords*: Acute oncology service, emergency care, cancer treatment, clinical audit, quality improvement.*

Dedication

To all the patients affected by cancer whom I have cared for and will continue to care for,

Your strength and resilience inspire me every day. I hope that this dissertation will in some way contribute to elevating the quality of care you truly deserve and support you along your journey.

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I was lucky to find support and guidance from so many wonderful individuals through this dissertation process. I would like to thank the following people wholeheartedly who were truly instrumental:

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Abbreviations

ACU – Acute care use

AHRQ - Agency for Healthcare Research and Quality

AHS – Alberta Health Services

AO – Acute oncology

AOS – Acute oncology service

BoS- Board of Studies

CASP - Critical Appraisal Skills Programme

CCP – Cancer Care Pathway

CHI - Commission for Health Improvement

CINAHL - Cumulative Index to Nursing and Allied Health Literature

CN – Clinical Nurse

CNC – Clinical Nurse Consultant

CNS – Clinical Nurse Specialist

CP - Clinical pathways

CPAS – Clinical Patient Administrative System

CUAC- Cancer urgent assessment clinic

CV - Coefficient of variation

CTCAE – Common Terminology Criteria for Adverse Events

DPO – Data Protection Officer

DRU – Direct referral unit

ED – Emergency Department

EHR – Electronic health records

EOL – End of Life

ESI – Emergency severity index

FREC - Faculty of Research Ethics Committee

GI – Gastrointestinal

GPs- General Practitioners

HQIP – Healthcare Quality Improvement Partnership

HCPs – Healthcare professionals

HSE - Health Service Executive

IACR – International Agency for Research on Cancer

IPAAC - Innovative Partnership for Action Against Cancer

IQR - Interquartile range

JBI - Joanna Briggs Institute

LOS – Length of stay

MAH – Maltese acute hospital

MeSH - Medical Subject Headings

MDT - Multidisciplinary team

MM – Multiple Myeloma

MMAT – Mixed methods appraisal tool

MO – Medical officer

NCAG - National Chemotherapy Advisory Group

NCCP - National Cancer Control Programme

NCEPOD - National Confidential Enquiry into Patient Outcome and Death

NICE –National Institute for Health and Care Excellence

NP- Nurse Practitioner

NTT- Nurse-led telephone triage

NYU – New York University

OC – Oncology center

OECC - Oncology extended Care Clinic

OLS – Oncology Liaison Service

ONN- Oncology nurse navigators

PC – Palliative care

PCP- Primary care providers

QI – Quality Improvement

RCN – Royal College of Nursing

RCR – Royal College of Radiologists

RCTs – Randomised controlled trials

RN – Registered Nurse

RT - Radiotherapy

SACT - Systemic anti-cancer treatment

SD – Standard Deviation

SCS - Supportive care service

SMART - Specific, Measurable, Achievable, Relevant, Timely and Theoretically

TRAEs - Treatment-related adverse events

UCC – Urgent care centre

UKAOS – United Kingdom acute oncology society

UOM – University of Malta

WHO – World Health Organization

Chapter 1

Introduction

1.1 Introduction

Acute oncology (AO) is a rapidly advancing sub-specialty, illustrating a systemic approach to the examination and treatment of patients with cancer who develop complications due to their malignancy or cancer treatment (Palmer et al., 2023). Acute oncology service (AOS) is a multi-disciplinary service framework consisting of oncologists, medical officers (MO), and AO clinical nurse specialists (Cooksley, 2021; Kulkarni et al., 2023). It integrates the skills and knowledge of healthcare professionals (HCPs) from oncology, emergency, general medicine, and palliative care departments (NHS, 2019). The fundamental principles of an AOS are to instil knowledge, awareness, and timely oncology specialist input (The Royal College of Radiologists [RCR], 2020). Incorporating the expertise of these professionals ensures timely management and high-quality care delivery (Cooksley, 2021).

AO presentations may be subdivided into three categories: Type 1; patients presenting with a new or suspected cancer diagnosis, Type 2; anti-cancer treatment associated complications or toxicities, and Type 3; symptomatic complications from the malignancy itself (Neville-Webbe et al., 2013; Cooksley, 2021; Kulkarni et al., 2023).

Currently, there are no official statistics on cancer therapy-associated hospitalisations, however, an unpublished study by Marmarà (2021), recorded 2,245 emergency department (ED) visits associated with cancer treatment complications in 2019, with the mean frequency of 4 admissions per day to an in-patient ward. Following the launch of the pilot AOS pathway in 2022 (Appendix 1) this study seeks to analyse the trend and pathways patients followed when they required acute care while undergoing antineoplastic treatment. Ultimately, this clinical audit will provide the latest statistics of oncology-related ED visits, hospitalisations, and length of stays (LOS). As a result, this study will identify potential gaps in the provision of service.

1.1.1 Background

The inception of acute oncology emerged in 2009 (UK acute oncology society [UKAOS], 2024) following the concern of systemic challenges of emergency cancer care reported in the review by the United Kingdom National Confidential Enquiry into Patient Outcome and Death (NCEPOD) (2008). NCEPOD (2008) mainly highlighted poor communication between emergency and oncology teams which raised both safety and quality of care concerns (Navani, 2014; UKAOS, 2024). Furthermore, it provided comprehensive recommendations including enhanced co-ordination of care for SACT toxicity associated admissions (NCEPOD, 2008; Gilligan, 2013).

Consequently, the UK National Chemotherapy Advisory Group (NCAG) (2009) advised that all hospitals with an emergency department (ED) should establish an AOS, with the fundamental aim for better engagement between oncology and acute care specialties (Navani, 2014; The Royal College of Radiologists [RCR], 2020; Kulkarni et al., 2023).

Novel cancer therapies, including systemic anti-cancer treatment (SACT) and radiotherapy (RT), have revamped the cancer care landscape (Debela et al., 2021). However, despite the advances of these cutting-edge approaches, such therapies are also associated with complications such as haematological, gastrointestinal (GI), dermatological and neurotoxicity, as well as cardiopulmonary sequelae. Although certain complications are easily managed in the community, several toxicities require hospitalisation for strict observation, intensive monitoring, and specialised procedures. Moreover, assessing and identifying the root cause of acute complications is a challenge, as presenting complaints may be treatment-induced, cancer-related, or unrelated conditions (Gallaway et al., 2021). Consequently, more than 50% of cancer patients endure at least one complication, leading to hospitalisation (Mahumud et al., 2024).

The intricate connection between, SACT, RT, and consequent hospitalisations has a significant effect on extensive oncology care (Jairam et al., 2019). Multiple studies have analysed the efficacy of these treatments in the context of disease control and survivorship (Chan et al., 2021; Miller et al., 2022; Güven et al., 2024). Nevertheless, the repercussions of treatment-associated complications and their correlative impact on hospitalisation rates still need to be established (Mahumud et al., 2024), as well as the management of patients requiring acute care.

1.2 Context

Cancer incidences continue to rise at an alarming rate highlighting a global cancer burden (World Health Organization, 2024). Worldwide, approximately 20 million new cancer cases were reported in 2022 (WHO, 2024; International Agency for Research on Cancer [IARC], 2024), while 21.3 million and 27 million new cases are expected in 2025 and 2035 respectively (IARC, 2024). Significant improvement has also been reported with regard to patient outcomes and survival rates, in both single and combination treatment modalities (Liu et al., 2024; Rosenberg et al., 2024).

In Malta, 1,800 new cases were recorded in 2017 (Ministry for Health, 2017), while the IACR (2024) reported 2,855 new cases in 2022. Moreover, President Emeritus Dr. George Vella stated that 50% of patients diagnosed with cancer are living an average of ten years attributing this to patients having access to early treatment and the latest therapeutic advances (The Office of the President, 2023).

The alarming statistics on the rising cancer incidence, survival rates, an aging multimorbid population, and vast therapeutic modalities with novel and unpredictable complications, will contribute to an increased demand of acute care needs for patients with cancer (RCR, 2020), including the ED (Lash et al., 2022). Moreover, these factors highlight the

significance of AO and acute care services more than ever. Consequently, planning for the coming decade is crucial (RCR,2020).

1.3 The current situation in Malta

Malta is covered by two acute state hospitals, the main acute hospital is located in Malta (Government of Malta 2023a), and another situated in Gozo (Government of Malta, 2023b). Furthermore, Malta has only one oncology centre (OC) specialising in Oncology and Haemato-Oncology (Government of Malta, 2021).

Cancer patients experiencing any symptoms may primarily seek advice from their nurse navigators, or the wards where they receive treatment. Depending on the case, patients are either given recommendations or directed to the ED. To this day, cancer patients requiring urgent care, must initially go through the ED.

In January 2022, the ED of the main Maltese acute hospital (MAH) and the Cancer Care Pathways (CCP) Directorate launched a pilot AOS. The service established a pathway of referring cancer patients from the ED to OC admission and emergency services (Appendix 1). This pathway outlines the trajectory for patients upon presenting to the ED due to SACT/RT associated symptoms, who received treatment within the last six weeks, or due to cancer-related complications. Furthermore, it provides guidelines according to the clinical scenario until discharge. The role of an Oncology Liaison Medical Officer (MO), who is a senior oncology physician, was created to provide oncology advice to the ED physician. Such advice includes the management and guidelines to either 1) treat and discharge, 2) admit to the MAH or 3) admit to OC adult wards.

In March 2024, three General/Internal Medicine Consultants, within the Department of Medicine in MAH were appointed to care for Oncology patients admitted to acute medical wards in MAH. This aimed at enhancing continuity of care for patients with solid tumours hospitalised within six weeks of receiving cancer treatment or under the care of the

Palliative care team (Johma et al., 2024). Moreover, Consultant Oncologists also review patients who are hospitalised in MDH. Ultimately, patients admitted to OC are followed by the firm of their caring Oncology Consultant (Appendix 1). The latest advancement within the AOS was recruiting the first AO practice nurse by the CCP Directorate in September 2024.

For haemato-oncology patients, the ED physician liaises with the senior haematology physician on-call for the management plan. Subsequently, patients hospitalised in MAH are reviewed by the haematology outliers' team, while Consultants review these patients on a twice weekly basis. Patients hospitalised at oncology are cared for by the haematology team covering the haematology ward.

1.4 Aims and objectives

The Aims of this clinical audit are to: -

1. Analyse the pathway of acute care received by oncology patients undergoing cancer treatment;
2. Serve as a quality improvement tool (QI), establishing implications for practice that would enhance the AOS aiming for high quality patient care, cost effectiveness, and overall improve oncology care delivery.

The research objectives intend to:

1. Identify where patients received care, in the event of a hospitalisation;
2. Examine unplanned hospitalisation patterns of oncology patients experiencing complications while receiving anti-cancer treatment;
3. Display national statistics on emergency department visits and hospitalisation rates of oncology patients requiring acute care while on active treatment;
4. Identify gaps in the care service that may hinder quality of care.

It is anticipated that in the absence of local data and research, this clinical audit showcases current statistics of the Maltese ED visits and hospitalisation rates related to complications from cancer treatment or cancer itself.

1.5 The research question

Formulating a well-defined research question is paramount to conducting an evidence-based study, outlining the search strategy and identifying literature gaps (Hosseini et al., 2024). The population for this study consists of adults (18+) diagnosed with solid tumours or haematological neoplasms, receiving anti-cancer therapies. The AO pathway for these individuals who required acute care due to complications while undergoing cancer treatment will be evaluated. Moreover, this study aims to establish recommendations for practice to ameliorate the AOS. Consequently, the formulated research question was: 'How is acute care provided to oncology patients who develop complications while receiving cancer treatment, and how can the AOS be enhanced?'

1.6 Rationale of the study

Several advances in oncology treatment and services have been implemented locally. However, there are gaps in existing knowledge relevant to the Maltese AOS including data on the incidence of patients requiring urgent care, hospitalisation trends, the role of ED in cancer care, and how cancer patients' acute care needs are addressed.

This will be the first clinical audit to assess how cancer patients, specifically those undergoing anti-cancer treatment, follow the AO pathway. It is therefore envisaged that this dissertation will shed more light on the local AOS through hospitalisation patterns and care for cancer patients needing urgent care due to anti-cancer treatment effects, or the malignancy itself. Consequently, this clinical audit aspires to provide recommendations to ameliorate the local AOS, striving for enhanced patient experience and quality of care, which

ultimately aligns with the National Cancer Plan (Ministry for Health, 2017-2021). Moreover, this will support the commitment to ensure optimal oncology care delivery, which efforts were recently recognized by the European Commission (OECD, 2025), declaring that oncology care in Malta adopts the best cancer practices, recommending other countries to follow the Maltese lead (Lamtargi & Zammit, 2025).

1.7 Conclusion

This chapter provided an overview of the problem, and the purpose of the study. The following chapter will provide a thorough review of existing literature focused on strategies to improve the AOS.

Chapter 2

Literature review

2.1 Introduction

The purpose of this chapter is to critically evaluate and discuss the outcomes of available studies which examined acute care utilisation by oncology patients who develop complications while receiving antineoplastic treatment, and how integrating an AOS ameliorates care for these patients.

The first section of this chapter outlines the formulation of the research question, and presents a comprehensive explanation of the search strategy used to collate evidence related to the area of study. This is followed by a critical appraisal of the studies retrieved. Subsequently, a synthesis of evidence of the selected studies will be presented while any gaps in research are addressed.

2.2 Initiating the search process

A structured research question is critical, serving as the basis to execute a successful research project (Covvey et al., 2024). The primary aim of this study is to investigate the acute care pathway for cancer patients, who underwent SACT/RT within the last six weeks and who experienced complications requiring urgent care. Based on the research question established in the previous chapter, the key components specifying the population and outcome of interest were identified (Ratan et al., 2019).

2.2.1 Components of the research question

The process of the search strategy was adhered to by identifying the key components of the research question and rephasing natural language terms. The selection of synonyms for each key element was facilitated with thesaurus, the Medical Subject Headings (MeSH) browser, and terms which the researcher came across while reviewing the literature. Table 2 below displays the terms aligned with the mentioned database terminology.

Table 2.1

Key terms aligned with database terminology.

Key component	Term/s derived from database terminology
Population: Oncology patients	Cancer patients (synonym); Patients with cancer (synonym)
Cancer treatment	Antineoplastic protocols (MeSH); Antineoplastic agent (MeSH) Anti-cancer treatment (synonym); Anti-cancer therapy (MeSH); anticancer therapeutics (MeSH); anticancer regimen (synonym); Systemic anti-cancer treatment (synonym); Radiotherapy (synonym)
Complication	Sequelae (MeSH), Treatment-related complications (synonym), Adverse effects (synonym); adverse event (synonym); side effect (synonym); Toxicity (synonym);
Outcome: Acute care	Urgent care (synonym) Emergency care (synonym)
Acute oncology service	Acute cancer care (synonym) Acute oncology care(synonym)
Enhanced care	Improved care (synonym)

Truncations and wild cards were implemented to the list of mapped search terms and phrases to exhaust all possible literature and ensure a rigorous search. Truncation means adding a symbol at the end of the root term, which is usually an asterisk (*) to incorporate plurals and variants (New York University [NYU], 2024). Subsequently, wildcards allow the search to capture variations in spelling of the root word, by replacing one or more characters of the root word. A question mark (?) replaces one character, while an asterisk (*) replaces two or more characters (JSTOR, 2024). The adjusted key search terms are presented in Table 2.2.

Table 2.2

Key terms and truncations

Key term	Synonyms	Synonym using truncation or Wildcard	Words retrieved
Oncology patient:		Oncology patient*;	‘’oncology patient’’or‘’oncology patients
	Cancer patient	Cancer patient*	‘’cancer patient’’,‘’cancer patients’’;
Cancer treatment:		Cancer treat*	‘’cancer treatment’’,‘’cancer treatments’’
	Cancer therapy	Cancer therap*	‘’cancer therapy’’,‘’cancer therapies’’,‘’cancer therapeutics’’
	Anti-cancer treatment	Anti-cancer treat*	‘’anti-cancer treatment’’, ‘’anti-cancer treatments’’
	Anticancer therapy;	Anticancer therap*;	‘’anticancer therapy’’,‘’anticancer therapies’’,‘’anticancer therapeutics’’
	Antineoplastic protocol;	Antineoplastic protocol*	‘’antineoplastic protocol’’,‘’antineoplastic protocols’’
	Anticancer regimen;	Anticancer regime*;	‘’anticancer regime’’,‘’anticancer regimen’’,‘’anticancer regimes’’
	Systemic anti-cancer treatment;	Systemic anti-cancer treat*;	‘’systemic anti-cancer treatment’’,‘’systemic anti-cancer treatments’’
	Radiotherapy	Radiotherap*	‘’radiotherapy’’, ‘’radiotherapies’’, ‘’radiotherapeutics’’

Key term	Synonyms	Synonym using truncation or Wildcard	Words retrieved
Complications:		complication*	‘’complication’’, ‘’ complications’’
	Sequela	Sequela*	‘’sequela’’, ‘’sequelae’’
	Treatment-related complication	Treatment-related complication*	‘’treatment-related complication’’, ‘’treatment-related complications’’
	Side effects;	side effect*	‘’ side effect’’, ‘’side effects’’
	Adverse effect;	Adverse effect*	‘’adverse effect’’, ‘’adverse effects’’
	Adverse event;	Adverse event*	‘’adverse event’’, ‘’adverse events’’
	Toxicity;	Toxicit*	‘’toxicity’’, ‘’toxicities’’
Acute care:			‘’acute care’’
Urgent care:			’urgent care’’
Emergency care:			‘’emergency care’’
Acute Oncology Service:		Acute Oncology Service*	‘’acute oncology service’’, ‘’acute oncology services’’
	Acute oncology care		
	Acute cancer care		
Enhanced care:	Improved care		

2.3 The search strategy

The upcoming section illustrates the approach taken to determine the applicable research studies.

2.3.1 The search

The literature search for this dissertation was conducted using Hydi, the online library of the University of Malta (UOM), to establish if previous significant studies were carried out locally. As no results were obtained related to this subject matter, a literature search was carried out by searching various databases accessed through the UOM online library. These included: Cumulative Index to Nursing and Allied Health Literature (CINAHL) complete (EBSCO), Cochrane Clinical Answers (EBSCO), Cochrane Database of Systematic Reviews (EBSCO), MEDLINE complete (EBSCO), Web of Science, and Scopus.

2.3.2 Database search

The next phase was to attempt and refine the keywords generated from each concept to the database. The researcher opted to search for the ‘‘all text’’ option in the EBSCO search field option to expand the search, as the ‘abstract’ was generating minimal results. The publication date range was set from 1st January 2014 to 15th November 2024, to ensure retrieval of the latest and most relevant studies. The Boolean operators ‘‘OR’’, ‘‘AND’’ were applied to expand the search through a combination of key terms and achieve more relevant results. Table 2.3 presents a summary of the search strategy using the Boolean operators.

Table 2.3

Search conducted with Boolean operators

Keyword combinations	**Limiters applied**	**Database accessed**	**Results**
1) ‘’cancer patient*’’ OR ‘’oncology patient*’’ OR ‘’patients with cancer’’ AND ‘’cancer treatment*’’ OR ‘’cancer therap* OR ‘’anticancer treatment*’’ OR ‘’anti-cancer treatment*’’ OR ‘’anti cancer treatment*’’ OR ‘’anti-cancer therap*’’ OR ‘’anti cancer therap*’’ OR ‘’anticancer therap*’’ OR ‘’oncolog treatment*’’ OR ‘’systemic anti-cancer therap*’’ OR ‘’radiotherap*’’ OR ‘’antineoplastic therap*’’ AND ‘’complication*’’ OR ‘’sequela*’’ OR ‘’treatment complication*’’ OR ‘’treatment-related complication*’’ OR ‘’treatment related complication*’’ OR ‘’adverse effect*’’ OR ‘’adverse event*’’ OR ‘’side-effect*’’ OR ‘’side effect*’’ OR ‘’toxicit*’’ AND ‘’acute care’’ OR ‘’urgent care’’ OR ‘’emergency care’’ AND ‘’acute oncology service*’’ OR ‘’acute oncology care’’ OR ‘’acute cancer care’’ AND ‘’enhanced care’’ OR ‘’improved care’’	English Language Peer-reviewed articles Human Date of publication: 2014-2024	Scopus Web of Science EBSCO: including CINAHL complete, Cochrane Clinical Answers, Cochrane Database of Systematic Reviews, MEDLINE complete	11 355 299 **Total: 665**

Keyword combinations	Limiters applied	Database accessed	Results
2) ‘’cancer patient*’’ OR ‘’oncology patient*’’ OR ‘’patients with cancer’’ AND ‘’cancer treatment* OR ‘’cancer therap* OR ‘’anticancer treatment*’’ OR ‘’anti-cancer treatment*’’ OR ‘’anti cancer treatment*’’ OR ‘’anti-cancer therap*’’ OR ‘’anti cancer therap*’’ OR ‘’anticancer therap*’’ OR ‘’oncolog treatment*’’ OR ‘’systemic anti-cancer therap*’’ OR ‘’radiotherap*’’ OR ‘’antineoplastic therap*’’ AND ‘’acute care’’ OR ‘’urgent care’’ OR ‘’emergency care’’ AND ‘’acute oncology service*’’ OR ‘’acute oncology care’’ OR ‘’acute cancer care’’	English Language Peer-reviewed articles Human Date of publication: 2014-2024	Scopus Web of Science EBSCO: including CINAHL complete, Cochrane Clinical Answers, Cochrane Database of Systematic Reviews, MEDLINE complete	62 2,440 1,711 **Total: 4,213**

Keyword combinations	Limiters applied	Database accessed	Results
3) ‘’cancer treatment*’’ OR ‘’cancer therap*’’ OR ‘’anticancer treatment*’’ OR ‘’anti-cancer treatment*’’ OR ‘’anti cancer treatment*’’ OR ‘’anti-cancer therap*’’ OR ‘’anti cancer therap*’’ OR ‘’anti-cancer therap*’’ OR ‘’oncolog treatment*’’ OR ‘’systemic anti-cancer therap*’’ OR ‘’radiotherap*’’ OR ‘’antineoplastic therap*’’ AND ‘’complication*’’ OR ‘’sequela*’’ OR ’’treatment complication*’’ OR ‘’treatment-related complication*’’ OR ‘’treatment related complication*’’ OR ‘’adverse effect*’’ OR ‘’adverse event*’’ OR ‘’side-effect*’’ OR ‘’side effect*’’ OR ‘’toxicit*’’ AND ‘’acute care’’ OR ‘’urgent care’’ OR ‘’emergency care’’ AND ‘’enhanced care’’ OR ‘’improved care’’	English Language Peer-reviewed articles Human Date of publication: 2014-2024	Scopus Web of Science EBSCO: including CINAHL complete, Cochrane Clinical Answers, Cochrane Database of Systematic Reviews, MEDLINE Complete	11 568 1,864 **Total: 2,443**

Keyword combinations	Limiters applied	Database accessed	Results
4) ‘’cancer patient*’’ OR ‘’oncology patient*’’ OR ‘’patients with cancer’’	English Language	Scopus	68
AND ‘’complication*’’ OR ‘’sequela*’’ OR ’’treatment complication*’’ OR ‘’treatment-related complication*’’ OR ‘’treatment related complication*’’ OR ‘’adverse effect*’’ OR ‘’adverse event*’’ OR ‘’side-effect*’’ OR ‘’side effect*’’ OR ‘’toxicit*’’	Peer-reviewed articles	Web of Science	1,482
	Human	EBSCO: including	
AND	Date of publication: 2014-2024	CINAHL, Cochrane Clinical Answers, Cochrane Database of Systematic Reviews,	1,792
‘’acute oncology service*’’ OR ‘’acute oncology care’’ OR ‘’acute cancer care’’			**Total: 3,342**

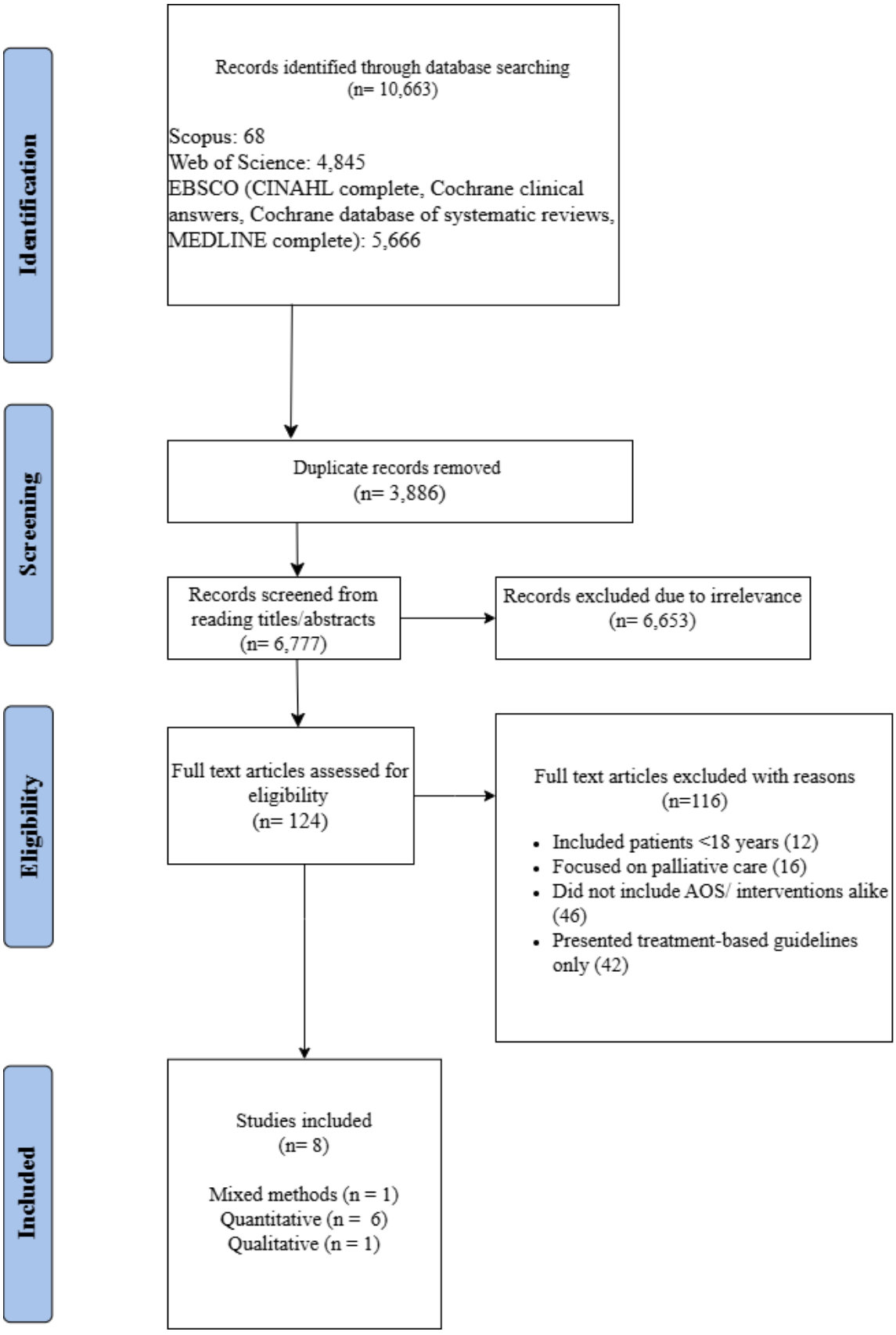
2.3.3 Search results and selection

A total of 10,663 results were obtained from the database search. From this record, 3,886 duplicates were detected and eliminated, leaving 6,777. From these 6,777 results, 6,653 results were eliminated as these were deemed irrelevant by reading the title or abstract, leaving 124 results for eligibility screening. These articles were screened for eligibility through an inclusion and exclusion criteria (Table 2.4). From 124 articles, 116 were excluded since they included patients <18 years, focused on palliative care, did not include AOS or interventions alike to enhance care, or only presented treatment-based guidelines. A total of eight articles were included in this literature review (n=1 mixed methods, n=6 quantitative, n=1 qualitative). Finally, the references of the articles retrieved from this search were scrutinised to determine if further articles may be considered for this review. However, no further articles were deemed relevant.

Figure 2.1 provides a succinct representation of the pathway of the selection process, using the PRISMA flowchart.

Figure 2.1

PRISMA flowchart explaining the selection process



2.3.4 Inclusion and exclusion criteria

The inclusion and exclusion criteria were formulated to assist with the selection of the most relevant studies. The criteria of this literature review were based on key components of the research question.

Table 2.4

Inclusion and exclusion criteria

	Inclusion criteria	**Exclusion criteria**
Population	Adults aged 18 years or older	Paediatric and young adults (0-17 years)
	Patients with solid tumours and/or haematological malignancies	Patients with no known malignancy
	Patients receiving SACT+/-RT	Patients not receiving SACT+/-RT
Exposure	Cancer-related ED visits and/or hospitalisations	Focused on non-cancer related ED visits and/or hospitalisations
Outcome	Acute care settings or oncology centres Examined and outlined oncology services / interventions which enhance AO care	Cancer care outside the ED and acute care settings; Did not examine or report oncology services and/or interventions which enhance acute oncology care
		Presented only treatment-based clinical guidelines
Study design	Quantitative, qualitative, mixed methods studies, clinical audits, QI studies	Blogs, opinions, conference abstracts
Published	Studies published between1st January 2014 to 15th November 2024	Studies published prior to 31st December 2013
Language	English Language	Other languages

Apart from analysing the acute care trajectory, the focus of the study is to identify gaps in such process and establish QI strategies to address these shortcomings. For this rationale, studies which did not examine AOS or similar interventions and their impact, where excluded. Patients with cancer are quite a heterogenous population (Antonuzzo et al., 2017). AO admissions are classified into three categories; 1) presentation at the ED with a new malignancy; 2) known oncology patients undergoing antineoplastic therapies or cessation of treatment in the previous six weeks, 3) known oncology patients presenting with malignancy related complications, with the latter associated with longer LOS (Neville-Webbe et al., 2016). Thus, only studies which focused on patients receiving active treatment were included.

From the search, eight studies were deemed relevant to this study, where researchers examined patients who required acute care while undergoing or had undergone active treatment. Table 2.5 presents a summary of the selected articles outlining the title, authors, year of publication, country, and methodology.

Table 2.5

List of selected studies

Study title	Authors, Publication year	Country	Methodology
Emergency admissions and subsequent inpatient care through an emergency oncology service at a tertiary cancer centre: service users' experiences and views	Chen et al. (2019)	United Kingdom	Qualitative study
Impact of a Cancer Urgent Care Clinic on Regional Emergency Department Visits	Hong et al. (2019)	United States	Quantitative, Quasi-experimental – interrupted time series study
Impact of a Dedicated Cancer Urgent Care Center on Acute Care Utilization	Gould Rothberg et al. (2021)	United States	Quantitative, Quasi-experimental - Pre-test-Posttest design
Impact of a supportive care service for cancer outpatients: management and reduction of hospitalizations. Preliminary results of an integrated model of care	Antonuzzo et al. (2017)	Italy	Quantitative, Retrospective study
A Rapid Assessment Clinic to improve delivery of ambulatory care to cancer patients	Kuo et al. (2017)	Australia	Quantitative, Retrospective study
The impact of an oncology urgent care centre on healthcare utilization	D'Avella et al. (2024)	United States	Quantitative, Retrospective study
Home-Based Management of Patients With Cancer Experiencing Treatment-Induced Toxicities With a Nurse-Led Telephone Triage (the NTT Study)	Calvetti et al. (2022)	Italy	Quantitative, prospective study
Evaluation of a new emergency department avoidance model of care, the Cancer Urgent Assessment Clinic, in response to the COVID-19 pandemic	Haugstetter et al. (2022)	Australia	Mixed Methods, Service Evaluation

The following sections delineate a critique of the selected quantitative, mixed methods and qualitative studies. Proceeding with this process, are the ethical considerations concerning the selected articles.

2.4 Critical appraisal of a qualitative study.

Critical appraisal is the approach to rigorously and systematically scrutinise the literature to assess its credibility, comprehend its findings, and determine their significance within a specific context (Burls, 2015). A thorough critical appraisal enables the judgement of whether the study adequately addresses the question posed, the validity of methods applied, potential factors that may confound its findings, and if such findings are significant. It also considers the parameters that may be endorsed from such a study, and whether the findings, despite their limitations, are credible and relevant to study of interest (Clapton & Sami, 2023). Several checklists are available to allow the researcher to examine various types of studies, such as the Critical Appraisal Skills Programme (CASP), Joanna Briggs Institute (JBI), Consolidated Standards of Reporting Trials (CONSORT) and The Transparent Reporting of Evaluations with Non-randomised Designs (TREND) statement (University of the West of Scotland, 2025).

The CASP tool is typically one of the most commonly used checklists for appraising health and social qualitative research synthesis, and it is often recommended for novice researchers. It consists of ten questions, designed to assess the method, rigour, validity, and credibility (Long et al., 2020). (Appendix A). Primarily, two preliminary inquiries examine the aim and methodology of the studies. The subsequent questions are associated with the details of the methods applied to assess and appraise the quality of the research design, recruitment process, data collection, ethical considerations, rigour of data analysis, detailing results, and its value to the research body.

The following table displays a critical appraisal on the methodological rigour of the only qualitative study included in this review.

2.4.1 Exploratory qualitative analysis

Table 2.6

Characteristics of the qualitative study

Study	**Chen et al. (2019)**
Eligible patients (n=x)	Not specified
Patients included (n = x)	n = 20
Cancer type/s included	Solid tumours (Lung, Upper GI, Lower GI, Genitourinary), others
Cancer treatments	Chemotherapy, RT, Immunotherapy
Intervention	Emergency oncology service (embedded with teletriage)
Methods	Semi-structured interviews

This qualitative study explored the experiences of service users concerning the emergency oncology service and consequent inpatient care, with the aim of generating new knowledge to improve the service. Adopting a qualitative approach was ideal as it allowed the researchers to gain a deeper understanding of the service users' subjective experiences and perspectives on the service. However, the design was not explicitly specified (Creswell & Creswell, 2023).

A maximum variation, purposive sampling was deemed appropriate. This approach was selected as it allowed the researcher to target participants with similar characteristics but distinct experiences, thereby enhancing data quality and gain an in-depth understanding from multiple viewpoints (Nyimbili & Nyimbili, 2024). Although the authors specified the eligibility criteria for recruiting the participants, with the aim of collecting the nuanced data sought by the study, they did not explicitly establish an exclusion criterion. The researchers acknowledged the limitations and provided a rationale for excluding eligible patients. The total amount of eligible patients was not mentioned. However, a sample size of 20 participants is considered adequate as this was justified by reaching data saturation, that is the

point at which no new insights emerged and thus, further data collection was deemed unnecessary (Creswell & Creswell, 2023).

Semi-structured interviews enabled the researchers to gain comprehensive knowledge from participants (Ruslin et al., 2022). However, it was not explicitly stated whether interviews were held face-to-face. This would have provided a deeper understanding of the participant's attitudes and emotions. Although a validated interview guide was utilised, a pilot interview may have enhanced the reliability and validity of this study (Tate et al., 2023). Consequently, the dyadic interviews may have enhanced the process, through expression of mutual experiences, and generation of rich data, as interviewees could build on each other's responses during the interviews (Valentine 1999; Polak & Green, 2016). Nonetheless, this might have negatively affected the process, as interaction between interviewees may suppress an individuals' narrative (Polak & Green, 2016).

Interviews were transcribed verbatim; however, the record method is not specified. A rigorous data analysis was achieved through framework analysis, between multiple analysts. Credibility and trustworthiness were well-established through triangulation, by utilising patient and admission event as the case and sub-case, respectively. A robust data analysis was achieved through grounded analysis, while a comprehensive documentation of the analytical process enhanced collaboration among analysts. This study validated findings, through a presentation of direct quotes which provides a better illustration of the participants' experience (Eldh et al., 2020). Results were presented in four categories, while five common themes were derived from participants hospitalised in an oncology ward. These themes will be presented in the findings.

This study presented an elaborate discussion of the findings in relation to existing body of literature on emergency oncology services and acute care, acknowledging its' limitations. Despite evident constraints, it may be concluded that this study is relatively robust and well executed.

2.5 Critical appraisal of quantitative studies

The JBI tool was applied to assess the methodological quality of the quantitative studies, specifically evaluating quasi-experimental and cohort designs (Appendix C and D), respectively.

2.5.1 Quasi-Experimental studies

Quasi-experimental studies are conducted to examine the efficiency of a treatment or intervention (University of Toledo, 2025). The most common types of this design include Non-equivalent group, Pretest-Post-test, Interrupted time series, and Combination designs (Jhangiani et al., 2015).

Table 2.7

Characteristics of quasi-experimental studies

Study	**Hong et al. (2019)**	**Gould Rothberg et al. (2021)**
Participants pre intervention	12,677	2,095
Time period	1st January 2009- 31st December 2012	1st September 2016 – 31st December 2016
Participants post intervention	20,639	2,188
Time period	1st January 2013 – 31st December 2016	1st September 2017 – 31st December 2017
Cancer type/s included	Solid tumours, Lymphomas (Excluding non-melanoma and Leukaemia)	Solid Tumours and Haematological
Cancer treatments	Chemotherapy, RT, Immunotherapy, surgery.	Chemotherapeutic treatment plan
Intervention	Cancer Urgent Care Clinic (UCC)	Oncology Extended Care Clinic (OECC)
Design	Quasi-experimental – interrupted time series design	Quasi-experimental - Pretest - Post test design

Methods and analysis	Regional database, Descriptive statistics Poisson distribution; Marginal effects, interrupted time series segmented regression	Hospital's demographic profile, Bivariate analyses Poisson model with log transformation Robust standard errors

2.5.1 Critical appraisal of the quasi-experimental studies.

The implementation of both the Urgent cancer care clinic (UCC) and the Oncology extended Care Clinic (OECC) served as the cause in both studies respectively. On the other hand, in Hong et al. (2019), the effect studied was the impact on ED utilisation, while Gould Rothberg et al. (2021) investigated the impact on the acute care utilisation.

The participants' characteristics with regard to demographics and clinical features included in the cohorts of both studies were similar, which is critical to avoid selection bias and to maintain the integrity of internal validity (Tufanaru et al., 2020). Moreover, participants in both studies underwent similar therapies aside from the exposure to the UCC and OECC.

Hong et al. (2019) lacked the explanation of HCPs who manned the UCC, while Gould Rotherberg et al. (2021) thoroughly described the HCPs involved and their role at the OECC. Such feature is paramount to help the reader understand how the practice operates, articulate findings better, and state to what extent the results may be replicable and generalisable.

The regional database accessed by Hong et al. (2019), does not report ED arrival time, and visits which occurred on weekday evenings were combined with those of the intervention group, which may have caused potential bias. However, a control group was only incorporated in Hong et al.'s (2019) study. Since the UCC did not operate during weekends, a control group was integrated to justify and account for weekend and holiday ED visits.

An interrupted time analysis in Hong et al. (2019), allowed multiple measurements of ED use which the researchers observed monthly over six months, before and after intervention, and included a slightly larger variety of covariates. Such measures enriched the investigation of causal plausibility (Tufanaru et al., 2020). Although the findings of Gould Rothberg et al. (2021) addressed the outcomes, being conducted over a four-month period limited the ability to conduct multiple measurements, which the authors acknowledged as a limitation. To achieve comprehensive follow-up, both studies ensured extensive data acquisition through a regional database and adjacent hospital demographic profiles respectively. Hong et al. (2019) ensured adequate patient tracking through exclusive patient identifiers, while Gould Rotherberg et al. (2021) seasonally linked a four-month parallel research period.

Both studies conducted statistical adjustment to account for several presentations by the same patients and modified rates of fundamental covariates. Consequently, both studies incorporated a robust analysis process to adequately measure the outcome between groups which is paramount to avoid threats to internal validity (Tufanaru et al., 2020).

Hong et al. (2019) recognised that the unreadable ED presentation time may have misinterpreted the effect of the intervention. Although they presented a discussion of findings, a wider comparison of results to present evidence would have provided a deeper insight of the study and placed better the results into context. Gould Rotherberg et al. (2021) provided an intensive discussion of the results and holistically addressed recommendations against current literature. Considering their strengths and weaknesses, both studies are comprehensible and of good quality.

2.6 Critical appraisal of other quantitative methods

The upcoming three studies (Table 2.8) described their research as retrospective in design. Despite the latter, the researcher applied the JBI cohort checklist for a thorough critical appraisal. This classification is due to the elements of a cohort design, in which the

choice of participants was based on shared characteristics, with the key distinguishing factors between the groups being exposure, specifically, between patients who were exposed to the newly introduced services, and those who required acute care prior to the provision of the service (Capili & Anastasi, 2021).

Table 2.8

Characteristics of quantitative retrospective review

Study	**Antonuzzo et al. (2017)**	**Kuo et al. (2017)**	**D'Avella et al. (2024)**
Intervention	Supportive care service (SCS)	Rapid Access Clinic (RAC)	Direct Referral Unit (DRU)
Outcomes Measured	ED visits, Hospitalisation rates in oncology and non-oncology units, LOS, expenses	Time to medical exam, Time on site, Hospitalisations, LOS and Time to antibiotic treatment (Febrile Neutropenia)	ED use (Primary), Hospitalisation rate, 30-day ED/admission, expenses
Cancer types	Solid tumours	Solid tumours	Solid tumours
Cancer treatment	Chemotherapy, immunotherapy, targeted therapy, and combinations	Chemotherapy	Chemotherapy, immunotherapy, RT and surgery
Participants in non-exposure group	1,275	287; [a]16	5,737
Time period	January 2011 – December 2011	September 2013-June 2014	January 2014 – June 2018
Participants in exposure group	1,358	217; [a]11	7,377
Time period	April 2012 – December 2012	September 2013-June 2014	January 2014 – June 2018
Design	Retrospective study	Retrospective study	Retrospective study

Methods	Data collection from Hospital's internal software	Data collection from Oncology and ED Information systems	Data collection from EHR from organisation's data warehouse International classification of Diseases (ICD) ICD-9:June 2014-1st October 2015 ICD-10: 2nd October 2015- June 2018
Analysis	Unspecified	Mann-Whitney U test	Stata MP version 15, Descriptive statistics, Unadjusted differences: X_2 and t test Adjusted differences: random effect logistic regression; Poisson regression; Sensitivity analysis: cluster-correct Standard Errors

[a] Additional records for febrile neutropenia presentations

The three studies evidently outlined the purpose of their study. Antonuzzo et al. (2017) aimed to examine the impact of a SCS on hospitalisations, while Kuo et al. (2017) and D'Avella (2024) evaluated the effect of a RAC and DRU on ambulatory care and healthcare use respectively.

Patient demographics and clinical characteristics were common between comparison groups. However, Antonuzzo et al. (2017) may have strengthened their study by comparing parallel time periods between groups to avoid bias (Moola et al., 2020).

Kuo et al. (2017) and D'Avella et al. (2014), both established an inclusion and exclusion criteria. Antonuzzo et al. (2017), did not establish such criteria but rather evaluated the effect of SCS for any patient that accessed their hospital. The groups in each study seemed to be free of the outcome of interest at the start of the study. All three studies measured the exposure and outcome by collecting data and utilising objective measurement through EHRs. Additionally, D'Avella et al. (2024) acknowledged the upgrade from ICD-9 to ICD-10, which sustained that their source was up to date, while Kuo et al., (2017) uti-

lised the triage system adapted from a validated assessment toolkit (UKONS). Consequently, inter-rater reliability was only established in D'Avella et al.'s (2024) study, where two authors evaluated the presentation codes. Although exposure and outcome measurement was considered valid and reliable through EHRs, double checking of variables would have further intensified reliability and data quality (Queiroz et al., 2019).

Antonuzzo et al. (2017) provided significant statistics on patient demographics, and reasons for hospitalisation before and during SCS. They hypothesised that a SCS would curtail rate and cost of hospitalisations. Although they provided a descriptive and comparative account, they lacked explanation on the analytical approach to test such hypothesis. The Mann-Whitney U test allowed Kuo et al. (2017) to examine the efficiency between at the ED or RAC. Identifying and accounting for factors such as comorbidities, poor performance status, and low socio-economic status, which drive ED use (Lash et al., 2022) would have increased the credibility of these studies. Neither of the two studies have illustrated or accounted for potential confounding factors, through statistical processes such as multivariate regression. D'Avella et al. (2024), conducted a robust analysis enabling them to address various critical covariates that may serve as confounding factors. The Poisson regression examined the yearly impact, which was identified as a key confounder. Factors such as comorbidities, socio-economic and performance status may have been missed due to amendments in the EHRs which the authors disclosed. Neither the SCS nor the RAC operated 24/7. Accounting for ED visit periods, in the hours where the service was not available could have reduced bias and provided more accurate results. Although, D'Avella et al. (2024), presented results of ED vs DRU presentations from Monday to Sunday, this service did not run 24/7 either, and the authors acknowledged that they could not display timeframes as this was a limitation of their EHR, and ED visit-level data did not differentiate between oncology –related and oncology-unrelated presentations.

While EHRs provide real-time data, these may pose the challenge on patient follow-up specifically if patients are treated in other centres (Gianfrancesco & Goldstein, 2021).

Given that these articles are retrospective studies, lost follow-ups are unclear (Talari & Goyal, 2020). Kuo et al. (2017) acknowledged incomplete recording of time to medical assessment, and suggested a prospective study with a larger sample to support their results. Consequently, D'Avella et al. (2024) confirmed that they could not detect patients who were treated in a different hospital. A four-year period measurement assessing ED vs DRU trends at population and patient level on a monthly and yearly basis by D'Avella et al. (2024) suggests a sufficient follow up. Although the studies measuring the impact of SCS and RAC obtained pertinent outcomes, their follow-up period is short compared to similar studies.

Even though only D'Avella et al. (2024) recorded the odds ratio of patient population and visits among exposures, each study reported and visualised the contrast among the exposed and unexposed groups, together with the key outcomes. Each study reported a strong association between the exposure and outcome, albeit only D'Avella et al. (2024) explicitly reported the relative risk ratio for the patient population with ED and DRU visits.

Although Antonuzzo et al. (2017) provided *p* values recognising statistical significance, these lacked precision as they did not present confidence intervals (CIs) for the leading outcomes. Conversely, Kuo et al. (2017) and D'Avella et al. (2024) both presented such feature. The findings of these studies appear to be valid as they revealed significant impacts. Although, Antonuzzo et al. (2017) and Kuo et al. (2017) may have not completely accounted for confounding variables, their results remained nonetheless consistent across various key outcomes, thus suggesting valid findings. Each study's data collection was conducted through reliable sources, and maintained consistency to address outcomes.

Despite clear shortcomings, the studies by D'Avella et al. (2024) and Kuo et al. (2017) may be classified as methodologically sound. However, the methodological process of Antonuzzo et al.'s (2017) study presented several ambiguities.

2.7 Critical appraisal of a quantitative prospective review.

Table 2.9

Characteristics of a quantitative prospective review

Study	**Calvetti et al. (2022)**
Intervention	Nurse-led Telephone triage (NTT)
Outcome metrics	Hospitalization rates (Primary) reported treatment-related adverse events (TRAEs) according to primary malignancy; cost effectiveness of NTT (secondary)
Cancer types	Solid tumours
Cancer treatments	Chemotherapy, Immunotherapy, targeted therapies, hormone therapies
Participants in non-exposure group	936
Time period	10th September 2017 – 6th September 2018
Participants in exposure group	1075
Time period	10th September 2018 – 6th September 2019
Design	Real-world prospective study
Methods	TRAE record form, clinical records
Data analysis	Chi-square

Calvetti et al. (2022), clearly outlined the aim of their study which was to examine the effect of a NTT strategy on curtailing ED visits, and hospitalisations among patients receiving antineoplastic therapies, with the primary and secondary outcomes illustrated in Table 10.

The similarity between the exposure and non-exposure cohorts in this study is evident, and participants were recruited based on an established inclusion and exclusion criteria from their respective Oncology department. The exposure was equally and consistently measured across groups, to observe the NTT effect. The exposure was measured in a valid and reliable manner by examining the outcome across similar time periods. Additionally, a structured training programme was introduced for oncology nurses to ensure that these professionals were competent to triage and grade TRAEs effectively utilising the assessment tool developed based on the Common Terminology Criteria for Adverse Events (CTCAE) v5.0 scale.

Although Calvetti et al. (2022) acknowledged the limitation of not using random assignment, they declared that the documented quantitative variables were normalised, aligned with the number of patients across the two periods, and that no significant dissimilarities were detected between cohorts in terms of patient characteristics and clinical attributes. Consequently, the researchers met monthly to anticipate and address any factors which may have affected their outcomes. Such actions sustained the study's internal validity. They did not include a control group within the same time period due to the small sample size, together with ethical concerns about withholding an available service from patients in need. However, a control group for patients who were hospitalised after hours, would have provided better insights. Ultimately, no further confounding factors were established. Patients receiving treatment were invited to enter the study after the training was finalised, and to contact the NTT in the event of uncontrollable TRAEs indicating that they were free of the outcome at the moment of the exposure. The outcomes were measured in a valid and reliable manner by ensuring nurses were competent, adapting a validated TRAE report form ensuring nurse competencies, and scoring symptoms according to colour-code. A one-year follow-up period was deemed adequate as it allowed the service to stabilise, and for the study endpoints to be effectively captured . Although the study did not outline particular loss to follow-up, or implications to address such matter, Calvetti et al. (2022) indicated that all patients eligible for the study accepted the enrolment and were included, and all symptoms reported were addressed.

The effect of the study was adequately analysed through a chi-square test. Stratification analysis would have provided a more robust analysis however, the researchers identified such factor as a limitation. Ultimately, the researchers provided a comprehensive visualisation of their findings. They concluded that the NTT left a considerable positive impact and provided a comprehensive economic analysis with regard to hospitalisations as well as HCPs training, however it did not provide statistical significance value.

The authors provided the TRAE and CTCAE scale in their appendices, which assists the reader to comprehend the tools utilised for the study. Despite some noticeable shortcomings, one can conclude that the methodology of this study was a positive one.

2.8 Critical appraisal of a mixed method study

For the only mixed method study included in this review, the mixed methods appraisal tool (MMAT) (Appendix B) was applied. The MMAT consists of two sections namely the checklist in Part 1, and a description of the criteria in Part 2. The MMAT highlights that the two preliminary screening questions of the checklist, must be answered as 'Yes' to ensure that the study appraised is an empirical one. The checklist is divided into five categories: qualitative, quantitative (randomised controlled trials [RCTs]), quantitative (non-randomised), quantitative descriptive, and mixed methods.

Table 2.10

Characteristics of the Mixed method study

Study	**Haugstetter et al. (2022)**
Intervention	CUAC
Cancer type/s included	Solid tumours
Cancer treatments	SACT
Outcomes measured	Presentation patterns in CUAC, compare ED use pre and post CUAC, explore service user feedback and experience on the service
Time period prior intervention	23rd March 2019 – 31st July 2019
Time period post intervention	23rd March 2020 – 31st July 2020
Methods	Mixed methods– Service Evaluation EHR, and patient surveys

Although the research question/s are not explicit, the authors clearly outlined that this study was a service evaluation of the CUAC, aimed at informing future service development, and potential integration into standard procedures. A mixed-method approach combining quantitative data and qualitative data was considered ideal to efficiently address

the evaluation's agenda. Data triangulation through such approach enhanced its credibility and validity (Noble & Heale, 2019).

The participants in the study were representative of the target population. This was evident through the inclusion and exclusion criteria established, which resonated with the primary goal of the service. Such method diminishes selection bias, and safeguards external validity (Patino & Ferreira, 2018). The effect of CUAC was adequately measured by objective data. Critical demographics were identified and extracted from EHRs which examined parallel time periods to compare the outcomes between the pre- and post-implementation of the CUAC. Standard descriptive statistics displayed a concise report of presentation patterns. Although the study reported a relevant decrease in ED short stay unit, it did not specify its statistical significance. The study demonstrated reliability through a complete representation of the findings.

The survey incorporated quantitative and qualitative elements through 5-point Likert scales, and open-ended questions respectively. The format of questions asked and including a 5-point Likert scale minimised the risk of acquiescence bias, where participants tend to agree with statements irrespective of their content or context (Dunsch et al., 2018). Open-ended questions enabled subjective measurement of the impact of the CUAC. Consequently, this approach provided clarity and a thorough understanding of patients' perspectives, enabling institutions to better grasp service users' concerns, and implement appropriate strategies to improve patient outcomes (Kumah et al., 2017). Interpretation of findings, in this section was supported through well-presented visualised data of patient-reported quantitative results. Outcomes from open-ended questions, briefly outlined four concepts. However, there was no indication that findings from open-ended questions were systematically analysed, through qualitative analytic methods for common themes to emerge. This in turn may have weakened the study's validity (Hecker & Kalpokas, 2025). The survey was validated by a team of specialised HCPs which ensured face and content validity (Nickerson et al., 2024). The survey was informed by existing evidence, and aligned with

the study's objectives, including questions from an established questionnaire. However, the survey was not piloted, which would have strengthened its construct validity (Hassane, 2024). Apart from including a research assistant, a reply-paid postage aimed for better chances of response rate (Ward, 2023).

Integrating EHR data and patient experiences of the service, provided concrete evidence that CUAC provided significant benefit and may be implemented in standard practice. Although some shortcomings are noticeable, this study may be concluded as methodologically sound.

A detailed presentation of these findings will be presented in the summary of findings.

2.9 Ethical considerations

The four fundamental principles grounding ethical research are: respect for autonomy, beneficence, non-maleficence, and justice (de Sanctis et al., 2022). From the appraised articles (n=8), six explicitly stated that their study underwent scrutiny from their respective ethics committee (EC) board, except for Antonuzzo et al. (2017) and Gould Rothberg et al. (2021). Antonuzzo et al. (2017) did not record any measures taken with regard to ethical implications or declarations of potential conflicts of interests, However, Gould Rothberg et al. (2021) ensured transparency by disclosing that their study was funded and supported, consequently declaring potential conflicts of interests (Bhatt & Arun, 2024). All other studies acknowledged and declared support, funding, and potential conflicts of interests.

Gaining informed consent was only reported in the studies conducted by Chen et al. (2019), Calvetti et al. (2024), and Haugstetter et al. (2022). Chen et al. (2019) established that participants were primarily recruited by the research nurse, while Haugstetter et al. (2022), stated that survey participation was voluntary. Anonymity was only established in Chen et al.'s (2019) study. ECs may approve a waiver of consent, however, retrospective

studies must present justification for such action (Bhatt & Arun, 2024). From the retrospective studies included, only D'Avella et al. (2024) indicated a waiver of patient consent from their EC.

NB. The age group of participants included in the study of Gould Rothberg et al. (2021), and D'Avella et al. (2024) was clarified after the researcher of this study contacted the corresponding authors of the respective studies (Appendix E & Appendix F).

3.1 Synthesis of evidence

The main interventions introduced to enhance AO service were teletriage advice, dedicated cancer clinics, and direct admission to oncology wards. The bottom-line results of these studies indicate that each service had beneficial effects. Table 2.11 is a representation of the approaches identified in the appraised studies. The implemented strategies included skilled HCPs who can address AO concerns, which ranged according to the local context of the study. Resources in oncology UCC were generally comparable, allowing them to accommodate patients presenting with cancer-related complications or treatment-related toxicities, including access to lab investigations, imaging, and treatment for supportive management (Hong et al., 2019, Gould Rothberg et al., 2021; Haugstetter et al.; 2022 Antonuzzo et al.; 2017, Kuo et al., 2017). From the five studies which implemented a dedicated acute clinic, only Gould Rothberg et al., (2021) reported having the capability to activate a rapid response team for high-acuity cases. Ultimately, ED referrals were only made for clinically unstable cases.

Table 2.12 presents a summary of findings, addressing common endpoints. Subsequently, the findings from the only two studies involving service user views are presented in table 2.1

Table 2.11

Approaches of interventions implemented

Study	Intervention	Setting/operation	Staffed by	Mode of referral/admission
Chen et al. (2019)	Emergency oncology service; Tele triage (TT) (UKONS)	Cancer Center: 24hours/7 days; TT, assessment, admission to oncology ward 99 beds between 4 oncology units	TT: Nurse specialists	Calls by patients; decision to admit by nurse specilist/duty MO; Other Physicians may contact centre for admission based on investigations.
Hong et al. (2019)	UCC	Comprehensive cancer centre;Telephone advice & UCC; Monday-Friday; 8am-4pm	Unspecified	Patients call UCC
Gould Rothberg et al. (2021)	OECC	Oncology Hospital; Monday - Sunday;7am-11pm; 6 beds	Advanced practice providers (APPs); Backed up by: Internal Medicine Hospitalists	Primary Oncology team
Antonuzzo et al. (2017)	SCS	Section within Oncology Hospital; Monday - Saturday; Morning - Afternon (hours unspecified)	Medical Oncologists, RN, Psychologist, spiritual assistant	Self-referral
Kuo et al. (2017)	RAC;TT (UKONS)	District general hospital; Days unspecified; 9am- 5 pm	Medical oncology advanced trainee registrar; RNs from oncology day unit	Patients call TT

Study	Intervention	Setting/operation	Staffed by	Mode of referral/admission
D'Avella et al. (2024)	DRU	Cancer Center; Monday – Saturday (2014-2017) (2018) Monday - Friday 8am-5pm	NPs, Internal medicine hospitalists	Primary oncologist/ Radiation oncologist/ Surgeon From office visit
Calvetti et al. (2022)	NTT (CTCAE)	Oncology Department from General Hospital; Monday - Friday 8am - 8pm	Oncology nurse led TT; Medical Oncologist – Same day visit assessments	G3-4 or ≥G2 events on immunotherapy referred for an urgent visit in their department with medical oncologist on duty
Haugstetter et al. (2022)	CUAC; TT (UKONS)	Oncology department within University Hospital; Monday - Sunday; Day Unit 8am - 4pm; Haematology inpatient unit 4pm - 8pm;2 physical spaces	**TT**; **Business hours:** Clinical nurse consultants (CNCs) from Clinical Nurse Specialist (CNS) team, **After hours**; Inpatient ward leader: Clinical nurse (CN) or Registered Nurse (RN); **CUAC**; **Business hours**: NP with RN from day unit, supported by Medical Consultants, **After hours**: MO and RN from inpatient unit	Self-referral

Table 2.12

Summary of findings

Study	Complaints	ED visits	Hospitalization	LOS	Costs
Chen et al. (2019)	Fatigue, pain, diarrhoea, fever, nausea & vomiting	ED visits: 8/43 CNS advice: 3/43 Patient/carer: 5/43(via ambulance)	Direct admission to oncology unit :35/43 ED to oncology: 5/43 ED to other unit: 3/43	Not an end point	Not an endpoint
Hong et al. (2019)	Patterns for complaints not measured	Significant monthly reduction during weekdays **(*p*=.007)** Insignificant monthly decline during week-ends (P=.533)	Pre: 47.7% Post: 44.7% Insignificant reduction both during weekdays (*p*=.639) and weekends (*p*=.247)	Not an end point	Not an endpoint
Gould Rothberg et al. (2021)	Patterns for complaints not measured	Pre: 682 visits by 466 patients Post: 618 visits by 447 patients Significant reduction **(p=.004)**	Pre: 863 admissions by 546 patients Post: 833 admissions by 567 patients Insignificant reduction(P=>.05)	Not an end point	Not an endpoint

Study	Complaints	ED visits	Hospitalization	LOS	Costs
Antonuzzo et al. (2017)	pleuro/pulmanory vascular/cardiac, general, GI, palliative, surgical complications	Pre:145 Post:117 Significant reduction; 5% **(p =0.018)**	Oncology unit Pre: 50; Post: 45 Other units Pre:171; Post: 147 Total admissions Pre: 221; Post: 192 Significant reduction -3.2% **(P= 0.024)**	Total hospitalisation days Pre: 1,623 Post:1,378 **-15%** **(n.a)**	Pre: €1,181,078 Post: €1,155,299 **-2.2%** **(n.a)**
Kuo et al. (2017)	Fever/ neutropenia, new symptom, pain, GI, respiratory	Time to review was less in RAC, however insignificant (p=0.12) Time on site was significantly less in RAC 3.1hrs vs ED: 11.8 hrs **(p=<0.00001)**	ED: 105 RAC: 31 Significant reduction; **(P=<0.00001)**	ED: 9.5 RAC: 6.5 Significant reduction **(P=0.013)**	Beyond scope of study

Study	Complaints	ED visits	Hospitalization	LOS	Costs
D'Avella et al. (2024)	**ED**: abdominal pain, fever dehydration, urinary tract infections and chest pain **DRU**: dehydration, nausea/vomiting, fever, dysponea and diarrhoea	Significantly decreased monthly and yearly visits **(P=<.001)** **30-day visit:** Unadjusted ED: 23% DRU: 27% Adjusted: ED: 22% DRU: 25% **(P=0.004)**	Unadjusted: ED: 22% DRU: 22% insignificant reduction (p=.91) Adjusted: ED: 27% ; DRU: 22% significant reduction of hospitalization rates from DRU **(P =<.001)** **30-day Readmission:** Unadjusted ED: 24% DRU: 24% Adjusted Significant reduction ED: 27% DRU: 22% **(P=<.001)**	Insignificant (P=.84)	Significant reduction in expenses: Unadjusted: **(p=<.001)** ED: $10, 261; DRU: $2,221 Adjusted: **(p=<.001)** ED $11,521 DRU: $1,930
Calvetti et al. (2022)	G3-4: fever, GI symptoms, cancer pain and fatigue	*noted decreased ED visits; number not explicitly stated* ED visits: Pre: 347 Post: 315 **Avoided ED: 166/218**	Significant reduction **(P=.002)**	Not recorded	Yearly saving: €345,247
Haugstetter et al. (2022)	Pain, fever, dysponea, diarrhoea, signs of infection	**Referred to ED:** 52/218 due to COVID, clinically unstability, limited CUAC space, Decline CUAC visit, uneligible for CUAC	Significant reduction in ED short stay unit :**614.57 hours**	Not an endpoint	Not an endpoint

* ***P values in bold indicate statistical significance***

Table 2.13

Findings of service user views

Research Study	**Chen et al. (2019)**	**Haugstetter et al. (2022)**
Main Findings	*Prompt and effective symptom management and stabilisation of acute conditions* *Continuity of oncology care and coordination among acute and long-term regimens* *Satisfying HCP-patient communication and knowledge sharing* *Diligent, motivated and skilled staff* *Sufficient visiting hours*	60/115 (52% response) **CUAC convenient over ED** *Agreed/ Strongly agreed* 46/60 ;76.6% **CUAC felt safer vs ED** 48/60; 80% (*Pandemic did not affect decision to visit hospital if unwell: 39/60; 65%;* *CUAC more likely/much more likely affected decision to visit hospital during pandemic: 33/60; 55%*) Preference of CUAC vs ED: CUAC: **44** ED: 1 No response: 7 Open-ended questions: ***Strongly positive*** *Ease of access* *Time to treatment after arrival* *Confidence in their assessment and treatment of their malignancy or therapy associated issues,* *Likelihood of visiting the hospital when sick during COVID-19*

Symptoms

Among the six studies which reported the patterns of presenting complaints, the five most common symptoms were fever, pain, GI and respiratory symptoms, and fatigue. Notably, Hong et al., (2019) and Gould Rothberg et al. (2021) did not report any complication patterns.

ED visits

While Haugstetter et al. (2022) noted ED avoidance with a CUAC clinic, the studies examining the impact of oncology UCC all reported a significant reduction of ED visit rates. Moreover, Kuo et al. (2017) reported that such service significantly reduced patients' time on site. Only D'Avella et al. (2024) explored ED and DRU readmission rate. Although this was higher in the DRU cohort, the authors noted that this warrants further study, as the this may be attributed to insufficient investigations, disease progression or continuous treatment toxicities. None of the seven studies investigating the outcome on ED visits ran 24/7, thus, it is suggested that further investigation is required to rationalise outcomes around weekend and night time patterns.

Hospitalisation and LOS

Oncology UCC also had a beneficial effect on hospitalisation rates; however statistical significance was reported in four out of seven studies (Antonuzzo et al., 2017; Kuo et al., 2017; Haugstetter et al., 2022; and D'Avella et al., 2024) investigating such effect, meaning that this requires further investigation. Consequently, a NTT also showed a statistically significant reduction in hospitalisation rates.

The effect on LOS also needs further examination. From eight studies only three studies examined such effect. Only Kuo et al. (2017) reported a statistically significant effect ($p=.013$), Although Antonuzzo et al. (2017) reported a 15% reduction, the statistical

significance was not specified, While D'Avella et al. (2024), did not show a significant effect in the LOS (p=.84)

Costs

From the three studies which calculated an economic analysis of their intervention, only D'Avella et al. (2024), reported a statistically significant reduction with the introduction their DRU (p=<.001). Although Antonuzzo et al. (2017) reported reduced costs by €25,779 (2.2%) and Calvetti et al. (2022) by €345,247 it is not evident whether these reductions where statistically significant,

Apart from Chen et al.'s (2019) study, one must consider that these clinics did not operate 24/7, thus studies examining similar clinics running 24/7, would provide more clarity, possibly disclosing further ED reductions as stated by Hong et al. (2019) and D'Avella et al. Service user views, also affirm that these services elevate AO care. Yet, neither have included providers' perspective, which would provide a holistic understanding within this context.

The limitation of generalisability was observed in the eight selected studies for different reasons. The studies conducted by Chen et al. (2019), Haugstetter et al. (2022), Calvetti et al (2022), D'Avella et al. (2024), Kuo et al., (2017), and Antonuzzo et al. (2017) were conducted within a single-centre institution. Such limitation was reported by the first four authors. Consequently, Haugstetter et al., (2022) also acknowledged that the COVID pandemic may have affected their results, while D'Avella et al. (2024) disclosed that their generalisability may be impacted since their patients were insured. Hong et al. (2019) and Gould Rothberg et al. (2021) disclosed that since their study was within a large regional and a large tertiary hospital respectively, their findings may not be applicable to smaller organisations.

4.1 Conclusion

Acute care demands for cancer patients will continue to increase due to rising cancer incidence rates, survival rates, and an aging comorbid population. As a result, healthcare systems have globally introduced strategies to deliver optimal AO care with the aim of curtailing acute care use (ACU), healthcare expenses, and ultimately enhancing patient outcomes. An AOS is not a one-size fits all service (RCR, 2020). The innovations introduced in the appraised studies ranged in terms of geographical infrastructure and logistics, healthcare workforce, and eligibility in terms of service provision by cancer type, and acuity of the patient's condition. Close observation was maintained by the primary Oncology team, however optimal oncology care is also a critical aspect of general practitioners' (GPs') daily duties, and their involvement can contribute to relevant assistance along the treatment trajectory (Thorsen et al., 2019).

These studies revealed that specialised emergency oncology specifically through UCCs and teletriage can truly accomplish direct patient benefit. However, further studies examining the impact of such services on hospitalisation rates and LOS, including service user and provider viewpoints, will contribute to a stronger body of evidence. Moreover, incorporating early palliative care (PC), better liaison between oncology and primary care, specifically with GPs, would help to achieve a holistic beneficial effect. The involvement of the GPs can contribute to relevant assistance along the treatment trajectory (Thorsen et al., 2019). However, their involvement was only mentioned in Chen et al. and Haugstetter et al.'s studies, indicating that their role remains unclear, and thus, further research is recommended (Perfors et al., 2019). Moreover, investing in digital infrastructure would assist the relevant stakeholder to collect salient data, that would assist data-driven decisions (Hong et al., 2019).

The recognised contributing factors to the increased demands of acute care also apply within the local context. Therefore, the affected stakeholders and policymakers must investigate which strategies would best fit the local health care system to deliver high-standard quality of care to this patient cohort, that would also benefit the organisation in terms of cost-effectiveness. To date there is no evidence of local studies analysing ACU by cancer patients along their treatment trajectory. Therefore, the present clinical audit will address this literature gap, and it will also provide QI strategies to drive service improvement for the AO subspecialty, which will in turn also benefit the broader healthcare system in the long run.

The following chapter will present a comprehensive report of the methodology applied for this clinical audit.

Chapter 3

Methodology

3.1 Introduction

This chapter provides a detailed account of the clinical audit methodology. An elaborate explanation of the data collection, as well as the data analysis process is included. The methodology will outline how this study will adequately analyse patient flow along the AO pathway while undergoing cancer treatment, and provide a QI plan that would ameliorate the AOS. Consequently, it will explain how the researcher identified hospitalisation trends, the location of hospital care, potential bottlenecks in the care service, and present national statistics ED visits and hospitalisation rates for this patient cohort. This will ultimately address how acute care is delivered to these patients when complications arise, and how the AOS may be enhanced. Moreover, a discussion of the ethical considerations is also incorporated within this section.

3.2 Defining clinical audit

Recognising the disparities between research and a clinical audit can be challenging, particularly for novice researchers (Twycross & Shorten, 2014). Research aims to discover new knowledge, while a clinical audit is a rigorous examination of the care provided to patients against accredited measures for high standards with the purpose of identifying and addressing areas for improvement (Dickerson, 2023). The Healthcare Quality Improvement Partnership [HQIP] (2020a) describes a clinical audit as one scope of QI modality that strives to deliver excellence in care quality outcomes for service users. A clinical audit is acknowledged as being one of the cornerstones of clinical governance. The latter is a systemic approach which healthcare institutions employ to achieve and sustain excellence in clinical care delivery (Flint, 2024). It encompasses seven pillars including: service user involvement, clinical audit and QI, staffing and staff management, clinical effectiveness, safety and risk management, information management, education and training (NHS, 2021, Winter, 2023a).

Subsequently, QI is the collaborative and unwavering efforts of everyone involved, including HCPs, patients, and caregivers, with the scope of implementing changes to practice. This in turn aims for better patient experiences, outcomes, and continuous professional development and support for HCPs (Dickerson, 2023; Health Service Executive [HSE], 2024), with the overarching purpose of ensuring the provision of optimal patient care (Bullivant & Corbett-Nolan, 2010, Hook, 2020).

This study is classified as a clinical audit as the researcher aims to evaluate the patient's hospital event along the AOS pathway, to reveal potential gaps and recommend evidence-based strategies to ameliorate the AOS (Blagburn, 2022). Through such analysis, the researcher aims to deliver QI strategies that would enhance the current AOS. As a result, the QI strategies identified fulfil the seven pillars of clinical governance framework.

3.3 Clinical audit design

The goal of the audit cycle is to ensure that clinical practice is consistently observed, and any shortcomings in accordance with specified standards are resolved (Braden et al., 2022).

There are four main types of clinical audits which the reviewer may adopt. These include outcome, process, structure, and significant event audits (Mosedale, 2020). Outcome audits observe the findings of a procedure, while process audits assess if guidelines are being adhered to. Structure audits examine facilities and amenities, and significant event audits are a comprehensive analysis of a particular episode (Mosedale, 2020, NHS Education for Scotland, 2022).

In the context of the aims and objectives highlighted earlier, this clinical audit particularly aligns with a process audit however features elements of an outcome audit. This is

because, apart from analysing the process of the AOS pathway, through ED and hospitalisation patterns, the reviewer will also determine the location where patients were treated due to their acute complication.

3.4 The clinical audit cycle

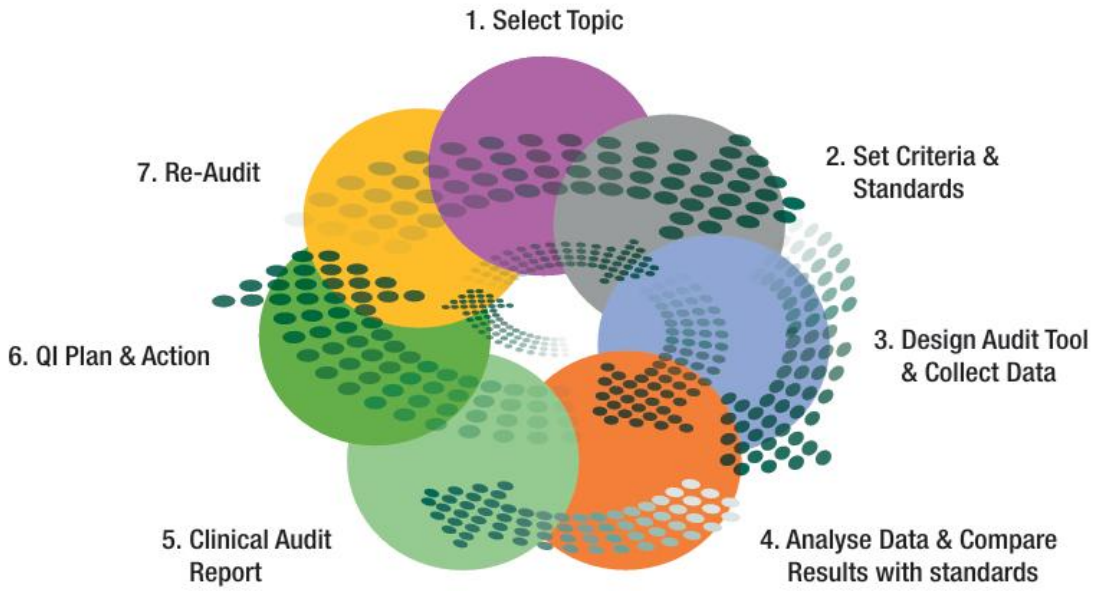
The clinical audit process is a cycle of a recurrent sequence (Hook, 2020). It routinely adheres to a standard technique of preparation and planning, measuring performance, implementing change, and sustaining improvement (HQIP, 2020a).

Various literature sources present the clinical audit cycle using different numbers of steps, ranging from five (National Institute for Health and Care Excellence [NICE], Commission for Health Improvement [CHI], Royal College of Nursing [RCN], & University of Leicester, 2002), to six (Blagburn, 2022), seven (HSE, 2023), eight (Dilnawaz et al., 2012), and even twelve cycles (Winter, 2023b). Nevertheless, the fundamental t principles of the clinical audit cycle remain consistent, namely, selecting a topic and standards, measuring and reporting performance, planning and implementing QI strategies, and conducting re-audits.

In the context of this dissertation, the researcher adhered to the clinical audit cycle and guidelines provided by the HSE framework National Quality and Patient Safety Directorate (2023) as attached in Figure 3.1 below.

Figure 3.1

The Clinical Audit Cycle



Adapted from HSE National Centre for Clinical Audit. Clinical Audit - A Practical Guide (2023).

The reviewer completed this audit until stage six, as this clinical audit is examining a pilot pathway. Re-auditing will be conducted after the QI recommendations have been implemented and sufficient time has elapsed for the changes to take effect (Blagburn, 2022). Nevertheless, any gaps that emerged were analysed, addressed, and discussed to provide an action plan for QI.

3.4.1 Stage 1: Selecting the topic

The selected topic needs to have the potential to enhance the quality, or safety of practice or service delivery (HSE, 2023). Moreover, the topic should ideally be chosen grounded on the concern of high-volume, high-risk, or high-cost issues (HQIP, 2020b, Skull, 2020).

This topic covers all three concerns. It is of high-volume concern because, as highlighted in the introductory chapter, the significant surge of cancer incidence rates, survival outcomes, novel antineoplastic therapeutics, and an aging co-morbid population will trigger an escalating demand for AO care.

Presently, oncology patients who develop complications while on active treatment, must present at the ED, voluntarily or after seeking advice from their respective nurse navigator (Appendix 1). However, one must consider how the ED is usually overcrowded, treating multiple patients with several conditions, thus exposing oncology patients to transmissible diseases (Alishahi Tabriz et al. 2023; Majka & Trueger, 2023). Such exposure is ultimately a threat to oncology patients due to immunosuppression, impaired integumentary system, and cancer treatment sequelae (Alishahi Tabriz et al., 2023). Eventually, infections and treatment-related complications pose a higher risk for hospital readmissions, leading to increased healthcare expenses (Xu et al., 2020). Thereby, this situation is classified as both high-risk and high-cost concerning, to both patients and the organisation respectively.

Furthermore, patients who require hospitalisation, may be admitted either at the OC or MAH. Ideally, patients who fit the AOS pathway criteria are directly admitted at the OC, depending on bed capacity (Appendix 1). However, one must appreciate that there are only 16 and 17 beds in male and female oncology wards respectively, 16 beds in the palliative unit, and 21 beds in the Haematology unit. Consequently, patients are admitted in a general ward (Appendix 1). With critically increasing cancer incidence rates, it is paramount to consider the increasing pressures on general medicine bed availabilities and LOS, classifying it as a high-volume and high-cost concern (RCR, 2020, Scottish Government, 2022). NB. COVID screening for admission to oncology was no longer mandatory as of 1st May 2023 (Appendix 10), unless patients displayed signs and symptoms of respiratory infections.

This audit will hereby address the three concerns and, following a thorough analysis, the reviewer will propose evidence-based QI approaches with the potential to streamline the AO pathway. An optimised AO pathway aims to ameliorate the AOS, by ensuring timely, specialist input for patients requiring urgent care, while maintaining cost-effectiveness through reduced LOS, and avoidance of unnecessary investigations (RCR, 2020; Viggars et al., 2022).

Consequently, the Donabedian model developed by Avedis Donabedian (Ayanian & Markel, 2016) presents a classification framework, to examine healthcare quality (Agency for Healthcare Research and Quality [AHRQ], 2015) and guide the topic selection. The metrics within this framework are categorised as structure, process, and outcome measures. Structural measures provide service users an awareness of the HCPs capacities and amenities. Process measures are the procedures conducted with regards to patient needs, and outcome measures are the perceived impact of the providers' activities (Agency for Healthcare Research and Quality [AHRQ], 2015, Blagburn, 2022). Table 3.1 concisely explains how the reviewer intends to focus on these elements to ensure a successful execution for this clinical audit.

Table 3.1

The Donabedian framework

Metric	Action
Structure	Location where oncology patients receive acute care
Process	The pathway patients endure initiating from ED presentation until discharge

Metric	Action
Outcome	Setting where patients received care, and LOS

Clinical audits must be developed and performed alongside, or by professionals delivering the care or service under scrutiny (HQIP, 2020b). Subsequently, these may be conducted either individually, or within a multidisciplinary team (MDT) (Limb et al., 2017, Hook, 2020). The HSE (2023) recommends the involvement of the right stakeholders with the appropriate skillset. This clinical audit is undertaken at an individual level, where the reviewer is a senior nurse who is clinically oriented and knowledgeable in oncology care. Since this audit also forms part of a Master's dissertation, it is carried out under the supervision of two academic experts in the fields of cancer care and nursing. Finally, the Research manager from the CCP Directorate and Consultant in Public Health Medicine from the Directorate for Health Information and Research were involved in the data collection, which process will be elaborated upon further in stage 3.

The researcher proposed this clinical audit to the relevant stakeholders which will be further discussed in the ethical considerations (Appendix 3, 4 and 5). Permission was granted prior commencing this audit. Apart from abiding to ethical regulations, this ensured that every aspect was examined to execute a robust clinical audit (HSE, 2023)

3.4.2 Stage 2: Setting the criteria and standards

The next critical step following the topic selection is to define evidence-based standards and criteria against which the audit will be implemented (Hook, 2020). A criterion is the specific dimension of care one desires to audit, while standards are the explicit level of excellence the organisation aims to achieve (Silva and Kumaran, 2015).

Standards must be evidence-based, and may be derived from local standards, national or international guidelines, significant quality and safety strategies, clinical care plans and professional bodies, and clinical protocol implementation organisations such as NICE. If these are not available, a literature review may be conducted to establish the latest credible evidence from which criteria and standards may be developed (HSE, 2023).

The standard used for this clinical audit was the local pilot AOS pathway, which outlines the referral process for directing patients from the ED to the OC and emergency services (Appendix 1). Consequently, the researcher measured the patient flow at different stages presented in the same pathway as explained in Table 3.2. Furthermore, the researcher utilised the UKONS triage tool (Appendix 6) as a criterion to analyse the presenting complaints at the ED to determine if these were oncology related or not.

Table 3.2

Criteria and performance

Outcome	Total	%
Received SACT/RT		
Individuals presented at the ED		
Total ED presentations		
Total hospitalizations		
Individuals hospitalized		
Admissions from ED to MAH		
Admissions from ED to Oncology		
Transfers from MAH to Oncology		

This pathway involves multiple stages that require reviewing patients' medical records to analyse their full care trajectory. However, as the study's primary focus is on the location of care, and Data Protection Officer (DPO) clearance was limited to accessing triage notes (Appendix 4), the reviewer assessed compliance with the standard by analysing patient flow based on the available data.

Clinical audit standard validity

Standards must be ideal, however realistic (Rose & Panf, 2021; HSE, 2023). Substantially, standards are credible if they comply with the SMART guideline; Specific, Measurable, Achievable, Relevant, Timely and Theoretically sound as delineated in table 3.3 (HSE, 2023).

Table 3.3

SMART guideline for assessing trustworthiness of standards

Metric	Approach
Specific	The pathway outlines clear guidelines from ED admission until discharge.
Measurable	Identifies key metrics which can be measured.
Achievable	Standard is based according to the availability of local resources. International guidelines present similar strategies for acute hospitals (NHS England Chemotherapy Clinical Reference Group, 2018, NHS Acute oncology group (AOG), 2019).

Metric	Approach
Relevant	Significant to the aims and objectives. This standard aims to provide enhanced care for oncology patients seeking urgent care. Aims to achieve positive patient outcomes through specialist advice, timely and appropriate assessment, and treatment (RCR, 2020). Statistics from observed metrics will guide development of strategies for better AOS (National AOS Short Life Working Group, 2022).
Timely	Timeframe for data collection, interpretation, and documentation is adhered to the study's allocated deadline.
Theoretically sound	This audit was developed between experts in the field. Contributed between the ED and CCP Directorate (Appendix 1)

3.4.3 Stage 3: Data collection

Choosing the appropriate data collection method is critical for the successful execution of any study. This defines the process and interpretation to answer the study question (Hassan, 2024a). Therefore, despite the distinction between research and clinical audits, the methodology framework was determined based on philosophical worldviews, encompassing themes of ontology, epistemology, and methodology (Guba, 1990, Creswell & Creswell, 2023).

A qualitative methodology is associated with constructivist and transformative worldviews, focusing on understanding the subjective meanings individuals or groups attribute to their experiences and the world around them (Creswell & Creswell, 2023 p. 9-11). For this study, the researcher intends to evaluate how to enhance the AO pathway for

oncology patients who develop complications while undergoing cancer treatment, as well as identifying ED visits and hospitalisation trends associated with this patient cohort. Therefore, a qualitative approach was regarded as inappropriate to analyse the AO pathway.

The ontology in this context is fixed to realism (Guba, 1990), suggesting that reality is objective, and can be revealed through empirical observations (Ar Rashid, 2023). Knowledge is generated through dualism and objectivism, by observing, but yet remaining distant from participants, to ensure internal validity and minimal bias (Guba, 1990; Park et al., 2020). This enables the researcher to comprehend the reality of the phenomena in question through quantifiable metrics and data (Lim, 2024). Ultimately, the answers derived from the three stems of the philosophical assumptions guided the researcher to employ the positivist paradigm (Guba, 1990; Park et al., 2020). Therefore, a quantitative approach exhibited substantial potential to address the question and fulfil the aims and objectives of this study (Park et al., 2020, Creswell & Creswell, 2023).

Design

Quantitative methodology can be classified as either experimental or non-experimental (Siedlecki, 2020; Lim, 2024). However, clinical audits do not involve testing or comparing new treatments and are therefore not considered experimental (Health Research Authority, 2017). Within this context, the current study adopts a non-experimental design (Lim et al., 2024).

A correlational design analyses the relationship among variables without manipulation (Bhandari, 2023), while a descriptive design intends to meticulously and systematically depict populations, circumstances or phenomena as they occur in nature (McCombes, 2023). Such an inquiry allows the identification of issues present within a population, system, or institution (Siedlecki, 2020). Additionally, results emerging from descriptive research are particularly effective for measuring the frequency of occurrences, and for providing detailed insights into specific, unexplored, or novel phenomena (Bloomfield & Fisher,

2019). As a result, the descriptive design supports a more comprehensive illustration of the subject under investigation, aligning with the investigator's positionality (Slater & Hasson, 2024).

A descriptive design may be either cross-sectional (Aggarwal & Ranganathan 2019), or longitudinal (Siedlecki, 2020). In cross-sectional studies the inquirer measures the outcomes and exposure on a population at a single point in time (Setia, 2016). Distinctively, longitudinal studies explore trends over a period of time (Siedlecki, 2020, Lim, 2024). Thus, within this context, the current study would be considered a longitudinal study, as the researcher aims to evaluate the AO pathway of the patients' journey upon ED presentation until discharge.

Data collection source

Data collection in quantitative research holds the advantages of speed, standardisation, and scalability (Lim, 2024). Data acquisition methods may employ either a primary or secondary approach. Primary data is the original data collation tailored to meet the research question, while secondary data employs existing data (Taherdoost, 2021, Lim, 2024).

Electronic health records (EHRs) are described as the national gathering of electronic patient data (Mullins et al., 2020), and are a credible source for secondary data interpretation (Dziadkowiec et al., 2020). Locally, the MOSAIQ software was introduced, which is an integrated patient management platform. It integrates radiation and medical oncology patient information in a unified user interface attainable by MDTs across various departments, thus allowing oncology workflow and information governance (Appendix 2, Elekta, n.d; Elekta, 2018). Locally, clinical oncology documentation is accessible to MDTs through patient dashboard (Appendix 8). Consequently, the Clinical Patient Administrative system (CPAS) is the operational system which streamlines administrative duties and patient data. Since these platforms can display significant information relevant to the study, EHRs were deemed as the optimal data collection source to achieve the highlighted aims

and objectives. For data protection purposes, data extraction was carried out by two intermediaries. This will be further elaborated upon in the ethical considerations section.

Data gathering may be either retrospective, concurrent, or prospective. Retrospective data is gathered after the delivery of care or treatment, concurrent data is collected as service is provided (HSE, 2023), while prospective data is acquired from a defined point in time during provision of care (Waine et al., 2021). The retrospective method was chosen for this study as it enables prompt collection of readily available data (HSE, 2023).

Whether data collection is primary or secondary, it is critical to comprehend the chosen sampling method and how it may induce bias and inaccuracies in data (Ewing and Park, 2020). Ultimately, applying methods which ensure the reliability and validity of the data collected is paramount (Bloomfield & Fisher, 2019).

Population

This audit is classified as a descriptive retrospective longitudinal study of adult cancer patients undergoing oncology treatment, within the country's sole oncology centre. Therefore, the interpretation results will be representative and generalisable to the target population for the upcoming years (Rudolph et al., 2023), safeguarding the external validity of the audit findings (Lieb, 2020). Secondary data of patients who received anti-neoplastic therapy between 1st August 2023 and 31st July 2024 were retrieved by the research manager, who was the main intermediary. This resulted in a total of 1,514 patients, excluding rare cases. Patients identified through MOSAIQ enabled a Consultant in Public Health Medicine, who was the secondary intermediary from the Directorate for Health Information and Research, to detect which of these patients had experienced an unplanned hospital event, through the CPAS system. The episodes accounted to a total of 1,775, of which 1,510 indicated an oncology-related complaint. Consequently, 265 episodes were not oncology related due to trauma, road traffic accidents, mechanical falls, psychological crisis

such as suicidal ideations, alcohol intoxication, and complications related to surgical interventions. Relevant ED presentations were recorded between 1st August 2023 until 11th September 2024, to capture the total six-week timeframe of those who completed treatment on the 31st July 2024. The researcher chose this timeframe with the rationale to collect the latest data, and appraise the present circumstances, within the stipulated timeframe to conduct the study.

An inclusion and exclusion criteria (Table 3.4) was established to ensure that the individuals included in this audit are reflective of the broader target population and facilitate data collection (HQIP, 2018; HSE, 2023).

Table 3.4

Inclusion and Exclusion criteria

Inclusion Criteria	Exclusion Criteria
Aged 18 years or older	Paediatric and adolescents up to 17 years
Solid tumours or haematological malignancy diagnosis	Benign solid tumours or haematological disorder diagnosis
Undergoing SACT/RT	Did not receive SACT/RT
Received SACT/RT between 1st August 2023 and 31st July 2024	Did not undergo SACT/RT between 1st August 2023 and 31st July 2024
Underwent SACT/RT within the last six weeks (42 days) upon ED visit	Underwent SACT/RT beyond a six-week period upon ED visit

Paediatric patients were excluded as these are directly admitted to the paediatric oncology unit. Patients who exceeded the six-week SACT/RT follow up were excluded to adhere to the standard criteria (Appendix 1), and thus avoid skewed outcomes (HQIP, 2020a).

To maintain clarity and eliminate any ambiguities, Table 3.5 provides an explanation of each classification of SACT that were included in this audit.

Table 3.5

Definition of SACT treatments

Class	Meaning
Chemotherapy	Cytotoxic medications killing rapidly growing cells
Immunotherapy	Ameliorates the immune system to detect and destroy cancer cells
Targeted therapy	Treatments which inhibit specific pathways significant for cancer proliferation
Hormonal therapy	Interferes with the growth of hormone-sensitive malignancies
*Immunoglobulins	Derived from human blood plasma, providing a sufficient number of antibodies, through passive immunity (National Cancer Control Programme [NCCP], HSE, 2021)
*Bisphosphonates	Prophylactic use for Skeletal related events (SRE) Therapeutic use for hypercalcaemia secondary to malignancy and bone metastases (Lorange et al., 2023)

Note. Patients who received immunoglobulins and bisphosphonates were included as although the latter are not considered cytotoxic, feature anti-cancer characteristics in a broader aspect (National Cancer Control Programme [NCCP]; HSE, 2021; Lorange et al., 2023).

Data collection tool

To maintain clarity of terminology and ensure inter-rater reliability, data items relevant to the study were clearly defined. During the planning phase the data collection process was thoroughly discussed, and mutually agreed upon (HSE, 2023). Although, this project entailed secondary data acquisition by skilled professionals, a structured data collection tool using Microsoft Excel was also designed to facilitate the process (HSE, 2023). The audit tool included fields for relevant demographics, as follows: -

1. Code
2. Gender
3. Age group
4. Cancer site
5. Cancer treatment
6. Days from last treatment
7. Presented at ED
8. ED time
9. Triage note
10. ESI
11. Hospitalised
12. Location of hospitalisation
13. Transferred
14. Ward transferred
15. LOS

Pilot testing

Pilot testing was performed for the first 100 patients to reveal potential challenges and streamline the process for the full audit and data analysis (HQIP, 2020c; HSE, 2023). Data cleaning was done by the researcher to determine any misleading data and ensure validity (Rogers, 2024). A limitation that emerged during this phase was that concerning patients receiving oral SACT. These patients were not detected through MOSAIQ, which could have affected the representation of every treatment approach. Hence, the researcher added a field "oral SACT in triage note'' to pinpoint triage notes which documented such feature. The data collection tool was modified to aid data cleaning and analysis as displayed in the table below.

Table 3.6

Modification of data fields

Original	**Amended**
Code	Code
Gender	Gender
Age group	Age group
Cancer site	Cancer site
Cancer treatment	*Class of treatment
	*Treatment Regimen
	*Oral SACT in triage note
Days from last treatment	Days from last treatment
Presented at ED	Presented at ED
ED time	ED presentation timeframe
Triage note	*Presenting complaint
	Triage note

ESI	ESI
Hospitalized	Hospitalised
Location of hospitalisation	Admitting ward
Transferred	Transferred (Yes/No/Not applicable)
Original	**Amended**
Ward transferred	Ward transferred
	Second transfer (Yes/No/Not applicable)
	Second ward transferred
LOS	LOS

Identifying key attributes is critical as these will serve as measurable variables, for adequate data interpretation. These may be either quantitative, representing numerical values, or categorical, characterising groups or classifications (Hassan, 2024d).

Quantitative and categorical variables may be subdivided as discrete and continuous, or binary, nominal, and ordinal respectively (Shreffler & Huecker, 2023). The tables below present a structured explanation of the significant variables.

Table 3.7

Quantitative variables and audit demographics

Quantitative variables	
Discrete	Continuous
Specific values, and no transitional potential (Hassan, 2024b)	Quantifiable amount that may be of any value within a range (Hassan, 2024b)
Days from last treatment	LOS

Table 3.8

Categorical variables and audit demographics

Categorical variables		
Dichotomous	Nominal	Ordinal
Variables with two possible and distinct values (Hassan, 2024c)	Classification with no definite rank or order (Hassan, 2024d)	Classification with a particular order (Hassan, 2024d)
Gender; (Male/Female) Hospitalized; (Yes/No) Transferred Second transfer	Cancer type; Type of SACT/RT; Class of treatment; Complication Oral SACT in triage note Admitting ward Ward transferred to Second ward transferred	ESI; ED presentation period Age group

Reliability and validity of data

The main drawback of retrospective investigations is the risk of missing data. This is attributed to the fact that this method relies on data that were inputted in a medical database rather than a pre-designed template (Talari & Goyal, 2020). The researcher analysed the triage notes to identify the presenting complaints of patients who were receiving anti-cancer treatment. However, triage notes may contain inaccurate information for various reasons. Primarily, one must appreciate the time constraints of the ED, which poses a higher risk for human error (Berkowitz et al., 2022). Moreover, there may be miscommunication due to language constraints or the patient being in distress. Furthermore, patients may miss reporting significant details or recall incorrect details about their medical history (Talari & Goyal, 2020). To ensure reliability, validity, data quality, and minimise the risk of recall

bias, the researcher relied on the information extracted from MOSAIQ (HSE, 2023). Data cleaning resumed, and any discrepancies were communicated with the research manager to ensure completeness and precision (Dickerson, 2023).

Validity is categorised as internal and external. It relates to the integrity of results and the rigour with which consistency of results portrays the data. Internal validity was intensified by meticulous audit planning, data collection of the appropriate population and relevant variables, as well as comprehensive analysis. Subsequently, external validity was enhanced by a representative sample through an extensive inclusion criterion (Patino & Carvalho Ferreira, 2018, Simkus, 2023).

3.4.4 Stage 4: Data analysis and comparing results with standards

Following data completeness, statistical analysis was performed using a combination of descriptive and inferential statistics. IBM Statistical Package for Social Sciences (SPSS) was utilised, allowing rigorous data analysis for a large set, examining relationships among variables through statistical tests (Rahman & Muktadir, 2021).

Descriptive statistics

Descriptive statistics organise quantitative and categorical data using an explanatory approach, typically through numbers and graphics. They establish the foundation of quantitative analysis, determining trends, sequences, and connection among variables (Alabi & Bukola, 2023), thereby serving as a predecessor for inferential statistics (Green et al., 2022). Consequently, they allowed the interpretation of the frequency, distribution, central tendency and variability of the relevant demographics (Alabi & Bukola, 2023).

The three pillars of central tendency metrics are the mean, median, and mode (Alabi & Bukola, 2023). These metrics were analysed to determine average, middle and most common values for daily ED visits, days from last treatment to ED admission, daily hospi-

talisations, and LOS. The researcher also analysed such outcomes through variability indices which are critical metrics of descriptive statistics, measuring data dispersion (Alabi & Bukola, 2023). The applicable variable indices for this study were the range, variance, standard deviation (SD), and Interquartile range (IQR), and Coefficient of variation (CV) are the key components which determined such dispersion and are further elaborated upon in Table 3.9.

Table 3.9

Variability indices

Variable indices	**Action**	**Metric**
Range	Difference between the lowest (L) and highest (H) observations	Daily ED visits Daily Hospitalisations
Variance	Determines dispersion of data around the mean	Daily ED visits Daily Hospitalisations
SD	Square root of variance; Measures the dispersion of data from the mean	Days from last treatment Daily ED visits Daily Hospitalisations LOS
IQR	Range of the middle half of the data record; Difference between 1st quartile (Q1) and 3rd quartile (Q3)	Days from last treatment LOS

Although descriptive statistics provide a succinct summary of the significant elements within a dataset, descriptive data alone may lead to insufficient analysis, inability to reveal underlying issues, and biased data (Alabi & Bukola, 2023). Thus, inferential statistics were incorporated to overcome these limitations (Green et al., 2022).

Inferential statistics

Inferential statistics are statistical processes applied to achieve data-based conclusions regarding the correlation among variables. Such associations are examined through several statistical tests available through statistical software (Bhattacherjee, 2019). The table below provides an explanation and justification of the statistical tests adopted. The Shapiro wilk test was conducted to determine whether the data of continuous variables had a normal or skewed distribution. Since data were largely deviated, the non-parametric tests presented in Table 3.10 were applied to test the desired association.

Table 3.10

Statistical tests applied

Statistical test	**Function**	**Application**
Chi-Square test	Examines if there is an association among two categorical variables (Oxford Brookes University, n.d.)	Gender and Hospitalisations; Age group and hospitalisation; Age group and cancer type Cancer type with presenting symptoms; Treatment regimen and Primary symptom; Cancer type and admission rates; Presenting symptoms and ESI; Presenting symptoms with hospitalisation; ED presentation timeframe and hospitalisation; Presenting symptoms and admitting ward Presenting symptom and ward transferred
Mann Whitney test (Non-parametric)	Compares the mean scores among two independent groups (Oxford Brookes University, n.d.)	Gender with LOS; Transfers with LOS;

Statistical test	Function	Application
Kruskal-Wallis test (Non-para-metric)	Compare mean scores between three or more independent groups (Oxford Brookes University, n.d.)	Age group and LOS; Cancer type and LOS; Cancer type with presenting symptom; Treatment regimen and days from last treatment; Days from last treatment and primary symptoms; Treatment regimen with LOS Presenting symptoms and LOS

p values equivalent to or less than 0.05 were considered statistically significant, thereby a 95% CI was maintained throughout the analysis.

Data visualisation

Graphical representation approaches were employed to ensure the efficient delivery, interpretation, and coherence of complex data (Alabi & Bukola, 2023). These included pie charts, bar charts, frequency tables, cross-tabulation tables, and histograms. The table below illustrates how these representations were applied.

Table 3.11

Data visualisation applications

Visual	Definition
Pie chart	Comparative frequency distribution of a categorical variable (Russell, 2020)
Bar chart	Comparison between categorical data (Strivastava, 2023)
Frequency table	Details one categorical variable (Kent State University, 2024)

Visual	Definition
Cross-tabulation table	Describes the correlation between two categorical variables (Kent State University, 2024)
Histogram	Present the dissemination of a continuous variable (Yale University library, 2024)

This thorough analysis allowed the analyst to ground her judgement based on credible statistics, which enables data-driven strategic planning (Alabi & Bukola, 2023). Findings from the data analysis were compared with the standard to determine if this was being met (HSE, 2023).

3.4.5 Stage 5: Clinical audit report

In this section, the HSE (2023) outline how all clinical audits must be documented in a clinical audit report, which must include the background, aims and objectives, methods, findings, conclusion, suggestions, and a QI strategy. The dissertation in itself covers the whole aspect of this stage by providing a background in chapter one, highlighting the aims and objectives in chapter two, and summarised in chapter three, the methodology, which was just elaborated, presentation of findings in chapter four, a thorough discussion of the results, recommendations and a QI roadmap in chapter five, and a conclusion in chapter six. Acronyms and abbreviations are listed at the beginning of this report. Although clinical audits must be presented to significant stakeholders (HQIP, 2020c, HSE, 2023), this is part of an academic study, thus it was submitted to the Board of Studies of the Faculty of Health Sciences. Consequently, the researcher plans to meet with the relevant stakeholders after completing the audit, to discuss how the established QI strategies may be implemented.

3.4.6 Stage 6: QI and action

Following the data analysis, a QI strategy must be constructed with the goal of mitigating any shortcomings (Hook, 2020). Such strategy will abide to the SMART guideline to ensure that the plan is Specific, Measurable, Achievable, Relevant, Timely and Theoretically sound (HSE, 2023). Since the AO pathway involves several stages, the researcher conducted process mapping to address shortfalls and formulate a structured QI plan (HQIP, 2020d; Blagburn, 2022).

3.5 Ethical considerations

The local policy for access to oncology systems to non-employees (Appendix 2) clearly highlights that for data collection and research purposes, researchers must request approval and abide to the department ethics committee pathway. With respect to this regulation, approval was sought and granted from the Clinical Chairperson of Oncology and Haematology, the Research Manager, and the Quality Assurance manager (Appendix 3). Furthermore, approval from the DPO (Appendix 4), the Research Support Lead, and the Chief Executive Officer (Appendix 5), were granted prior to submission to the Faculty of Research Ethics Committee (FREC).

In contrast to traditional research studies, clinical audits do not require an ethical approval from a research ethics committee (HQIP, 2018). However, the researcher within this context is a student conducting this clinical audit conducting the clinical audit as part of her dissertation at the UOM. Therefore, approval for research involving human subjects was sought and granted by the FREC (Reference number: FHS-2024-00517). Data collection commenced upon receiving approval from the University Research Ethics Committee (UREC) (Appendix 7).

3.5.1 Anonymity

For this study, retrospective data were collected from the same local hospital where the researcher works. Nevertheless, the researcher never made direct contact with patients, relatives or staff who were not specified in the approved ethics application for the purpose of data collection. Anonymisation of data was done by the research manager following the data extraction from MOSAIQ, and after obtaining the data of identified patients who had an unplanned hospital visit while on active treatment. This was done by coding the patients' identification numbers with a letter followed by a number (Example A1). This code also enabled the researcher to be able to detect readmissions during data analysis. Moreover, the research manager provided the researcher age brackets instead of the patients' actual age, and excluded rare cases to abide by the conditions of the DPO clearance, ensuring that patients are unidentifiable to the researcher.

The anonymised data sheet was stored in an encrypted format on the researcher`s personal computer that is password protected, and destroyed upon completion of the study (HSE, 2023).

3.6 Conclusion

This chapter captured the full clinical audit methodology, to assess the current process of the AO pathway. The next chapter will present the findings derived from data collection and analysis.

Chapter 4

Results

4.1 Introduction

The aim of this chapter is to provide a comprehensive description of the findings. Such results were obtained after an extensive data collection process and a thorough analysis through descriptive and inferential statistics conducted through SPSS. The findings will be displayed through different graphics and visualisations, depending on the variables under investigation, followed by a succinct explanation. Since this is a clinical audit, the researcher compared the findings with the pilot AOS pathway to discuss the trends through different phases. A thorough statistical analysis was conducted with the assistance of an expert statistician at UOM.

4.2 Descriptive statistics

This study analysed patients who were undergoing anti-cancer treatments, to investigate how many patients required acute care during their treatment trajectory. Table 4.1 presents a description of the population receiving SACT/RT.

Table 4.1

Description of population undergoing SACT/RT from 1st August 2023-31st July 2024

Age group	N	%
18-29	26	1.90%
30-44	125	8.30%
45-59	278	18.40%
60-74	677	44.70%
≥75	408	27.00%
Gender		
Male	737	48.70%
Female	777	51.30%
Cancer type		
Solid tumours		
Breast	279	18.40%
Lung	218	14.40%
Upper GI	161	10.60%
Colorectal	159	10.50%
Gynaecological	112	7.40%
Genitourinary	108	7.10%
Head and Neck	62	4.10%
Brain	33	2.20%
Skin	20	1.30%
Sarcoma	15	1.00%
Haematology		
Lymphoma	131	8.70%
Multiple Myeloma	64	4.20%
Leukaemia	61	4.00%
Other	91	6.00%
Treatment/s received		
Single agent chemotherapy	414	24.40%
Combination chemotherapy	375	22.10%
Single agent targeted/immunotherapy	358	21.10%
Radiotherapy	231	13.60%
Combination therapies	154	9.10%
Combination targeted/immunotherapies	23	1.40%
Single Hormone therapy	11	0.60%
Bisphosphonates	64	3.80%
Immunoglobulins	43	2.50%
Other	22	1.30%

Through descriptive statistics, a description of the data obtained from different variables that were significant in conducting this study will be provided.

Table 4.2

Patient characteristics who had at least one ED visit

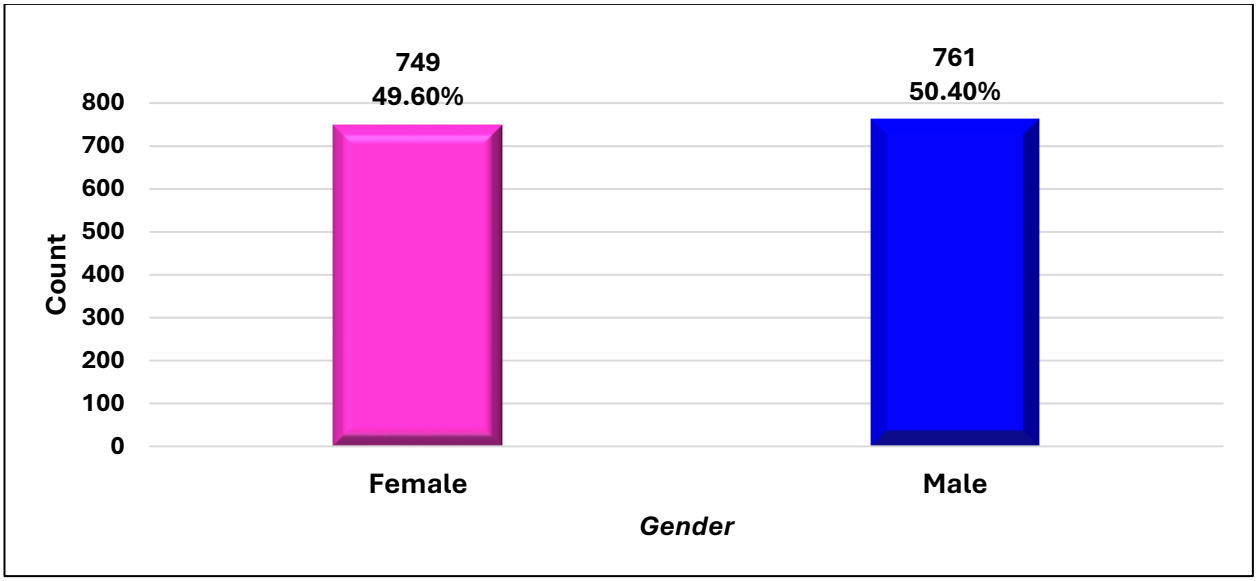
At least one episode (N=828)			Frequency (from population)	
Age group	N	%	N	%
18-29	15	1.4%	15	57.70%
30-44	76	6.9%	76	60.80%
45-59	151	13.6%	151	54.30%
60-74	374	33.8%	374	55.20%
≥75	212	19.1%	212	51.90%
Gender				
Male	411	49.60%	411	55.70%
Female	417	50.40%	417	53.70%
Cancer type				
Solid tumours				
Breast	151	18.2%	151	54.1%
Lung	129	15.6%	129	59.1%
Upper GI	95	11.5%	95	59.0%
Colorectal	81	9.8%	81	50.9%
Gynaecological	75	9.0%	75	67.0%
Genitourinary	65	7.8%	65	60.1%
Head and Neck	29	3.5%	29	46.7%
Brain	18	2.2%	18	54.5%
Skin	10	1.2%	10	50.0%
Sarcoma	9	1.1%	9	60.0%
Haematology				
Lymphoma	66	8.0%	66	50.4%
Multiple Myeloma	45	5.4%	45	70.3%
Leukaemia	28	3.4%	28	45.9%
Other	27	3.3%	27	29.7%
Treatment/s received				
Single agent chemotherapy	221	23.1%	221	53.40%
Combination chemotherapy	215	22.5%	215	57.30%
Single agent targeted/immunotherapy	187	19.6%	187	52.20%
Radiotherapy	154	16.1%	154	66.60%
Combination therapies	95	9.9%	95	61.70%
Combination targeted/immunotherapies	12	1.3%	12	52.17
Single Hormone therapy	7	0.7%	7	63.60%
Biphosphonates	35	3.7%	35	54.70%
Immunoglobulins	18	1.9%	18	41.80%
Other	11	1.2%	11	50%

From 1,514 patients receiving treatment, 828 sought acute care, resulting in a total of 1,510 visits. Although patients aged 60-44 had the highest ED rates, the highest frequency was among those aged 30-44 (60.8%). The highest ED visits were reported in breast and lymphoma within the solid tumour and haematology cohort respectively. While the highest ED frequency for solid tumour was reported in gynaecological cancers and MM in the haematology group. Consequently, patients receiving single agent chemotherapy had the highest number of ED visits; but patients receiving RT had the highest frequency (66.6%). Consequently, although more females were undergoing cancer treatment (51.3%), the highest ED frequency was recorded in males (55.7%).

4.2.1 Episodes by patient gender

Figure 4.1

ED attendance by gender

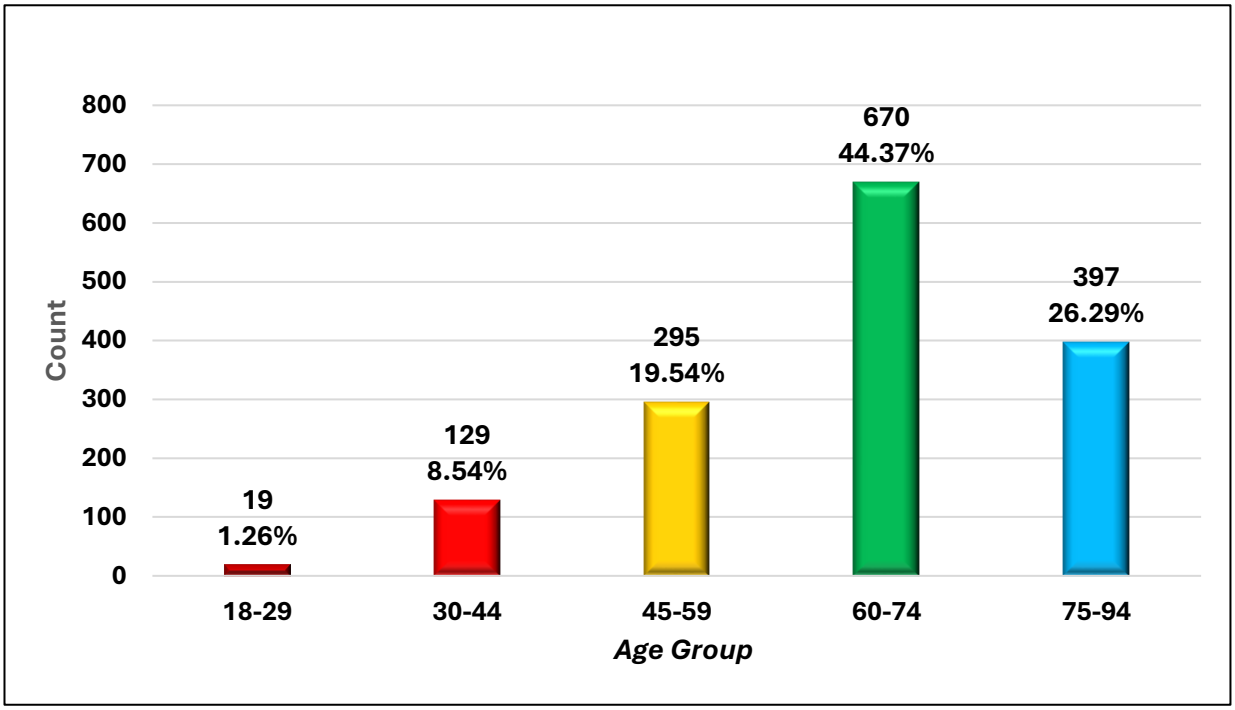


A total of 1,510 ED episodes were recorded during the study period. Of these, 749 were made by females (49.60%) and 761 were made by males (50.40%), which represents a difference of 0.80% between genders.

4.2.2 Age group

Figure 4.2

ED attendances by age group



The highest ED visit rates were recorded among patients falling within the 60-74 age bracket (44.37%), followed by those aged 75-94 (26.29%), 45-59 (19.54%), 30-44 (8.54%) and 18-29 (1.26%) respectively.

4.2.3 Cancer type

Table 4.3

ED attendances by cancer type

	N	%
Solid tumours		
Breast	288	19.1%
Lung	221	14.6%
Upper GI	179	11.9%
Colorectal	148	9.8%
Genitourinary	141	9.3%
Gynaecological	105	7.0%
Head and Neck	42	2.8%
Brain	34	2.3%
Skin	18	1.2%
Sarcoma	15	1.0%
Haematology		
Lymphoma	122	8.1%
Multiple Myeloma	97	6.4%
Leukaemia	58	3.8%
Other	42	2.8%

For solid tumour malignancies, patients with Breast (19.1%), Lung (14.6%) and Upper GI (11.9%) were the highest 3 prevalent cohorts to seek acute care management, while sarcoma (1%) was the least prevalent. ED visits for patients with a haematological malignancy were most prevalent in patients with lymphoma (8.1%) followed by MM (6.4%) and leukaemia (3.8%).

4.2.4 Type of antineoplastic treatments received

Table 4.4

Treatment regimen received prior ED attendance

	N	%
Single agent chemotherapy	376	24.9%
Combination chemotherapy	326	21.6%
Single agent targeted/immunotherapy	321	21.3%
Radiotherapy	207	13.7%
Combination therapies	152	10.1%
Combination targeted/ immunotherapy	17	1.1%
Single Hormone therapy	11	0.7%
Bisphosphonates	55	3.6%
Immunoglobulins	33	2.2%
Unspecified therapy	12	0.8%

The table above shows that the most common treatments that patients were receiving when they required acute care were single agent chemotherapy regimens (24.9%), followed by combination chemotherapy (21.7%) and single agent targeted/immunotherapies (21.3%). For 0.8% of cases treatment type was unspecified, which was matched with haematology patients, while the least common treatment was single agent hormonal therapies (0.7%). The table below specifies the single agent chemotherapeutic agents.

4.2.5 Classes of cancer treatments

Table 4.5

Class of treatment received prior ED attendance

	N	%
Antimetabolites	148	9.8%
Taxanes	108	7.2%
Platinums	46	3.0%
Vinca alkaloids	44	2.9%
Topoisomerase inhibitors	12	0.8%
Anthracyclines	10	0.7%
Single targeted/immunotherapies	321	21.3%
Combination chemotherapy regimens	326	21.6%
Combination therapies	152	10.1%
Combination targeted/immunotherapies	17	1.1%
Radiotherapy	207	13.7%
Hormone therapy	11	0.7%
Immunoglobulins	33	2.2%
Bisphosphonates	55	3.6%
Other	20	1.3%

The table above shows that antimetabolites were the most common class of single chemotherapeutic agent that patients were receiving when they required urgent care.

Other useful data

Table 4.6

Other treatment indicated in triage note

	n	%
Chemotherapy tablets	23	53.5%
Chemotherapy	13	30.2%
Targeted Therapy tablets	5	11.6%
Immunotherapy	1	2.3%
Targeted therapy	1	2.3%

Figure 4.3

Treatments reported on triage notes with treatment extracted from MOSAIQ

		Included SACT in note					
		Chemotherapy tablets	Chemotherapy	Targeted therapy tablets	Immunotherapy	Targeted therapy	Total
Treatment regimen	Bisphosphonates	11	5	1	0	1	18
		47.8%	38.5%	20.0%	0.0%	100.0%	41.9%
	Radiotherapy	5	3	0	0	0	8
		21.7%	23.1%	0.0%	0.0%	0.0%	18.6%
	Single agent chemotherapy	4	3	0	0	0	7
		17.4%	23.1%	0.0%	0.0%	0.0%	16.3%
	Immunoglobulins	1	0	4	0	0	5
		4.3%	0.0%	80.0%	0.0%	0.0%	11.6%
	Single agent targeted/immunotherapy	1	2	0	0	0	3
		4.3%	15.4%	0.0%	0.0%	0.0%	7.0%
	Combination therapies	1	0	0	0	0	1
		4.3%	0.0%	0.0%	0.0%	0.0%	2.3%
	Unspecified therapy	0	0	0	1	0	1
		0.0%	0.0%	0.0%	100.0%	0.0%	2.3%
Total		23	13	5	1	1	43
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

As outlined in the previous chapter, patients on oral SACT could not be detected from MOSAIQ. However, the researcher noted a number of triage notes, which reported that patients were receiving cancer treatment. For this rationale, data on these patients were recorded, indicating that a total of 43 patients may have been receiving some form of SACT apart from the data extracted. Chemotherapy tablets and chemotherapy were mostly reported with bisphosphonates (47.8% and 38.5%). Targeted therapy tablets with immunoglobulins (80%), and bisphosphonates (20%). The one instance for immunotherapy and targeted therapy was reported in unspecified therapies and bisphosphonates respectively.

4.2.6 Days from last treatment to ED admission

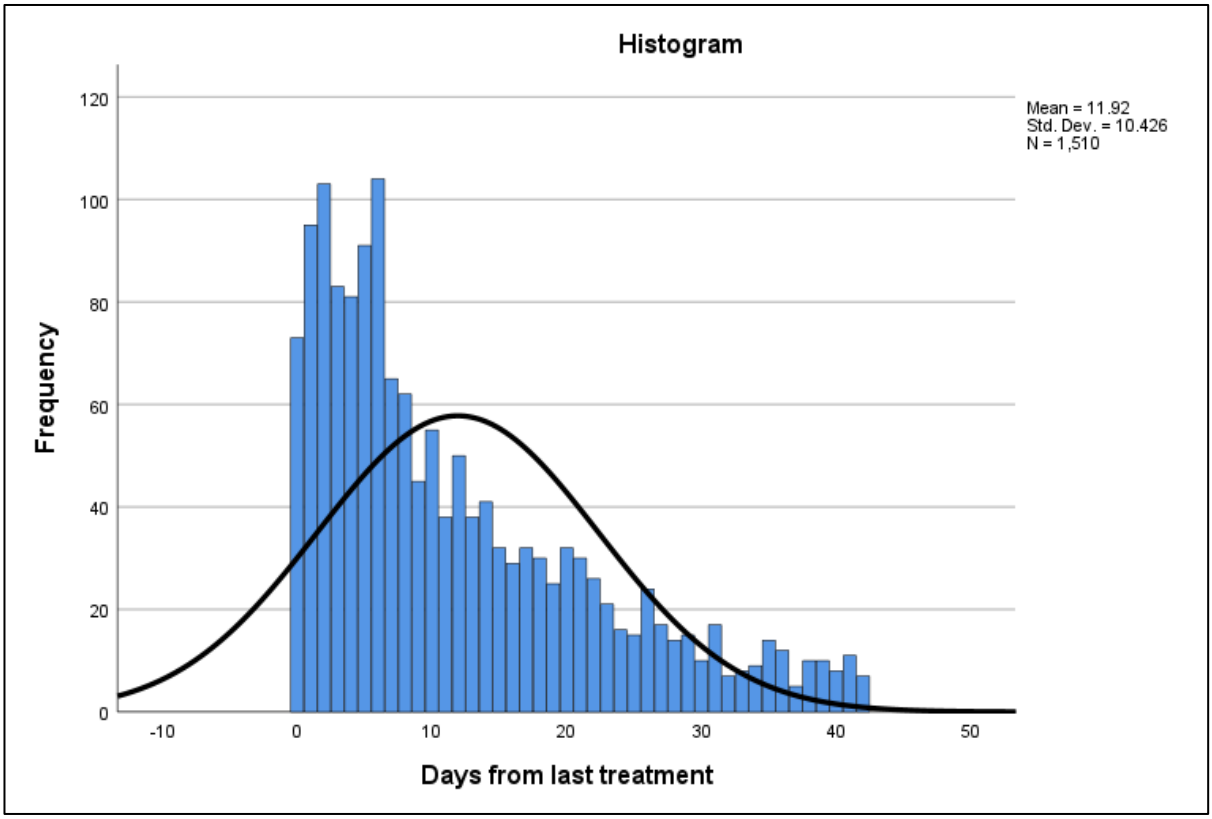
Table 4.7

Descriptives of days from last treatment upon ED visit

Minimum	0
Maximum	42
Mean	11.92
Median	8
Mode	6
Std. Deviation	10.426
Interquartile Range	14
Total	1510

Figure 4.4

Histogram representing range from last treatment date



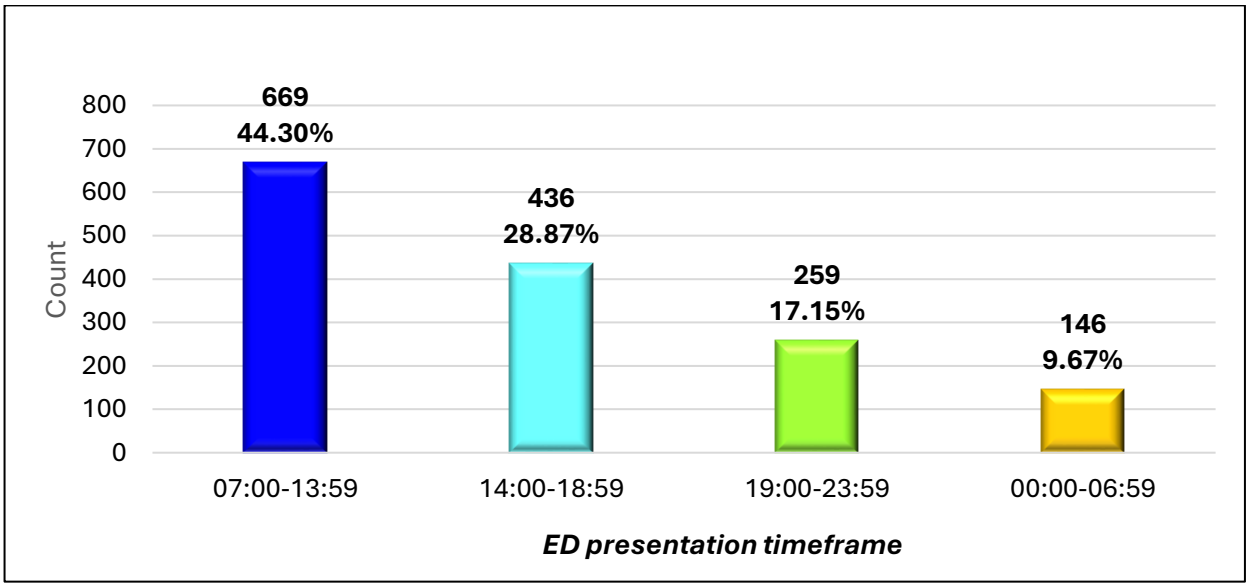
As per inclusion criteria, the days from treatment to ED presentation ranged from 0 to 42 days, with 0 being the same day of treatment administration. On average, patients at-

tended the ED 11.94 days after treatment. After sorting the days from treatment in ascending order, the middle observation was 8 days. Consequently, the most frequent presentations to the ED were from patients who received treatment within 6 days. The duration SD is 11.92, which is far from 0, indicating that the days from SACT/RT to ED presentation is largely deviated.

4.2.7 ED presentation timeframe

Figure 4.5

ED timeframes



ED visits were most common in the morning, with 44.30% (669/1,510) occurring between 07:00-13:59, whilst the lowest ED visit occurrence was during the night between 00:00-06:59 amounting to 9.67% (146/1,510).

4.2.8 Presenting complaints at the ED

Table 4.8

Presenting complaints reported during ED visit

	N	%
Fever	316	20.9%
Dysponea	176	11.7%
Pain	100	6.6%
Vomiting	98	6.5%
Consciousness/Cognitive disturbance	86	5.7%
Chest pain	73	4.8%
Bleeding/Bruising	69	4.6%
Fatigue/Performance status	63	4.2%
Infection	63	4.2%
Neurosensory/Motor	61	4.0%
Diarrhoea	41	2.7%
Ocular/Eye problems	38	2.5%
Skin	35	2.3%
Urinary	33	2.2%
Constipation	18	1.2%
Anorexia	12	0.8%
a Abdominal pain/distension	98	6.5%
b Other symptoms	22	1.5%
c Investigations/diagnostic workup	96	6.4%
d Other critical complications	12	0.8%

[a] Sub-grouped independently as it was noted to be a prevalent complaint during analysis.

[b] Other symptoms included: Hypotension/hypertension, palpitations, tinnitus, port-a-cath or gastrostomy concerns, jaundice, dysphagia, lip and testicular swelling.

[c] Includes deranged blood results, confirmed deep vein thrombosis, pulmonary embolism/effusion/ascites, or required further diagnostic workup.

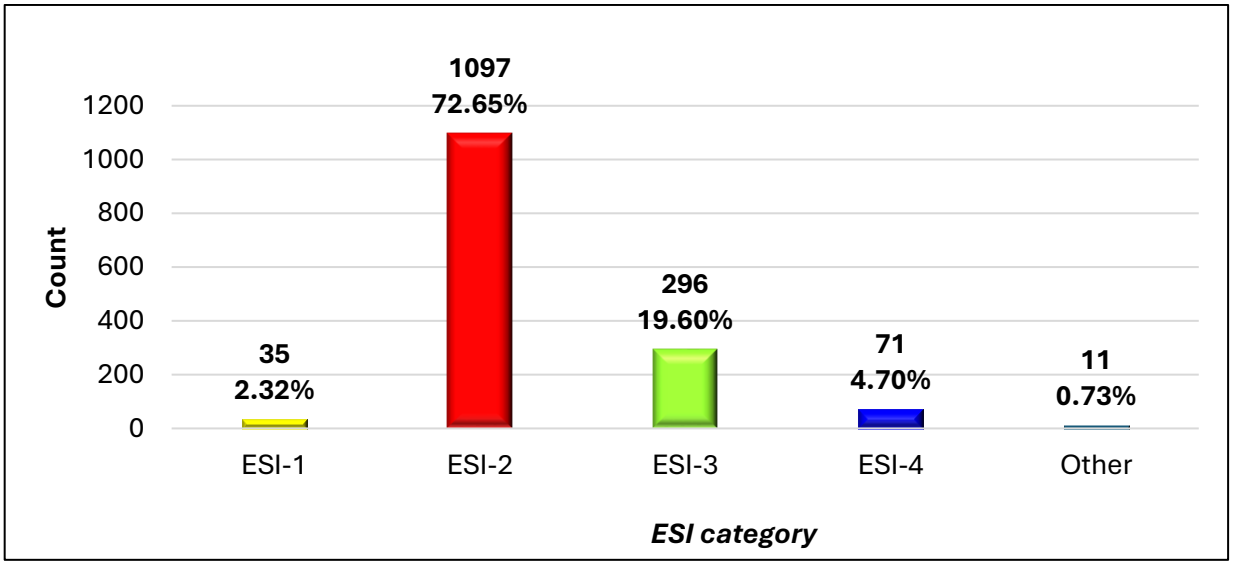
[d] Life-threatening complications which included cardiac arrest and seizures.

The most common presenting complaint for patients receiving cancer treatment was fever (20.9%), followed by dysponea (11.7%), and pain (6.6%). Moreover, vomiting and abdominal pain/distension were each reported by 6.5%.

4.2.9 ESI category

Figure 4.6

ESI scores of ED visits



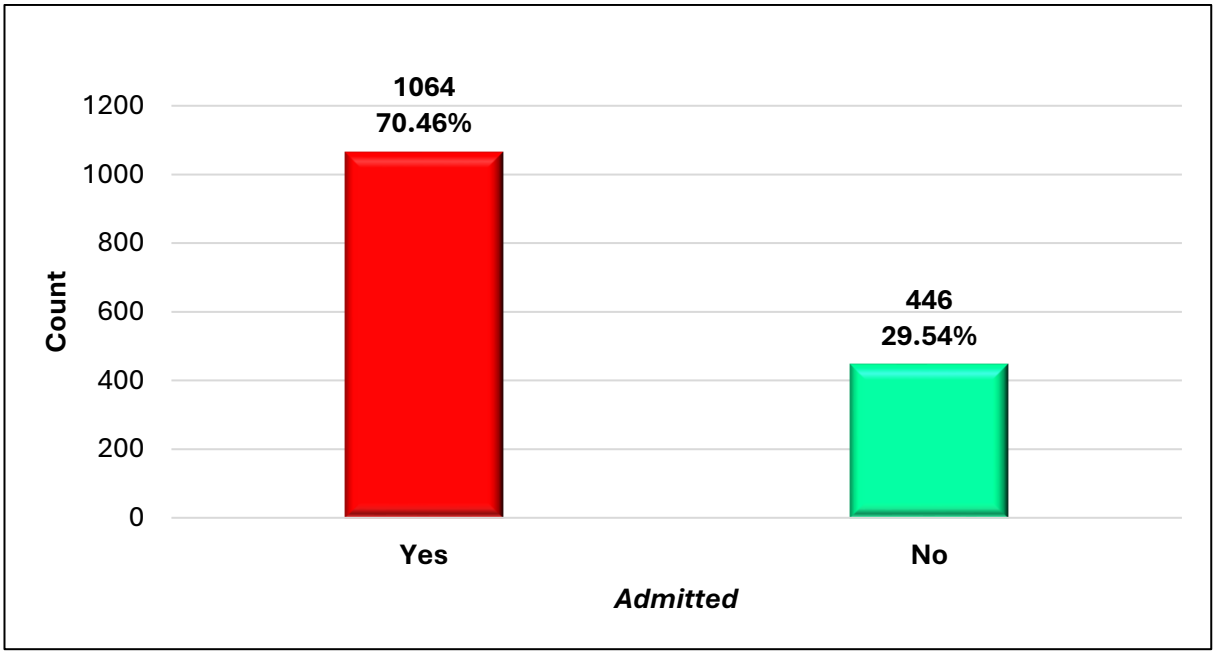
* 'Other' included skipped triage, ESI-5 and ESI-5 ophthalmic

Evidently, the majority of ED visits were classified as ESI-2 with an incidence of 72.65%. 296 of 1,510 cases were classified as ESI-3. The latter also included the sub-categories for ear, nose and throat (ENT), gynae and obstetrics (OBS), and ophthalmic (OPTH). This means that 1,097 from 1,510 visits were of high priority.

4.2.9 Required hospitalization

Figure 4.7

Amount of inpatient admissions vs ED discharges



From 1,510 ED episodes, 70.46% (1,064) resulted in hospitalisation, while 29.54% were discharged from ED (446). Consequently, 3/828 patients were recorded as deceased from the ED, while 128/638 were recorded deceased while hospitalised.

4.2.10 Wards which admitted patients undergoing treatment

Table 4.9

Wards receiving admissions from the ED

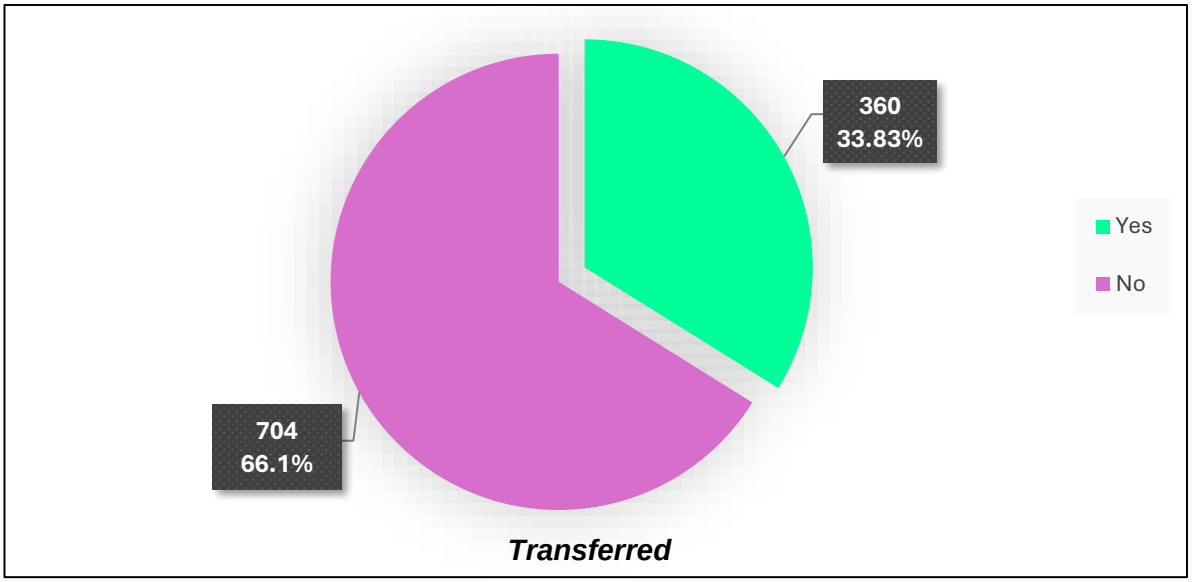
	N	%
General acute hospital	1,031	96.90%
General medical	435	40.9%
Medical assessment	150	14.1%
General surgical	137	12.9%
Observation/Admission unit	130	12.2%
Specialised surgical	111	10.4%
Specialised medical	20	1.9%
Cardiac unit	19	1.8%
Neuro unit	16	1.5%
Critical surgical	13	1.2%
Oncology hospital	33	3.1%
Oncology A	15	1.4%
Oncology B	14	1.3%
Oncology C	3	0.3%
Oncology D	1	0.1%

General medical wards had the highest rates of direct admission from the ED with 40.9% (435) for patients who required acute management while on active treatment. Only 33 (3.1%) patients were admitted directly to the Oncology hospital.

4.2.11 Transfers during hospitalisations

Figure 4.8

Patients who had an inpatient transfer



Out of 1,064 patients who were hospitalised, 360 were transferred to another ward, while 704 patients were discharged from the primary admitting ward.

4.2.12 Type of ward transferred

Table 4.10

Wards receiving admissions during first transfer

	N	%
General acute hospital	***304***	***84.40%***
General medical	172	47.8%
General surgical	43	11.9%
Medical assessment	24	6.7%
Specialised surgical	17	4.7%
Cardiac unit	12	3.3%
Observation/Admission unit	10	2.8%
Critical surgical	10	2.8%
Neuro unit	9	2.5%
Specialised medical	5	1.4%
Intensive care	2	0.6%
Oncology hospital	***56***	***15.6%***
Oncology A	17	4.7%
Oncology B	10	2.8%
Oncology C	1	0.3%
Oncology D	28	7.8%

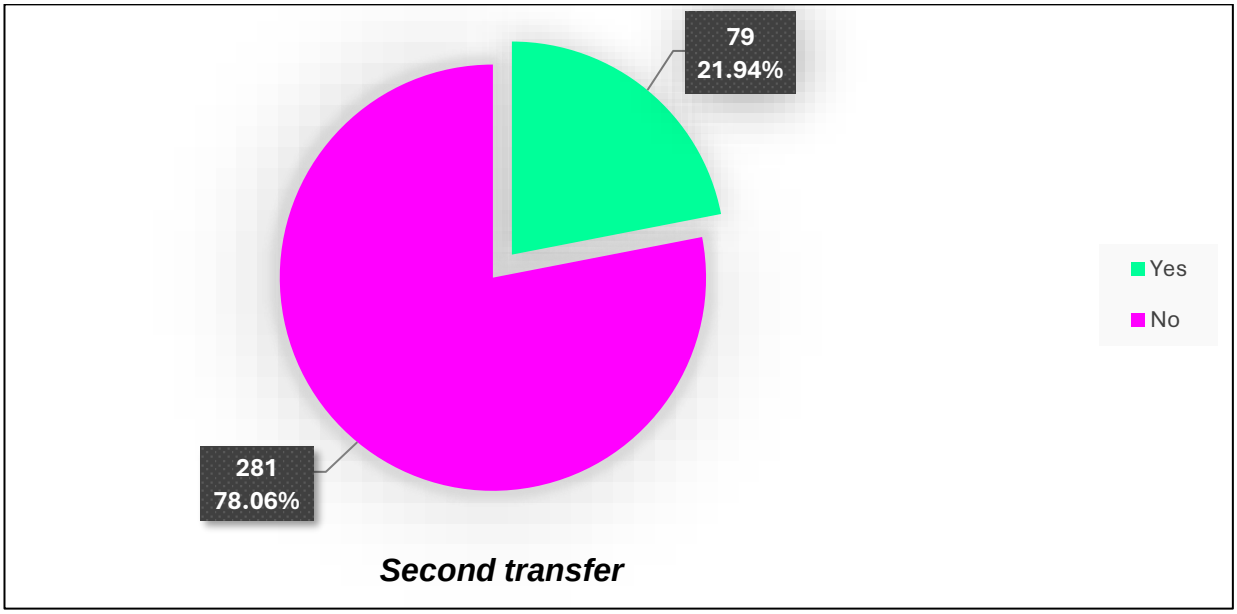
For the wards receiving transfers of patients who required acute care management while on SACT/RT, the general medical ward received the most transfers with a rate of 47.8% (172/360). On the other hand, the rate of admission to an oncology hospital bed was higher on transfer with 56/360 transferred being to an oncology ward.

4.2.13 Second transfer

Of the 360 patients who were transferred during their hospital stay, 79 (21.96%) had a second transfer to an alternative ward, as presented in Figure 4.9.

Figure 4.9

Patients who had a second transfer during their inpatient stay



The majority of patients (30/79) who had a second transfer were admitted to a general medical ward, followed by 17/79 patients transferred to an oncology ward (D). Table 4.11 presents in which units patient had their second transfer during their stay.

Table 4.11

Wards receiving admissions during the second transfer period

	n	%
General acute hospital	**54**	**68.30%**
General medical	30	38.0%
General surgical	9	11.4%
Specialised surgical	5	6.3%
Cardiac unit	3	3.8%
Medical assessment	3	3.8%
Critical surgical	2	2.5%
Neuro unit	2	2.5%
Oncology hospital	**25**	**31.6%**
Oncology A	5	6.3%
Oncology B	3	3.8%
Oncology D	17	21.5%

4.2.14 ED visits

The average daily ED visits amounted to 3.81 (approx. 4) visits per day, while both the median and mode amounted to 3 visits/day as represented in table 4.12

Table 4.12

Descriptives of daily ED visits

Minimum	1
Maximum	11
Range	10
Mean	3.81
Median	3.00
Mode	3
Std. Deviation	1.968
Variance	3.874
Total ED visits	1,510

The maximum ED visits in one day were 11 ED visits, while the minimum was 1 ED visit as described in frequency table 4.14.

Table 4.13

Frequency of ED visits

ED visits/day	Frequency (n)	%
1	37	9.3%
2	70	17.7%
3	97	24.5%
4	67	16.9%
5	52	13.1%
6	32	8.1%
7	19	4.8%
8	14	3.5%
9	5	1.3%
10	1	0.3%
11	2	0.5%

4.2.15 Hospitalisations

The average daily hospitalisations were 2.80 (approx. 3) admissions per day, while both the median and mode were 2 admissions/day as presented in table 4.14.

Table 4.14

Descriptives of daily hospital admissions

Total daily admissions	
Minimum	1
Maximum	9
Range	8
Mean	2.80
Median	2.00
Mode	2
Std. Deviation	1.625
Variance	2.641
Total admissions	1064

The maximum hospitalisations in one day amounted to 9 admissions, while the minimum was 1 inpatient admission as visualised in Table 4.15.

Table 4.15

Frequency of daily hospitalisations

Admissions/day	Frequency (n)	%
1	86	22.60%
2	114	30.00%
3	71	18.70%
4	53	13.90%
5	29	7.60%
6	16	4.20%
7	7	1.80%
8	1	0.30%
9	3	0.80%

4.2.16 Length of stay

The LOS (in days) for patients who were hospitalised ranged from 0 to 127 days. The average LOS was 8.3 days (approx. 8 days). The median observation is 5 days, while the most frequent LOS duration was 1 day as described in the table below.

Table 4.16

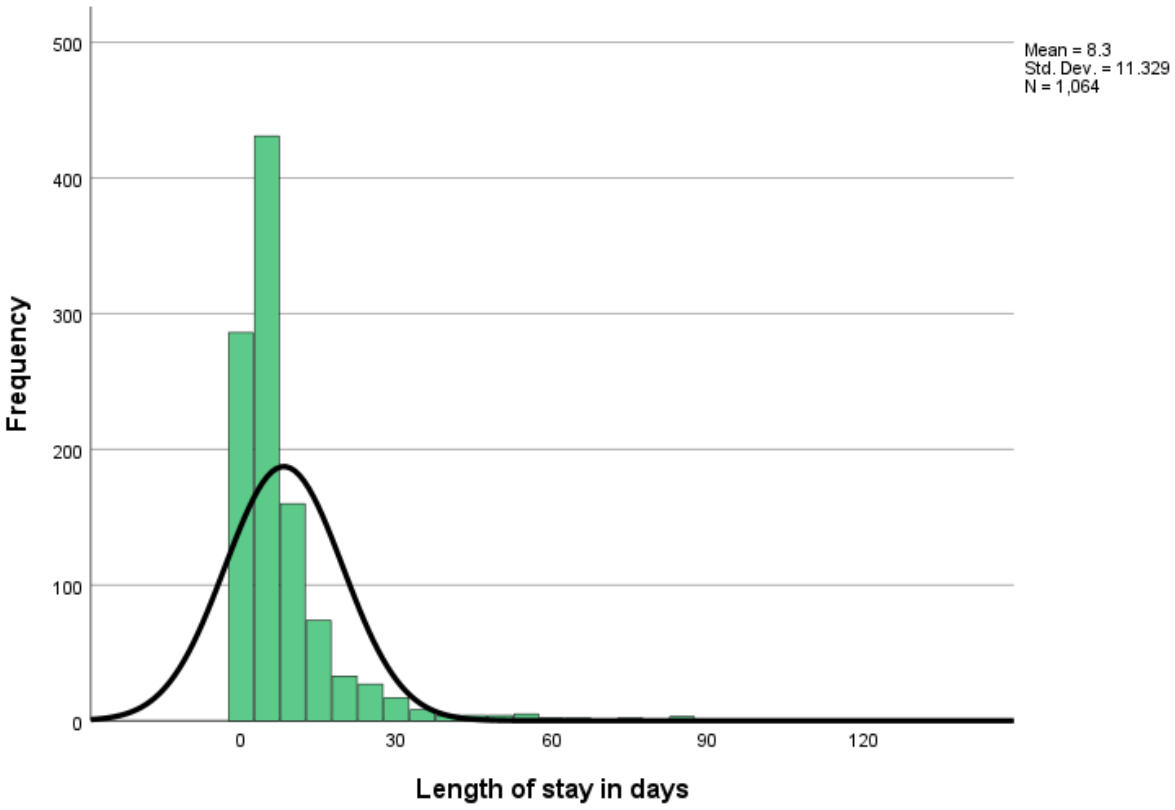
Descriptives for LOS

Minimum	0
Maximum	127
Mean	8.30
Median	5.00
Mode	1
Std. Deviation	11.329
Interquartile Range	8
Total admissions	1064
Sum	8828

The duration SD is 11.329, which is far from 0, indicating that the LOS durations are largely deviated, as visualised in the histogram below.

Figure 4.10

Histogram representing length of stay



As the approximate average of daily admissions is 3, and the average LOS is 8, one can calculate that on average, the hospital occupied 24 beds per day for this patient cohort (average daily admissions X average LOS).

4.2.17 Readmission rates

1,510 episodes represent the total number of unplanned ED presentations over a year. 828 from 1,510 were individual patients. Tables 4.17 and 4.18 represent the amount of ED episodes patients and hospitalisations patients experienced during the study period.

Table 4.17

Frequency table for ED presentations per patient

ED visits	Number of patients	%
1	470	56.8%
2	204	24.6%
3	70	8.5%
4	36	4.3%
5	29	3.5%
6	12	1.4%
7	2	0.2%
8	1	0.1%
9	1	0.1%
10	3	0.4%

Table 4.18

Frequency table for hospitalisations per patient

Hospitalisations	Number of patients	%
1	391	61.3%
2	145	22.7%
3	57	8.9%
4	21	3.3%
5	18	2.8%
6	4	0.6%
7	2	0.3%
Total	638	100%

4.3 Inferential statistics

Inferential statistics identified whether there were any significant associations between the relevant patient demographics, clinical characteristics and hospital metrics as outlined in the previous chapter. This section will present insights according to demographics, cancer, and treatment trends along the pathway and on the effect of unplanned hospitalisation patterns.

4.3.1 Demographics and outcomes

This section provides insights on the associations if any, between unplanned ED and hospitalisations patterns according to patients' demographics.

1) Patient gender and hospitalisation
2) Patient gender with LOS
3) Age group and hospitalisation
4) Age group and cancer type
5) Age group and LOS

Patient gender and hospitalisation

H_0: There is no difference in admission rates between males and females.

H_1: There is a significant difference in admission rates between males and females.

Table 4.19

Admissions between males and females

		Admitted		
		Yes	No	Total
Gender	Female	515	234	749
		68.8%	31.2%	100.0%
	Male	549	212	761
		72.1%	27.9%	100.0%
Total		1064	446	1510
		70.5%	29.5%	100.0%

Table 4.20

Chi square of admissions between genders

	Value	Df	*p* value
Pearson Chi-Square	2.076	1	0.150

Admission rates between males and females ranged by 3.3%. However, since the *p* value (0.150) exceeds the 0.05 level of significance, one can generalise that admission rate between genders was not statistically significant.

Patient gender with LOS

To determine if average LOS differs between genders.

Since LOS is a continuous variable, the test for normality distribution was carried out to identify whether a parametric or non-parametric test is more appropriate.

The Shapiro wilk test was carried out to test for normality:

Table 4.21

Shapiro- wilk test for LOS

	Shapiro-Wilk		
	Statistic	Df	*p* value
Length of stay in days	0.597	1064	<.001

The LOS violates the normality assumption as the Shapiro wilk p value is <0.001, which is less than the 0.05 level of significance. Hence, the Mann Whitney test was applied to test the relationship in the average LOS between males and females.

H_0: There is no difference in the mean LOS between genders.

H_1: There is a significant difference in the mean LOS between genders.

Table 4.22

Average LOS between males and females

	N	Mean	Std. Deviation
Female	515	**7.93**	12.412
Male	549	**8.64**	10.207
Total	1064	**8.3**	11.329

The mean LOS for male patients which is 8.64 (approx. 9) days exceeds the mean LOS for female patients 7.93 (approx. 8) days by 0.71 (approx. 1) day as seen in the table below.

Table 4.23

Mann-Whitney U test to test for mean LOS with patient gender

	Length of stay in days
Mann-Whitney U	127682
Wilcoxon W	260552
Z	-2.741
p value	**0.006**

A *p* value of 0.006 was obtained, thus, the alternative hypothesis is endorsed, indicating that mean LOS in males is significantly higher than females.

Age group and admission rates

To determine if there is an association between age groups and admission rates

H_0: There is no difference between age groups and admission rates.

H_1: There is a significant difference between age groups and admission rates.

Table 4.24

Admission rates by age group

		Admitted		
		Yes	No	Total
Age Group	18-29	11	8	19
		57.9%	42.1%	100.0%
	30-44	88	41	129
		68.2%	31.8%	100.0%
	45-59	199	96	295
		67.5%	32.5%	100.0%
	60-74	482	188	670
		71.9%	28.1%	100.0%
	75-94	284	113	397
		71.5%	28.5%	100.0%
Total		1064	446	1510
		70.5%	29.5%	100.0%

The highest admission rate was in patients aged 60-74 (71.9%), followed by 75-94 (71.5%), 30-44 (68.2%), 45-59 (67.5%), and 18-29 (57.9) as seen in table 4.23.

Table 4.25

Chi square for significance of admission rates with age group

	Value	Df	*p* value
Pearson Chi-Square	3.957	4	0.412

A *p* value of 0.412 accepts H_0, which shows that the association between age groups and hospitalisation was not statistically significant.

Age group and cancer type

To determine if there is an association between cancer types across age groups

H_0: There is no difference between cancer types across age groups.

H_1: There is a significant difference between cancer types across age groups.

Table 4.26

Patient's Age group with cancer type

		Age Group					
		18-29	30-44	45-59	60-74	75-94	Total
Cancer Type							
	Solid tumours						
	Breast	3	55	74	92	64	288
		1.0%	19.1%	25.7%	31.9%	22.2%	100.0%
	Lung	4	3	40	120	54	221
		1.8%	1.4%	18.1%	54.3%	24.4%	100.0%
	Upper GI	1	4	35	102	37	179
		0.6%	2.2%	19.6%	57.0%	20.7%	100.0%
	Colorectal	1	6	43	54	44	148
		0.7%	4.1%	29.1%	36.5%	29.7%	100.0%
	Genitourinary	4	6	15	76	40	141
		2.8%	4.3%	10.6%	53.9%	28.4%	100.0%
	Gynaecological	1	15	28	46	15	105
		1.0%	14.3%	26.7%	43.8%	14.3%	100.0%
	Head and Neck	0	1	8	19	14	42
		0.0%	2.4%	19.0%	45.2%	33.3%	100.0%
	Brain	1	5	12	15	1	34
		2.9%	14.7%	35.3%	44.1%	2.9%	100.0%
	Skin	0	1	3	8	6	18
		0.0%	5.6%	16.7%	44.4%	33.3%	100.0%
	Sarcoma	2	7	1	3	2	15
		13.3%	46.7%	6.7%	20.0%	13.3%	100.0%
	Haematology						
	Lymphoma	1	18	15	43	45	122
		0.8%	14.8%	12.3%	35.2%	36.9%	100.0%
	Multiple Myeloma	0	0	13	54	30	97
		0.0%	0.0%	13.4%	55.7%	30.9%	100.0%
	Leukaemia	1	5	7	21	24	58
		1.7%	8.6%	12.1%	36.2%	41.4%	100.0%
	Other	0	3	1	17	21	42
		0.0%	7.1%	2.4%	40.5%	50.0%	100.0%

Table 4.27

Chi-Square test for age group and cancer type

	Value	df	*p* value
Pearson Chi-Square	252.760[a]	52	**<0.001**

Overall, the highest rate of adults aged 75-94 presenting to the ED were patients with leukaemia. The frequency of sarcoma was identical in both the youngest and eldest age group, however, the highest rate was recorded in patients aged 30-44 years. Ultimately, a *p* value of <0.001 accepts H_1, where one can generalise that there is a significant association between cancer types across age groups.

Age group and length of stay

To determine if mean LOS differs across age groups.

H_0: There is no difference in the mean LOS between age groups.

H_1: There is a significant difference in the mean LOS between age groups.

Table 4.28

Mean LOS by age group

Age Group	Mean	N	Std. Deviation
18-29	**7.00**	11	8.037
30-44	**4.80**	88	5.540
45-59	**7.66**	199	10.409
60-74	**8.52**	482	11.741
75-94	**9.51**	284	12.431
Total	**8.30**	1064	11.329

Table 4.29

Kruskal Wallis test for significance of mean LOS between age groups

	Length of stay in days
Kruskal-Wallis H	18.934
Df	4
p value	**<.001**

The oldest patient cohort (75-94) had the highest mean LOS, followed by those aged 60-74, 45-59, 18-29 and 30-44. A p value of <.001 (Table 4.26) validates H_1. Thus, it can be generalised that patients over 75 years are expected to have longer mean LOS.

4.3.2 Cancer-specific trends

This section provides an analysis of which specific symptoms are more prevalent within particular cancer diagnosis. Subsequently, these results will also answer whether particular cancer types potentially lead to inpatient admissions, and which malignancies may be related to longer LOS.

1) Cancer type with presenting symptoms
2) Cancer type and admission rates
3) Cancer type and LOS

Cancer type with presenting symptoms

To determine if certain presenting symptoms are more common to particular cancer types.

H_0: There is no association between the cancer type and presenting complaints

H_1: There is a significant difference between the cancer type and presenting complaints

Figure 4.11

Cross-tabulation of cancer type with presenting complaints

		Cancer Type														
		Breast	Lung	Upper GI	Colorectal	Genitourinary	Gynaecological	Head and Neck	Brain	Skin	Sarcoma	Lymphoma	Multiple Myeloma	Leukaemia	Other	Total
Presnting symptoms	Fever	84	32	51	37	22	17	6	4	2	5	17	18	18	3	316
		26.6%	10.1%	16.1%	11.7%	7.0%	5.4%	1.9%	1.3%	0.6%	1.6%	5.4%	5.7%	5.7%	0.9%	100.0%
	Dysponea	31	54	7	9	15	5	8	4	4	2	15	13	4	5	176
		17.6%	30.7%	4.0%	5.1%	8.5%	2.8%	4.5%	2.3%	2.3%	1.1%	8.5%	7.4%	2.3%	2.8%	100.0%
	Pain	18	16	9	9	11	3	1	2	0	1	11	9	5	5	100
		18.0%	16.0%	9.0%	9.0%	11.0%	3.0%	1.0%	2.0%	0.0%	1.0%	11.0%	9.0%	5.0%	5.0%	100.0%
	Abdominal pain/distension	14	12	16	12	14	15	1	1	2	0	6	2	2	1	98
		14.3%	12.2%	16.3%	12.2%	14.3%	15.3%	1.0%	1.0%	2.0%	0.0%	6.1%	2.0%	2.0%	1.0%	100.0%
	Vomiting	20	8	18	13	6	20	1	2	0	1	7	1	1	0	98
		20.4%	8.2%	18.4%	13.3%	6.1%	20.4%	1.0%	2.0%	0.0%	1.0%	7.1%	1.0%	1.0%	0.0%	100.0%
	Investigations/diagnostic workup	11	8	8	6	8	7	1	1	0	0	16	10	11	9	96
		11.5%	8.3%	8.3%	6.3%	8.3%	7.3%	1.0%	1.0%	0.0%	0.0%	16.7%	10.4%	11.5%	9.4%	100.0%
	Consciousness/Cognitive disturbance	21	14	12	4	4	5	2	6	0	2	6	3	1	6	86
		24.4%	16.3%	14.0%	4.7%	4.7%	5.8%	2.3%	7.0%	0.0%	2.3%	7.0%	3.5%	1.2%	7.0%	100.0%
	Chest pain	9	14	5	9	7	3	2	1	2	1	6	8	4	2	73
		12.3%	19.2%	6.8%	12.3%	9.6%	4.1%	2.7%	1.4%	2.7%	1.4%	8.2%	11.0%	5.5%	2.7%	100.0%
	Bleeding/ Bruising	5	6	11	12	3	7	4	0	2	0	6	10	2	1	69
		7.2%	8.7%	15.9%	17.4%	4.3%	10.1%	5.8%	0.0%	2.9%	0.0%	8.7%	14.5%	2.9%	1.4%	100.0%
	Fatigue/ Performance status	6	20	2	9	4	2	4	0	2	0	4	3	2	5	63
		9.5%	31.7%	3.2%	14.3%	6.3%	3.2%	6.3%	0.0%	3.2%	0.0%	6.3%	4.8%	3.2%	7.9%	100.0%
	Infection	16	2	10	4	8	8	0	1	1	2	3	7	1	0	63
		25.4%	3.2%	15.9%	6.3%	12.7%	12.7%	0.0%	1.6%	1.6%	3.2%	4.8%	11.1%	1.6%	0.0%	100.0%
	Neurosensory/Motor	10	10	10	3	5	4	1	6	1	0	4	4	2	1	61
		16.4%	16.4%	16.4%	4.9%	8.2%	6.6%	1.6%	9.8%	1.6%	0.0%	6.6%	6.6%	3.3%	1.6%	100.0%
	Diarrhoea	13	9	3	5	4	1	0	0	0	0	3	3	0	0	41
		31.7%	22.0%	7.3%	12.2%	9.8%	2.4%	0.0%	0.0%	0.0%	0.0%	7.3%	7.3%	0.0%	0.0%	100.0%
	Ocular/Eye problems	6	4	1	4	6	0	3	0	0	0	5	2	4	3	38
		15.8%	10.5%	2.6%	10.5%	15.8%	0.0%	7.9%	0.0%	0.0%	0.0%	13.2%	5.3%	10.5%	7.9%	100.0%
	Skin	13	1	4	3	3	4	1	0	0	0	3	2	0	1	35
		37.1%	2.9%	11.4%	8.6%	8.6%	11.4%	2.9%	0.0%	0.0%	0.0%	8.6%	5.7%	0.0%	2.9%	100.0%
	Urinary	2	1	0	5	15	2	1	0	1	0	5	0	1	0	33
		6.1%	3.0%	0.0%	15.2%	45.5%	6.1%	3.0%	0.0%	3.0%	0.0%	15.2%	0.0%	3.0%	0.0%	100.0%
	Constipation	1	3	3	1	2	2	3	0	0	0	2	1	0	0	18
		5.6%	16.7%	16.7%	5.6%	11.1%	11.1%	16.7%	0.0%	0.0%	0.0%	11.1%	5.6%	0.0%	0.0%	100.0%
	Anorexia	0	4	3	1	1	0	0	1	1	0	1	0	0	0	12
		0.0%	33.3%	25.0%	8.3%	8.3%	0.0%	0.0%	8.3%	8.3%	0.0%	8.3%	0.0%	0.0%	0.0%	100.0%
	Other symptoms	5	3	5	1	3	0	3	0	0	1	0	1	0	0	22
		22.7%	13.6%	22.7%	4.5%	13.6%	0.0%	13.6%	0.0%	0.0%	4.5%	0.0%	4.5%	0.0%	0.0%	100.0%
	Other critical complications	3	0	1	1	0	0	0	5	0	0	2	0	0	0	12
		25.0%	0.0%	8.3%	8.3%	0.0%	0.0%	0.0%	41.7%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%	100.0%
Total		288	221	179	148	141	105	42	34	18	15	122	97	58	42	1510
		19.1%	14.6%	11.9%	9.9%	9.3%	7.0%	2.8%	2.3%	1.2%	1.0%	8.1%	6.4%	3.8%	2.8%	100.0%

Table 4.30

Chi square for presenting complaints with cancer type

	Value	df	*p* value
Pearson Chi-Square	626.027	247	<0.001

Overall, fever was most common in patients with breast cancer. However, it was also prevalent across patients with haematological malignancies. Dysponea was the second most common symptom reported in lung cancer, followed by pain mostly reported in breast cancer patients as well. Consequently, abdominal pain/distention was most prevalent in patients with Upper GI malignancies while vomiting was equally prevalent in patients with breast and gynaecological cancers. Both symptoms ranked as the fourth most common complaints. Since the *p* value that is <0.001 is smaller than the 0.05 level of significance, H_1 is accepted. Hence, one can generalise that specific complaints are associated with particular cancer types.

Cancer type and admission rates

To investigate if patients with specific cancers are more likely to be hospitalised

H_0: There is no relationship between cancer type and admission rates.

H_1: There is a significant relationship between cancer type and admission rates.

Table 4.31

Admission rates by cancer type

	Admitted		
	Yes	No	Total
Solid tumours			
Breast	182	106	288
	63.2%	36.8%	100.0%
Lung	178	43	221
	80.5%	19.5%	100.0%
Upper GI	131	48	179
	73.2%	26.8%	100.0%
Colorectal	100	48	148
	67.6%	32.4%	100.0%
Genitourinary	90	51	141
	63.8%	36.2%	100.0%
Gynaecological	77	28	105
	73.3%	26.7%	100.0%
Head and Neck	23	19	42
	54.8%	45.2%	100.0%
Brain	24	10	34
	70.6%	29.4%	100.0%
Skin	14	4	18
	77.8%	22.2%	100.0%
Sarcoma	11	4	15
	73.3%	26.7%	100.0%
Haematology			
Lymphoma	83	39	122
	68.0%	32.0%	100.0%
Multiple Myeloma	73	24	97
	75.3%	24.7%	100.0%
Leukaemia	47	11	58
	81.0%	19.0%	100.0%
Other	31	11	42
	73.8%	26.2%	100.0%
Total	1064	446	1510
	70.5%	29.5%	100.0%

Table 4.32

Chi square test for admission rates by cancer type

	Value	df	*p* value
Pearson Chi-Square	32.985	13	**0.002**

Overall, the highest admission rate was in leukaemia patients (81%), within the haematology cohort, followed by lung cancer patients (80.5%), who had the highest admission rate within the solid tumour cohort. A *p* value of 0.002 rejects the null hypothesis. Hence, one can surmise that there is an association between specific cancers and hospitalisation rates.

Cancer type and LOS

To determine if patients with particular cancers had higher LOS.

H_0: There is no association between the cancer type and mean LOS.

H_1: There is a significant association between the cancer type and mean LOS

Table 4.33

Mean LOS by cancer type

Cancer type	N	Mean	Std. Deviation	Minimum	Maximum
Solid tumours					
Breast	182	**5.76**	6.069	0	53
Sarcoma	11	**6.36**	3.042	1	11
Colorectal	100	**6.46**	9.044	0	75
Upper GI	131	**6.65**	7.343	0	50
Gynaecological	77	**7.71**	12.273	0	65
Lung	177	**7.78**	7.824	0	38
Head and Neck	23	**8.00**	5.657	0	26
Brain	24	**8.54**	9.084	0	30
Skin	14	**9.43**	9.741	0	32
Genitourinary	90	**9.46**	12.783	0	86
Haematology					
Lymphoma	83	**10.82**	14.636	0	92
Multiple Myeloma	73	**12.11**	16.922	0	87
Leukaemia	47	**12.38**	20.525	0	127
Other	31	**15.42**	18.502	1	63
Total	1064	**8.30**	11.329	0	127

Table 4.34

Kruskal Wallis test for mean LOS by cancer type

	Length of stay in days
Kruskal-Wallis H	32.720
Df	13
p value	**0.002**

The highest average LOS was in patients with leukaemia (12.38). However, patients with a haematological malignancy were all associated with an extended mean LOS. Within the solid tumour cohort, patients diagnosed with genitourinary cancer had the highest average LOS (9.46) while breast cancer had the lowest average LOS (5.76). Patients in the 'Other' category showed the highest mean LOS (15.42). Since the *p* value is smaller than the 0.05 level of significance (0.002), the null hypothesis is rejected. Hence, one can generalise that there is an association between cancer type and mean LOS.

4.3.3 Treatment-associated patterns.

To determine if treatment was associated with specific patterns, the researcher analysed the relationships between:

1) Treatment regimen and Primary symptom
2) Treatment regimen and days from last treatment
3) Days from last treatment and Primary symptoms
4) Treatment regimen and admission rate
5) Treatment regimen with LOS

Treatment regimen and Primary symptom

H_0: There is no association between the treatment regimen and primary toxicity.

H_1: There is a significant association between the treatment regimen and primary toxicity.

Figure 4.13

Crosstabulation of Treatment regimen with presenting complaint

		Treatment regimen										
		Single agent chemotherapy	Combination chemotherapy	Single agent targeted/ immunotherapy	Radiotherapy	Combination therapies	Combination targeted/ immunotherapy	Bisphosphonates	Immunoglobulins	Single Hormone therapy	Unspecified therapy	Total
Presenting symptom	Fever	90	94	43	18	47	2	10	6	2	4	316
		23.9%	28.8%	13.4%	8.7%	30.9%	11.8%	18.2%	18.2%	18.2%	33.3%	20.9%
	Dysponea	39	30	42	31	19	3	6	3	1	2	176
		10.4%	9.2%	13.1%	15.0%	12.5%	17.6%	10.9%	9.1%	9.1%	16.7%	11.7%
	Pain	22	10	24	24	6	3	6	3	1	1	100
		5.9%	3.1%	7.5%	11.6%	3.9%	17.6%	10.9%	9.1%	9.1%	8.3%	6.6%
	Abdominal pain/distension	28	24	19	13	8	0	3	2	1	0	98
		7.4%	7.4%	5.9%	6.3%	5.3%	0.0%	5.5%	6.1%	9.1%	0.0%	6.5%
	Vomiting	30	27	11	13	7	1	9	0	0	0	98
		8.0%	8.3%	3.4%	6.3%	4.6%	5.9%	16.4%	0.0%	0.0%	0.0%	6.5%
	Investigations/diagnostic workup	28	14	32	4	10	1	4	1	0	2	96
		7.4%	4.3%	10.0%	1.9%	6.6%	5.9%	7.3%	3.0%	0.0%	16.7%	6.4%
	Consciousness/ Cognitive disturbance	20	13	25	12	8	2	2	2	2	0	86
		5.3%	4.0%	7.8%	5.8%	5.3%	11.8%	3.6%	6.1%	18.2%	0.0%	5.7%
	Chest pain	18	11	17	11	5	2	3	5	1	0	73
		4.8%	3.4%	5.3%	5.3%	3.3%	11.8%	5.5%	15.2%	9.1%	0.0%	4.8%
	Bleeding/Bruising	16	15	20	11	5	0	1	1	0	0	69
		4.3%	4.6%	6.2%	5.3%	3.3%	0.0%	1.8%	3.0%	0.0%	0.0%	4.6%
	Fatigue/Performance status	11	10	10	14	11	0	3	2	1	1	63
		2.9%	3.1%	3.1%	6.8%	7.2%	0.0%	5.5%	6.1%	9.1%	8.3%	4.2%
	Infection	16	19	11	9	2	0	1	4	0	1	63
		4.3%	5.8%	3.4%	4.3%	1.3%	0.0%	1.8%	12.1%	0.0%	8.3%	4.2%
	Neurosensory/Motor	16	12	15	10	2	1	3	0	1	1	61
		4.3%	3.7%	4.7%	4.8%	1.3%	5.9%	5.5%	0.0%	9.1%	8.3%	4.0%
	Diarrhoea	7	8	13	4	6	2	1	0	0	0	41
		1.9%	2.5%	4.0%	1.9%	3.9%	11.8%	1.8%	0.0%	0.0%	0.0%	2.7%
	Ocular/Eye problems	7	6	13	5	3	0	1	2	1	0	38
		1.9%	1.8%	4.0%	2.4%	2.0%	0.0%	1.8%	6.1%	9.1%	0.0%	2.5%
	Skin	11	10	5	6	0	0	1	2	0	0	35
		2.9%	3.1%	1.6%	2.9%	0.0%	0.0%	1.8%	6.1%	0.0%	0.0%	2.3%
	Urinary	8	2	6	12	5	0	0	0	0	0	33
		2.1%	0.6%	1.9%	5.8%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%
	Constipation	0	7	3	3	5	0	0	0	0	0	18
		0.0%	2.1%	0.9%	1.4%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%
	Anorexia	3	2	2	4	1	0	0	0	0	0	12
		0.8%	0.6%	0.6%	1.9%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%
	Other symptoms	3	11	6	1	0	0	1	0	0	0	22
		0.8%	3.4%	1.9%	0.5%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	1.5%
	Other critical complications	3	1	4	2	2	0	0	0	0	0	12
		0.8%	0.3%	1.2%	1.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%
Total		376	326	321	207	152	17	55	33	11	12	1510
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4. 35

Chi square test for treatment regimen with presenting complaint

	Value	df	*p* value
Pearson Chi-Square	259.675	171	**<.001**

Patients receiving single agent chemotherapy, combination chemotherapy, single agent targeted/immunotherapy, combination therapies, bisphosphonates and immunoglobulins mostly presented with fever. Patients who underwent RT and combination targeted/immunotherapy mostly reported pain. Fever and consciousness/cognitive disturbances were equally reported in patients receiving single hormone therapy. As the p value is <0.001 H_1 is accepted. From these results, one can conclude that specific treatment regimens are associated with specific toxicities.

Treatment regimen and days from last treatment

To determine if there is an association between the treatment regimen and the number of days from last treatment to present to the ED.

Shapiro wilk test carried out to determine the normality distribution for days from last treatment is displayed in the table below:

Table 4.36

Shapiro wilk test for days from last treatment till ED presentation

	Shapiro-Wilk		
	Statistic	df	*p* value
Days from last treatment	0.888	1510	<0.001

H_0: There is no association between the treatment regimen and the number of days from last treatment to present to the ED.

H_1: There is a significant association between the treatment regimen and the number of days from last treatment to present to the ED.

Table 4.37

Treatment regimen received and the mean number of days until ED presentation

Treatment regimen	N	Mean	Std. Deviation
Combination chemotherapy	326	**10.47**	9.627
Single agent chemotherapy	376	**11.04**	10.146
Combination therapies	152	**12.51**	9.346
Single agent targeted/immuno-therapy	321	**12.65**	10.501
Radiotherapy	207	**12.72**	12.282
Combination targeted/ immu-notherapy	17	**16.24**	11.851
Single Hormone therapy	11	**22.64**	12.143
Immunoglobulins	33	**13.24**	9.135
Bisphosphonates	55	**13.84**	9.949
Unspecified therapy	12	**10.17**	8.537
Total	1510	**11.92**	10.426

Table 4.38

Kruskal Wallis test of treatment regimen received and the mean number of days until ED presentation

	Days from last treatment
Kruskal-Wallis H	30.873
Df	9
p value	**<.001**

Patients undergoing combination chemotherapy regimens had the earliest presentations to the ED 10.47 (approx. average within 10 days) while patients who were receiving single hormone therapy had a later presentation to the ED, 22.64 (approx. average within 23 days). The null hypothesis is rejected since a *p* value of less than <0.05 level of significance

was obtained, indicating that patients finishing or completing their cycle of specific treatments are expected to develop complications after a particular period of time, which differs between treatment regimens.

Days from last treatment and presenting symptoms

To establish if there is a relationship between the presenting complaints with the mean number of days from treatment to ED visit.

H_0: There is no association between the presenting complaints with the mean number of days from treatment to ED visit.

H_1: There is a significant association between the presenting complaints with the mean number of days from treatment to ED visit.

Table 4.39

Presenting complaints with mean number of days, from treatment to ED visit

Presenting symptom/toxicity	N	Mean	Std. Deviation
Diarrhoea	41	**8.05**	6.730
Fever	316	**9.57**	8.856
Bleeding/Bruising	69	**9.93**	9.658
Infection	63	**10.94**	10.367
Vomiting	98	**11.04**	9.953
Skin	35	**11.06**	10.970
Urinary	33	**11.42**	11.311
Neurosensory/Motor	61	**11.64**	9.406
Ocular/Eye problems	38	**11.84**	11.269
Investigations/diagnostic workup	96	**12.26**	10.287
Consciousness/Cognitive disturbance	86	**12.73**	10.924
Pain	100	**12.75**	10.757
Dysponea	176	**13.27**	10.939
Chest pain	73	**13.37**	11.692
Abdominal pain/distension	98	**13.80**	10.831
Constipation	18	**14.61**	10.517
Anorexia	12	**15.08**	13.734
Fatigue/Performance status	63	**17.10**	11.804
Other symptoms	22	**15.05**	11.303
Other critical complications	12	**17.42**	10.967
Total	1510	**11.92**	10.426

Table 4.40

Kruskal Wallis test for presenting complaints with mean number of days from treatment to ED visit

	Days from last treatment
Kruskal-Wallis H	55.599
Df	19
p value	**<.001**

Patients who experienced fever, which was the most commonly presented complaint, visited the ED on an average of 9.57 (approx. 10 days) post treatment. On the other hand, patients who experienced life threatening complications received their treatment at an average of 17.42 (approx. 17 days) before such an episode. Ultimately, the lowest average ED visit to treatment administration was after 8.05 (approx. 8 days) which was recorded in patients who presented with diarrhoea. The *p* value for this scenario (<0.001) also indicates that there is a significant relationship between specific presenting complaints and the number of days from last treatment.

Treatment regimen and admission rates

To determine if there is a significant relationship between treatment received and admission rates.

H_0: There is no association between treatment received and admission rates.

H_1: There is a significant association between treatment received and admission rates.

Table 4.41

Treatment received with admission rate

		Admitted		
		Yes	No	Total
Treatment regimen	Single agent chemotherapy	284	92	376
		75.5%	24.5%	100.0%
	Combination therapies	110	42	152
		72.4%	27.6%	100.0%
	Single agent targeted/ immunotherapy	225	96	321
		70.1%	29.9%	100.0%
	Combination chemotherapy	222	104	326
		68.1%	31.9%	100.0%
	Radiotherapy	136	71	207
		65.7%	34.3%	100.0%
	Combination targeted/ immunotherapy	8	9	17
		47.1%	52.9%	100.0%
	Single Hormone therapy	7	4	11
		63.6%	36.4%	100.0%
	Immunoglobulins	26	7	33
		78.8%	21.2%	100.0%
	Bisphosphonates	36	19	55
		65.5%	34.5%	100.0%
	Unspecified therapy	10	2	12
		83.3%	16.7%	100.0%
Total		1064	446	1510
		70.5%	29.5%	100.0%

Table 4.42

Chi square for treatment received with admission rate

	Value	df	*p* value
Pearson Chi-Square	15.497[a]	9	0.078

Besides the “unspecified therapy’’group, the highest admission rate was associated with immunoglobulins followed by single agent chemotherapy, while the lowest admission rate was associated with combination targeted/ immunotherapy. However, a *p* value of

0.078 indicates that the association between treatment received and admission rates was not statistically significant.

Treatment regimen with LOS

To examine the association between the mean LOS and treatment regimens.

H_0: There is no difference between the mean LOS and treatment regimens.

H_1: There is a significant difference between the mean LOS and treatment regimens.

Table 4.43

Treatment regimens and mean LOS

	N	Mean	Std. Deviation	Minimum	Maximum
Single Hormone therapy	7	**4.86**	6.309	0	87
Combination targeted/ immunotherapy	8	**5.88**	4.941	1	43
Combination chemotherapy	222	**6.10**	6.587	0	15
Single agent chemotherapy	284	**7.13**	8.517	0	74
Combination therapies	110	**8.55**	10.249	1	44
Single agent targeted/ immunotherapy	225	**9.64**	12.513	0	61
Radiotherapy	136	**10.10**	13.977	0	92
Immunoglobulins	26	**8.81**	9.086	1	86
Bisphosphonates	36	**12.14**	19.384	1	18
Unspecified therapy	10	**21.80**	37.985	1	127
Total	1064	**8.30**	11.329	0	127

Table 4.44

Kruskal-Wallis H test for Treatment regimens and mean LOS

	Length of stay in days
Kruskal-Wallis H	22.912
Df	9
p value	**0.006**

Besides the ‘’unspecified therapy’’ which was related to patients undergoing treatment for haematological malignancies, the highest mean LOS of (12.14) approx. 12 days was

associated with bisphosphonates, while the lowest mean LOS is associated with patients receiving single hormonal therapies. A *p* value of 0.006 accepts H_1 indicating that there is a significant relationship between treatment regimens and mean LOS.

4.3.4 Pathway and acute care dynamics

To better understand the care trajectory in terms of patient flow, this section illustrates the relationships between:

1) Presenting symptoms with ESI categories
2) Presenting symptoms with inpatient admissions
3) ED presentation timeframe and admissions
4) Transfers with LOS
5) Presenting symptoms and admitting ward
6) Presenting symptom with ward transferred
7) Presenting symptom with second ward transferred
8) Presenting symptoms and LOS

Presenting symptoms with ESI categories

To determine the relationship between presenting symptoms and ESI categories

H_0: There is no difference between presenting symptoms and ESI categories

H_1: There is a significant difference between presenting symptoms and ESI categories

Figure 4.14

Crosstabulation of presenting complaint with ESI category

		ESI					
		ESI-1	ESI-2	ESI-3	ESI-4	Other	Total
Presenting symptom	Fever	2	293	18	1	2	316
		5.7%	26.7%	6.1%	1.4%	18.2%	20.9%
	Dysponea	11	155	10	0	0	176
		31.4%	14.1%	3.4%	0.0%	0.0%	11.7%
	Pain	0	45	40	15	0	100
		0.0%	4.1%	13.5%	21.1%	0.0%	6.6%
	Abdominal pain/distension	0	71	26	1	0	98
		0.0%	6.5%	8.8%	1.4%	0.0%	6.5%
	Vomiting	0	75	23	0	0	98
		0.0%	6.8%	7.8%	0.0%	0.0%	6.5%
	Investigations/diagnostic workup	0	69	21	4	2	96
		0.0%	6.3%	7.1%	5.6%	18.2%	6.4%
	Consciousness/Cognitive disturbance	9	66	10	0	1	86
		25.7%	6.0%	3.4%	0.0%	9.1%	5.7%
	Chest pain	0	65	6	1	1	73
		0.0%	5.9%	2.0%	1.4%	9.1%	4.8%
	Bleeding/Bruising	0	41	20	7	1	69
		0.0%	3.7%	6.8%	9.9%	9.1%	4.6%
	Fatigue/Performance status	3	50	9	1	0	63
		8.6%	4.6%	3.0%	1.4%	0.0%	4.2%
	Infection	1	34	23	5	0	63
		2.9%	3.1%	7.8%	7.0%	0.0%	4.2%
	Neurosensory/Motor	1	40	20	0	0	61
		2.9%	3.6%	6.8%	0.0%	0.0%	4.0%
	Diarrhoea	0	23	18	0	0	41
		0.0%	2.1%	6.1%	0.0%	0.0%	2.7%
	Ocular/Eye problems	0	0	7	30	1	38
		0.0%	0.0%	2.4%	42.3%	9.1%	2.5%
	Skin	0	10	21	4	0	35
		0.0%	0.9%	7.1%	5.6%	0.0%	2.3%
	Urinary	0	27	6	0	0	33
		0.0%	2.5%	2.0%	0.0%	0.0%	2.2%
	Constipation	0	14	4	0	0	18
		0.0%	1.3%	1.4%	0.0%	0.0%	1.2%
	Anorexia	0	7	5	0	0	12
		0.0%	0.6%	1.7%	0.0%	0.0%	0.8%
	Other symptoms	0	8	9	2	3	22
		0.0%	0.7%	3.0%	2.8%	27.3%	1.5%
	Other critical complications	8	4	0	0	0	12
		22.9%	0.4%	0.0%	0.0%	0.0%	0.8%
Total		35	1097	296	71	11	1510
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.45

Chi square of presenting complaint with ESI category

	Value	Df	*p* value
Pearson Chi-Square	1094.044	76	<.001

Apart from the critical episodes reported at the ED, ESI-1 was highly reported in patients presenting with dysponea. Fever was mainly reported as ESI-2, vomiting with ESI-3, and ocular complaints with ESI-4. This test validates H_1, which shows a significant relationship between the ESI scores and presenting symptoms.

Presenting symptoms with inpatient admissions

To discover which complaints, drive higher admission rates.

H_0: There is no association between presenting complaints and admission rates.

H_1: There is a significant association between presenting complaints and admission rates.

Table 4.46

Presenting complaints and admission rate

		Admitted		
		Yes	No	Total
Presenting symptom	Fever	260 82.3%	56 17.7%	316 100.0%
	Dysponea	154 87.5%	22 12.5%	176 100.0%
	Pain	44 44.0%	56 56.0%	100 100.0%
	Abdominal pain/distension	65 66.3%	33 33.7%	98 100.0%
	Vomiting	76 77.6%	22 22.4%	98 100.0%
	Investigations/diagnostic workup	77 80.2%	19 19.8%	96 100.0%
	Consciousness/Cognitive disturbance	65 75.6%	21 24.4%	86 100.0%
	Chest pain	54 74.0%	19 26.0%	73 100.0%
	Bleeding/Bruising	36 52.2%	33 47.8%	69 100.0%
	Fatigue/Performance status	60 95.2%	3 4.8%	63 100.0%
	Infection	36 57.1%	27 42.9%	63 100.0%
	Neurosensory/Motor	40 65.6%	21 34.4%	61 100.0%
	Constipation	11 61.1%	7 38.9%	18 100.0%
	Diarrhoea	23 56.1%	18 43.9%	41 100.0%
	Ocular/Eye problems	2 5.3%	36 94.7%	38 100.0%
	Urinary	21 63.6%	12 36.4%	33 100.0%
	Skin	13 37.1%	22 62.9%	35 100.0%
	Anorexia	11 91.7%	1 8.3%	12 100.0%
	Other critical complications	9 75.0%	3 25.0%	12 100.0%
	Other symptoms	7 31.8%	15 68.2%	22 100.0%
Total		1064 70.5%	446 29.5%	1510 100.0%

Table 4.47

Chi square presenting complaints and admission rates

	Value	Df	*p* value
Pearson Chi-Square	244.543	19	<.001

Fatigue/performance status was associated with the highest admission rate (95.2%), while ocular complaints had the lowest admission rate (5.3%). A *p* value of <0.001 concludes that there is a significant association between specific presenting symptoms and hospitalisation rates.

ED presentation timeframe and admissions

To analyse the ED presentation time period with admission rates.

H_0: There is no difference between the ED presentation timeframe and admission rate.

H_1: There is a significant difference between the ED presentation timeframe and admission rate.

Table 4.48

ED presentation timeframe with Admission rate

		Admitted		
		Yes	No	Total
ED presentation timeframe	07:00-13:59	464	205	669
		69.4%	30.6%	100.0%
	14:00-18:59	305	131	436
		70.0%	30.0%	100.0%
	19:00-23:59	187	72	259
		72.2%	27.8%	100.0%
	00:00-06:59	108	38	146
		74.0%	26.0%	100.0%
Total		1064	446	1510
		70.5%	29.5%	100.0%

Table 4.49

Chi square test for ED presentation timeframe with admission rate

	Value	Df	*p* value
Pearson Chi-Square	1.687[a]	3	0.640

The highest admission rate was for patients who presented at the ED at night-time. However, a *p* value of 0.640 violates H_1, indicating that there was no significant difference between ED presentation time period and admission rate.

Transfers with LOS

To analyse if patients who had a transfer during their admission are associated with higher LOS.

H_0: There is no difference in the average LOS between the two groups.

H_1: There is a significant difference in the mean LOS between the two groups.

Table 4.50

Average LOS between patients who were transferred vs patients who were not

Transferred	N	Mean	Std. Deviation
Yes	360	**12.66**	13.851
No	704	**6.07**	9.020
Total	1064	**8.30**	11.329

Table 4.51

Mann-Whitney U for average LOS for inpatient transfers

	Length of stay in days
Mann-Whitney U	74135.500
Wilcoxon W	322295.500
Z	-11.125
p value	<.001

The average LOS for patients who were transferred during their hospital stay was of 12.66 (approx. 13 days), and 6.07 (approx. 6) days for those who did not, a discrepancy of 6.69 (approx. 7) days. A <0.001 p value validates the alternative hypothesis, indicating that inpatient transfers lead to prolonged hospitalisations.

Presenting symptoms and admitting ward

To investigate whether patients are admitted to specific wards depending on their presenting symptoms

H_0: There is no association between presenting complaints and type of ward admitted

H_1: There is a significant association between presenting complaints and type of ward admitted

Figure 4.15

Crosstabulation of presenting complaint with admitting ward

	Type of admitting ward													
	General medical	Medical assessment	General surgical	Observation/ Admission unit	Specialised surgical	Specialised medical	Cardiac unit	Neuro unit	Critical surgical	Oncology A	Oncology B	Oncology C	Oncology D	Total
Fever	124	26	33	25	37	7	1	2	0	3	2	0	0	260
	47.7%	10.0%	12.7%	9.6%	14.2%	2.7%	0.4%	0.8%	0.0%	1.2%	0.8%	0.0%	0.0%	100.0%
Dysponea	79	32	8	23	4	2	1	0	2	0	1	1	1	154
	51.3%	20.8%	5.2%	14.9%	2.6%	1.3%	0.6%	0.0%	1.3%	0.0%	0.6%	0.6%	0.6%	100.0%
Investigations/diagnostic workup	27	19	7	9	5	0	4	1	1	2	2	0	0	77
	35.1%	24.7%	9.1%	11.7%	6.5%	0.0%	5.2%	1.3%	1.3%	2.6%	2.6%	0.0%	0.0%	100.0%
Vomiting	26	5	23	12	3	1	2	1	0	3	0	0	0	76
	34.2%	6.6%	30.3%	15.8%	3.9%	1.3%	2.6%	1.3%	0.0%	3.9%	0.0%	0.0%	0.0%	100.0%
Abdominal pain/distension	15	8	20	12	6	2	1	0	0	1	0	0	0	65
	23.1%	12.3%	30.8%	18.5%	9.2%	3.1%	1.5%	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	100.0%
Consciousness/Cognitive disturbance	30	16	5	7	1	0	1	1	3	1	0	0	0	65
	46.2%	24.6%	7.7%	10.8%	1.5%	0.0%	1.5%	1.5%	4.6%	1.5%	0.0%	0.0%	0.0%	100.0%
Fatigue/Performance status	26	11	6	6	4	1	1	1	1	0	3	0	0	60
	43.3%	18.3%	10.0%	10.0%	6.7%	1.7%	1.7%	1.7%	1.7%	0.0%	5.0%	0.0%	0.0%	100.0%
Chest pain	21	11	4	7	3	1	5	0	0	1	1	0	0	54
	38.9%	20.4%	7.4%	13.0%	5.6%	1.9%	9.3%	0.0%	0.0%	1.9%	1.9%	0.0%	0.0%	100.0%
Infection	14	5	2	1	9	0	0	3	1	0	0	1	0	36
	38.9%	13.9%	5.6%	2.8%	25.0%	0.0%	0.0%	8.3%	2.8%	0.0%	0.0%	2.8%	0.0%	100.0%
Bleeding/Bruising	8	0	9	2	14	0	1	0	0	0	2	0	0	36
	22.2%	0.0%	25.0%	5.6%	38.9%	0.0%	2.8%	0.0%	0.0%	0.0%	5.6%	0.0%	0.0%	100.0%
Neurosensory/Motor	14	6	3	6	1	2	0	4	2	1	0	1	0	40
	35.0%	15.0%	7.5%	15.0%	2.5%	5.0%	0.0%	10.0%	5.0%	2.5%	0.0%	2.5%	0.0%	100.0%
Pain	16	2	4	11	6	0	0	1	2	1	1	0	0	44
	36.4%	4.5%	9.1%	25.0%	13.6%	0.0%	0.0%	2.3%	4.5%	2.3%	2.3%	0.0%	0.0%	100.0%
Diarrhoea	12	1	1	1	3	4	1	0	0	0	0	0	0	23
	52.2%	4.3%	4.3%	4.3%	13.0%	17.4%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Urinary	5	3	1	2	7	0	0	1	0	1	1	0	0	21
	23.8%	14.3%	4.8%	9.5%	33.3%	0.0%	0.0%	4.8%	0.0%	4.8%	4.8%	0.0%	0.0%	100.0%
Skin	7	0	2	0	2	0	1	0	0	0	1	0	0	13
	53.8%	0.0%	15.4%	0.0%	15.4%	0.0%	7.7%	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%	100.0%
Anorexia	5	0	2	3	1	0	0	0	0	0	0	0	0	11
	45.5%	0.0%	18.2%	27.3%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Constipation	1	1	4	1	3	0	0	0	0	1	0	0	0	11
	9.1%	9.1%	36.4%	9.1%	27.3%	0.0%	0.0%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	100.0%
Ocular/Eye problems	0	0	0	1	1	0	0	0	0	0	0	0	0	2
	0.0%	0.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Other symptoms	3	0	2	1	1	0	0	0	0	0	0	0	0	7
	42.9%	0.0%	28.6%	14.3%	14.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Other critical complications	2	4	1	0	0	0	0	1	1	0	0	0	0	9
	22.2%	44.4%	11.1%	0.0%	0.0%	0.0%	0.0%	11.1%	11.1%	0.0%	0.0%	0.0%	0.0%	100.0%
Total	435	150	137	130	111	20	19	16	13	15	14	3	1	1064
	40.9%	14.1%	12.9%	12.2%	10.4%	1.9%	1.8%	1.5%	1.2%	1.4%	1.3%	0.3%	0.1%	100.0%

Table 4.52

Chi square test for presenting complaint with admitting ward

	Value	df	*p* value
Pearson Chi-Square	445.905	228	<.001

A *p* value of <.001 accepts H_1. Although a number of patients were admitted to wards irrespective of their presenting complaint, the majority of specific complaints were significantly related to admission into specific wards.

Presenting symptoms and ward transferred

To investigate whether patients are transferred to specific wards depending on their presenting symptoms

H_0: There is no association between presenting complaints and type of ward transferred

H_1: There is a significant association between presenting complaints and type of ward transferred.

Figure 4.16

Presenting complaint with type of ward transferred

	Type of ward transferred														
	General medical	General surgical	Medical assessment	Specialised surgical	Cardiac unit	Observation/ Admission unit	Critical surgical	Neuro unit	Specialised medical	Intensive care	Oncology A	Oncology B	Oncology C	Oncology D	Total
Fever	32	11	3	2	4	3	1	2	0	0	6	4	0	2	70
	45.7%	15.7%	4.3%	2.9%	5.7%	4.3%	1.4%	2.9%	0.0%	0.0%	8.6%	5.7%	0.0%	2.9%	100.0%
Dysponea	32	0	6	2	2	1	1	0	2	0	6	1	0	2	55
	58.2%	0.0%	10.9%	3.6%	3.6%	1.8%	1.8%	0.0%	3.6%	0.0%	10.9%	1.8%	0.0%	3.6%	100.0%
Vomiting	12	8	1	0	2	0	1	0	0	0	4	1	0	1	30
	40.0%	26.7%	3.3%	0.0%	6.7%	0.0%	3.3%	0.0%	0.0%	0.0%	13.3%	3.3%	0.0%	3.3%	100.0%
Fatigue/Performance	19	3	0	1	1	0	0	0	0	0	0	0	0	4	28
status	67.9%	10.7%	0.0%	3.6%	3.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	100.0%
Pain	17	2	0	0	0	1	1	0	0	0	0	1	0	4	26
	65.4%	7.7%	0.0%	0.0%	0.0%	3.8%	3.8%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	15.4%	100.0%
a Abdominal	7	6	4	0	0	0	2	0	0	0	0	1	0	6	26
pain/distension	26.9%	23.1%	15.4%	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	23.1%	100.0%
Consciousness/Cogniti	8	2	2	0	1	0	2	2	0	0	0	1	0	5	23
ve disturbance	34.8%	8.7%	8.7%	0.0%	4.3%	0.0%	8.7%	8.7%	0.0%	0.0%	0.0%	4.3%	0.0%	21.7%	100.0%
c	9	2	2	3	2	1	0	0	1	0	0	0	0	0	20
Investigations/diagnosti	45.0%	10.0%	10.0%	15.0%	10.0%	5.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Chest pain	9	1	4	1	0	2	0	0	0	0	0	0	1	1	19
	47.4%	5.3%	21.1%	5.3%	0.0%	10.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	5.3%	100.0%
Neurosensory/Motor	9	1	0	2	0	0	1	1	0	0	0	0	0	1	15
	60.0%	6.7%	0.0%	13.3%	0.0%	0.0%	6.7%	6.7%	0.0%	0.0%	0.0%	0.0%	0.0%	6.7%	100.0%
Bleeding/Bruising	4	1	0	1	0	0	0	0	1	1	0	0	0	2	10
	40.0%	10.0%	0.0%	10.0%	0.0%	0.0%	0.0%	0.0%	10.0%	10.0%	0.0%	0.0%	0.0%	20.0%	100.0%
Infection	4	1	1	1	0	0	1	0	0	0	0	0	0	0	8
	50.0%	12.5%	12.5%	12.5%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Diarrhoea	2	1	0	1	0	0	0	0	1	1	1	0	0	0	7
	28.6%	14.3%	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	14.3%	14.3%	14.3%	0.0%	0.0%	0.0%	100.0%
Anorexia	3	1	0	0	0	1	0	0	0	0	0	1	0	0	6
	50.0%	16.7%	0.0%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	16.7%	0.0%	0.0%	100.0%
d Other critical	1	0	0	0	0	0	0	4	0	0	0	0	0	0	5
complications	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	80.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
b Other symptoms	0	2	0	1	0	0	0	0	0	0	0	0	0	0	3
	0.0%	66.7%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Urinary	0	1	0	2	0	1	0	0	0	0	0	0	0	0	4
	0.0%	25.0%	0.0%	50.0%	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Constipation	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Skin	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
	50.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Ocular/Eye problems	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total	172	43	24	17	12	10	10	9	5	2	17	10	1	28	360
	47.8%	11.9%	6.7%	4.7%	3.3%	2.8%	2.8%	2.5%	1.4%	0.6%	4.7%	2.8%	0.3%	7.8%	100.0%

Table 4.53

Chi square test for presenting complaint with type of ward transferred

	Value	df	p value
Pearson Chi-Square	421.754[a]	247	<0.001

Patients who presented with urinary complaints were mostly transferred to a specialised surgical ward, while patients who presented with other symptoms were mostly transferred to a general medical ward. A p value of <0.001 concludes that there was a significant association presenting complaints and type of ward transferred.

Presenting symptom and second ward transfer

To investigate if patients had a second ward transfer to specific wards depending on their presenting symptoms

H_0: There is no association between presenting complaints and second ward transferred

H_1: There is a significant association between presenting complaints and second ward transferred

Figure 4.17

Presenting complaints and second ward transfer

	Type of second ward transferred										
	General medical	General surgical	Specialised surgical	Medical assessment	Cardiac unit	Critical surgical	Neuro unit	Oncology A	Oncology B	Oncology D	Total
Fever	4	3	1	1	0	1	1	2	0	2	15
	26.7%	20.0%	6.7%	6.7%	0.0%	6.7%	6.7%	13.3%	0.0%	13.3%	100.0%
Dysponea	6	0	0	0	2	1	0	2	0	1	12
	50.0%	0.0%	0.0%	0.0%	16.7%	8.3%	0.0%	16.7%	0.0%	8.3%	100.0%
a Abdominal pain/distension	2	1	0	1	0	0	0	1	0	4	9
	22.2%	11.1%	0.0%	11.1%	0.0%	0.0%	0.0%	11.1%	0.0%	44.4%	100.0%
Consciousness/Cognitive	2	1	2	0	0	0	1	0	0	3	9
disturbance	22.2%	11.1%	22.2%	0.0%	0.0%	0.0%	11.1%	0.0%	0.0%	33.3%	100.0%
Fatigue/Performance status	5	0	0	0	0	0	0	0	1	2	8
	62.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	25.0%	100.0%
Pain	4	1	1	0	0	0	0	0	0	0	6
	66.7%	16.7%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Vomiting	1	2	0	0	0	0	0	0	0	1	4
	25.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	100.0%
c Investigations/diagnostic	1	0	0	0	1	0	0	0	1	0	3
workup	33.3%	0.0%	0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	33.3%	0.0%	100.0%
Neurosensory/Motor	0	0	0	1	0	0	0	0	1	1	3
	0.0%	0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	33.3%	33.3%	100.0%
Diarrhoea	2	0	0	0	0	0	0	0	0	0	2
	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Bleeding/Bruising	0	1	1	0	0	0	0	0	0	0	2
	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Chest pain	1	0	0	0	0	0	0	0	0	1	2
	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	100.0%
Constipation	0	0	0	0	0	0	0	0	0	1	1
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
d Other critical	0	0	0	0	0	0	0	0	0	1	1
complications	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
Skin	1	0	0	0	0	0	0	0	0	0	1
	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Anorexia	1	0	0	0	0	0	0	0	0	0	1
	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total	30	9	5	3	3	2	2	5	3	17	79
	38.0%	11.4%	6.3%	3.8%	3.8%	2.5%	2.5%	6.3%	3.8%	21.5%	100.0%

Table 4.54

Chi square test for presenting complaint and second ward transfer

	Value	Df	*p* value
Pearson Chi-Square	110.375[a]	135	0.941

Patients with bleeding/bruising complaints and had a second transfer were transferred to a surgical ward, while those who presented with vomiting were mostly transferred to a surgical ward. Patients who presented complaints had their second transfer mostly to a general medical ward. However, a p value of 0.941 accepts the null hypothesis which indicates that such difference was insignificant.

Presenting symptoms and LOS

To examine which symptoms are related to extended LOS.

H_0: There is no difference in the mean LOS between the specific presenting complaints.

H_1: There is a significant difference in the mean LOS between the specific presenting complaints.

Table 4.55

Mean LOS between the specific presenting complaints

Presenting symptom/toxicity	N	Mean	Std. Deviation
Skin	13	**4.77**	2.803
Investigations/diagnostic workup	77	**5.47**	7.833
Vomiting	76	**6.78**	7.657
Diarrhoea	23	**6.87**	8.813
Bleeding/Bruising	36	**7.31**	9.474
Dysponea	154	**7.35**	6.483
Infection	36	**7.61**	9.813
Abdominal pain/distension	65	**7.68**	8.800
Anorexia	11	**8.36**	10.433
Fever	260	**8.52**	12.291
Fatigue/Performance status	60	**9.10**	9.529
Chest pain	54	**9.94**	19.272
Pain	44	**10.18**	12.801
Consciousness/Cognitive disturbance	65	**10.23**	13.421
Urinary	21	**10.71**	19.945
Constipation	11	**10.82**	12.456
Neurosensory/Motor	40	**12.18**	16.213
Ocular/Eye problems	2	**16.50**	12.021
Other symptoms	7	**7.71**	7.588
Other critical complications	9	**9.22**	10.183
Total	1064	**8.30**	11.329

Table 4.56

Kruskal Wallis result for mean LOS between the specific presenting complaints

	Length of stay in days
Kruskal-Wallis H	30.128
Df	19
p value	**0.050**

The highest average LOS was for ocular complaints (16.50 days). The lowest average LOS was reported in skin related complaints, being 4.77 (approx. 5 days). A *p* value of 0.050 meets the threshold level of significance which validates the alternative hypothesis, indicating a modest significant difference between specific presenting complaints and mean LOS.

4.5 Patient flow along the AOS pathway

The comprehensive data analysis account provided above presented the patterns and meaningful associations of the demographics, clinical characteristics and hospital metrics recorded, of the patients who entered and passed through the AOS pathway. These were crucial to comprehend the actions measured along the pathway. As a result, Table 4.57 presents a summary of patient flow along the AOS pilot pathway.

Table 4.57

Statistics of patients flow along the AOS pilot pathway

Outcome	N	%
Received SACT/RT	1,514	100%
Individuals presented at the ED	828/1,514	54.7%
Total ED presentations	1,510	100%
Total Hospitalisations	1,064/1,510	70.46%
Individuals hospitalised	638/1,064	42.25%
Admissions from ED to MAH	1,031/1,064	96.90%
Admissions from ED to Oncology	33/1,064	3.1%
Transfers from MAH to Oncology	81/1,031	7.9%

4.6 Summary

From a total of 1,514 patients receiving treatment, 828 individual patients had an unplanned hospital visit. This means that 54.7% of patients receiving SACT/RT required acute care. With regards to demographics, extended mean LOS were higher in males and patients aged 75 and over. Patients with leukaemia and those with lung cancer had the highest hospitalisation rate. Subsequently, patients in the haematology cohort had longer mean LOS compared with those with solid tumours. Patients who were receiving bisphosphonates, which is also considered as supportive therapy, had the highest LOS, followed by patients who received RT.

Fever was the most prevalent complaint, and patients commonly presented with such a symptom after an average of approximately 10 days post treatment. However, specific cancer types were associated with particular presenting complaints. Fever was highly reported in in breast cancer patients as well as in patients with haematological malignancies. Dysponea and pain were the 2nd and most presenting complaints respectively, while abdominal pain/distention and vomiting both ranked as the 4th most frequent presenting complaint. Dysponea was prevalent in patients with lung malignancies, while abdominal pain/distention and urinary complaints were mostly reported by patients with upper GI and genitourinary cancers respectively. Consequently, fever was mostly reported in patients undergoing single agent chemotherapy, combination chemotherapy, single agent targeted/immunotherapy, combination therapies, bisphosphonates, and immunoglobulins. Pain was mostly associated with patients who received RT or combination targeted/immunotherapy. Additionally, fever and consciousness/cognitive concerns were recorded in those receiving single hormone therapy. Patients presenting with skin complaints had the shortest mean LOS, while those presenting with ocular complaints had the highest mean LOS. Subsequently, patients presented with symptoms on average between 8 to 17 days post treatment.

4.7 Conclusion

The findings displayed in this chapter provided statistics on the situation and patterns of oncology patients who required acute care along their continuum during antineoplastic treatments. The next chapter will discuss the results in relation to the theoretical body of knowledge introduced in the literature review and also derived from further research.

Chapter 5

Discussion

5.1 Introduction

Following a thorough analysis of the acute care trajectory that cancer patients endured along their unplanned hospital visit, this chapter will pinpoint bottlenecks and provide QI strategies to address the identified shortcomings. Currently, there are no official studies or national statistics on ACU. Thus, this aligns the audit as a foundational tool that will provide a comprehensive overview of the current situation, which will help inform the relevant stakeholders on planning efforts to improve the AOS to overcome and anticipate potential gaps.

5.2 Unplanned hospital visit trends

5.2.1 ED visits

During the study period, 1,514 individual patients received anti-cancer therapies, of which 54.7% sought emergency services during their course of treatment. This signifies a significant burden on patients, carers, and the healthcare system with regard to outcomes, QOL, and resources (Said et al., 2023).

Patients with breast cancer and lymphoma have higher ED visits from the solid tumour and haematology cohort respectively. However, patients with gynaecological malignancies and MM are more likely to encounter at least one ED presentation during their treatment. Although more females were undergoing treatment during the study period, ED attendances were marginally more frequent among males when compared to females by 0.8%. This could be since lung, pancreas, and colorectal cancer, which are three of the most prevalent cancers following breast cancer, are most common in men undergoing treatment (IARC, 2024).

Oncology patients are often classified as high acuity due to their increased susceptibility to complications. HCPs apply the ESI algorithm to evaluate the patient's medical history and presenting complaints to determine their acuity level (Alishahi Tabriz et al., 2023).

Locally, 2.32% of the cases were classified as ESI-1, meaning that these patients showed signs of rapid deterioration, where rapid response was critical, while 72.65% of ED visits were graded with an ESI score of 2, which meant that these patients required prompt management as they were at high risk of deterioration (Emergency nurses association, 2023). Cases which were subcategorised for ENT, gynae or obstetrics, or ophthalmic, were triaged at the ED and then directed to the specialist department (Government of Malta, n.d).

On average, patients visited the ED after approx. 12 days post treatment. However, this significantly differed according to the type of complaints. The most frequently presenting symptom was fever, where most commonly patients became febrile on average, 10 days post treatment. Such pattern was also observed in patients undergoing combination chemotherapy, which is likely due to the nadir phase (Cleveland clinic, n.d). The 2nd and 3rd most presenting complaints were dysponea and pain respectively, while vomiting, and abdominal pain/distention ranked 4th among this cohort, which remain consistent with studies investigating such phenomenon (Hsu et al., 2018, Lash et al., 2022). On average, patients presented with dysponea and pain approximately 13 days post treatment, with vomiting, after 11 days, and with abdominal pain/distension after 14 days. Ultimately, presenting symptoms were significantly associated with specific cancer cohorts, which implies that ED visits were not only triggered due to treatment toxicity but also symptoms from the malignancy itself (Cohen et al., 2020; Walder et al., 2023).

Abdominal pain was grouped separately from pain as it is associated with GI involvement (Laycock et al., 2025) and due to its high prevalence. This was done to avoid overlooking such complaint. Several oncology-related ED presentations are due to chemotherapy-induced toxicities (Grewal et al., 2020; Fleshner et al., 2022). Although, immune-mediated/targeted therapies are associated with fewer side-effects, patients undergoing these treatments still seek emergency services (Said et al., 2023). In fact, the incidence of

patients visiting the ED was most common in those undergoing chemotherapy (monotherapy followed by combination regimens), followed by single agent targeted/immunotherapies. Consequently, one must recognize that 66.6% of patients receiving RT had at least one ED visit, highlighting the importance of symptom burden for these patients.

Most ED visits occurred during the morning followed by the afternoon, evening, and night time. The highest admission rate was in patients presenting at night time, followed by the evening, afternoon and morning. Although such observation was not statistically significant, research implies that patients presenting at night are more likely to be hospitalised, nevertheless establishing the cause for higher hospitalisation rates need further examination (Simpson et al., 2019).

5.2.2 Hospitalisations

Research unveils that oncology-associated ED presentations result in hospitalisation at a rate of 3.5 times in comparison to non-oncology associated ED presentations (Shelburne et al., 2022). Indeed, from a total of 1,510 ED visits, 1,064 (70.46%) led to an inpatient admission. This study also revealed that on a daily average, 24 beds were occupied by this patient cohort. Local hospital bed demands continue to increase due to the escalating, and aging population (Shalan, 2024). As a result of bed shortages in a clinically suitable ward, where the patient requires care, patients may be admitted as outliers, wherever a vacant bed is available. When this is the case, the clinical plan is provided by medics from a clinically appropriate ward, however, care is provided by nursing professionals of the hosting unit (La Regina et al., 2019).

The highest ED visits were reported by patients in the age bracket between 60-74 (44.3%). However, the eldest patient cohort ≥75 years had the highest mean LOS. The latter may be due to the fact that older patients may endure worsening pre-existing comorbidities, increased treatment toxicities, and diminished biological response (Feliciana Silva et al., 2020). Moreover, males were associated with significantly longer LOS. While the LOS

significantly varies depending on the underlying malignancy and acute condition, socio-demographic factors may have contributed to this result (Lash et al., 2022)

In this study, fatigue/performance status symptoms recorded the highest admission rate. Fatigue is the most common symptom reported across every treatment type which may lead to functional decline (Muhandiramge et al., 2022). Its triggers are multifactorial, and negatively affect patient's QoL (D'Silva et al., 2022).

By cancer type, the highest hospitalisation rate was in patients with leukaemia, who mostly presented with fever. Moreover, patients with leukaemia also had the highest LOS. This may be characterised by the aggressiveness of the disease as well as the increased risk of infection associated with high morbidity (Kumar et al., 2018). Moreover, most of these patients (41.4%) were within the eldest patient cohort, which puts them at further risk of complications. Overall, patients with a haematological malignancy were associated with longer mean LOS. Frequent healthcare utilisation is highly reported in patients with haematological cancers (Ullgren et al., 2020), as 70% of these patients may experience quick deterioration while hospitalised (Hampshire et al., 2014, Magsood et al., 2017).

The highest hospitalisation rate in the solid tumour cohort was in lung cancer patients who mainly presented with dysponea. Patients with lung cancer are prone to high hospitalisation rates primarily due to the high-risk sequelae, particularly from respiratory complications that develop during the disease trajectory (Leonetti et al., 2023). Ultimately, patients with genitourinary cancer had the highest mean LOS, while breast cancer patients had the lowest mean LOS. While most patients in both groups were aged 60-74, the breast cancer cohort had a higher prevalence of younger patients than the genitourinary cohort. Although the extent of the disease was not recorded during this study, a potential factor is that patients with genitourinary cancers had advanced malignancies, resulting in higher morbidity, which in turn raises the demand for healthcare resources and heightens economic burden (Feliciana Silva et al., 2020).

5.2.3 Pathway analysis

Patients who satisfy the AOS pathway criteria (Appendix 1) are ideally admitted to an oncology bed. However, from 1,064 hospitalisation episodes, only 33 recorded direct admission to an oncology unit, which is likely due to oncology beds being electively booked for treatment. Apart from lack of oncology bed availability, this may suggest that patients may have been admitted to these units due to their complex needs (Numico et al., 2020). Admissions and patient transfers were mostly recorded in general medical wards, observation, and acute medicine units. Patients with abdominal pain/distention and constipation were mainly admitted to a general surgical ward, which could indicate that these patients required surgical input due to potential obstruction (National Cancer Institute [NCI], 2025). Moreover, transfers to surgical wards were also associated with abdominal pain/distention and urinary complaints.

A total of 360/1,064 episodes had an inpatient transfer during their stay, of which 79 had a second transfer. Consequently, intrahospital transfers were associated with significant extended mean LOS. Prolonged hospitalisations due to delayed transfers of care often lead to undesirable effects and high expenditures (Arntzen et al., 2023).

LOS ranged from a minimum of 0 days, which means the patient was admitted and discharged on the same day, up to 127 days, which was reported in one instance. Average LOS was of approx. 8 days. Apart from oncology-related complications, inefficiencies in discharge planning in terms of referral for home assistance, hospice care, or long-term care are a driver of extended LOS, as well as readmission rates (Numico et al.; 2020, Arntzen et al., 2023).

During the study period, 18.5% of patients had 3 or more ED visits, while 16% of those who were hospitalised had 3 or more hospitalisations during the study period. Sepa-

rate from cancer/treatment related symptoms, potential contributing factors to multiple re-admissions may be underlying comorbidities, psychological issues, or socio-demographic factors (Lash et al, 2022).

Finally, 3 episodes recorded that patients died in emergency, while 128 patients were recorded as deceased while hospitalised. The full clinical status of patients who were deceased is uncertain. Patients may have experienced complications from their treatment or symptoms due to disease progression, nearing EOL (Singh et al., 2024).

The following section will provide QI strategies, that have the potential to address potential gaps.

5.3 The QI plan

The QI plan is an indispensable component of the clinical audit process; in its absence, the clinical audit will be inadequate. For a QI plan to be successful, it must specifically include:

1. What needs to be modified
2. Illustrate the action/s required to bring change
3. Set a target date indicating by which period the changes must be accomplished
4. Outline who is accountable to ensure that the actions are attained
5. Demonstrate the necessary evidence to validate execution of actions (HSE, 2023).

5.4 What needs to change

The trends observed following a comprehensive data analysis, identified specific bottlenecks that may hinder quality of care that potentially led to increased hospital costs. Potential gaps in AO care for patients on active therapy may need to be addressed well in advance of an ED visit. A brief modal LOS of 1-day as well as hospitalisation shorter than a day indicates that patients may have been assisted through alternative

specialised emergency oncology services (Haugstetter et al., 2022). Moreover, interventions to diminish extended LOS must be explored to address such issue.

Handley et al. (2018) identified strategies into five themes, which have the potential to curtail acute care for patients with cancer, enhancing therapeutic outcomes and oncology care experience. These include:

1. Identifying individuals at considerable risk for unanticipated urgent care;
2. Elevating accessibility and care coordination;
3. Standardise clinical pathways for symptom control;
4. Introduce emergency oncology care approaches;
5. Incorporate early palliative care.

5.4 Actions to achieve change

Understanding the context, exploring complexities, and adapting efficient processes are integral components which influence successful knowledge translation (Dryden-Palmer et al., 2020). Therefore, perceiving the local political, cultural, and socio-economic contexts, and how these multidimensional components may influence health system protocols and adaptation techniques, is imperative before executing any strategy (Breneol et al., 2022).

The following discussion will present how the strategies recommended by Handley et al. (2018) can be implemented locally following the SMART framework.

5.5.1 Identifying high risk patients

As patients with cancer are prone to unplanned hospital visits, a growing body of evidence is focusing on digital health innovations which identifies individuals at increased risk for ACU (Handley et al., 2018; Csik et al., 2021). These modalities include tracking known risk-factors, predictive analytics, and risk-stratification models (Handley et al.,

2018). The National Health Strategy for Malta (2023-2030) denotes how the local hospital is gearing up for the application of predictive approaches to healthcare delivery with prospects deriving from big data analysis, and artificial intelligence.

Locally, tracking of informal risk factors is possible if patients report their health parameters via myHealth, which may be accessible to their linked providers; however, their physicians are not automatically notified when patients report in their symptom diary (Government of Malta, n.d). Predictive analytics applies retrospective data to develop predictive models. This is done with the intent of anticipating potential complications and personalising care for each patient (The National Health Strategy for Malta 2023-2030). Literature outlines how artificial intelligence predictive analytics is paving the way in enhancing patient outcomes through the analysis of several datasets such as EHRs, and imaging (Dixon et al., 2022).

Emerging research illustrates how prediction models can classify patients into high, medium, and low risk for ACU (Csik et al., 2021). Model selection must be one with face validity. This means that although a digital health tool ensures accuracy, involving clinical experts to review and select determinant variables is recommended to achieve accurate and clinically logical results (Craddock et al., 2022). Moreover, statistics identified may help oncology experts in collaboration with IT teams adapt a data-driven model. Common elements determined in risk models by Oncology experts in relevant studies were abnormal lab finding high malignancy burden or metastasis, comorbidities, ED visit, hospitalisation or readmissions in the last 3 months, and high psychosocial concerns or several symptomatic complaints (Csik et al., 2021; Daly et al., 2022)

Due to the gradual changes in treatment outcomes, patient demographics and clinical practice, measurement of such innovation requires continuous quality assurance to ensure accuracy and clinical reliability, due to changes. This may involve regular revalidation

of data with current data, supplementing learning dataset with current data, conditional updating of data depending on model performance standard, or dynamic updating where the tool undergoes regular real-time updates, with reduced emphasis scaling given to retrospective data. The approach relies on the extent and type of modification between the original and current dataset, clinical practicality, and amount of data available (Craddock et al., 2022). As a result, the risk rating may be modified through data collected from EHR, and amended every scheduled treatment or Oncologist follow-up, depending on which event takes place first (Csik et al., 2021).

Data pre-processing, refinement and management of incomplete records, outliers and data discrepancies is critical before implementing a predictive model (Bharati et al., 2024). Employing an actionable predictive model would necessitate the inclusion of clinical, technical, administrative, and patient viewpoints (Balch & Loftus, 2023). Nonetheless, to bring such innovation, clinicians, creators, and policymakers should address research, operational, and policy constraints which restrict the employment of analytics in cancer care (Parikh et al., 2019).

Public-patient involvement is crucial to ensure the accuracy and validity of such innovations, in order to resonate with the patients' needs (Markham, 2025). This can be achieved through regular patient engagement (Hong & Handley, 2021). Therefore, promoting health and digital literacy is critical for patients to engage with their care providers. Nonetheless, initiatives must be designed to easily target the general population as well as vulnerable groups such as the elderly, and those of low socio-economic status (The National Health Strategy of Malta 2023-2030).

Following the identification of high-risk patients, an action which minimises the risk, and the ability to adapt a viable innovation is crucial to achieve a solid risk-stratification programme (Osterman et al., 2021). myHealth is intended to expand the remote patient monitoring as well as widen the accessibility to HCPs (The National Health Strategy for

Malta, 2023-2030). Access and alerts to critical HCPs along the cancer continuum such as the oncology nurse navigators (ONNs), would enable prompt symptom management.

Protecting patient data is critical, therefore any innovation must comply with the General Data Protection Regulation (GDPR) act and the Network and Information Security directive (The National Health Strategy for Malta, 2023-2030). Introducing a novel technology into a local health organisation entails meticulous planning (Doorbar et al., 2022). Therefore, starting with a pilot project with the implications for scaling up envisioned (WHO, 2009), can help stakeholders comprehend relevant determinants for a successful implementation (Doorbar et al., 2022).

5.5.2 Accessibility and care coordination

Potentially preventable hospital presentations and admissions may be reduced through optimised accessibility and care coordination (Handley et al., 2018). The same authors presented this theme into various factors including: patient navigation services, provision of clear and trustworthy sources for patients to reach their team and standardise care progression.

Emerging literature suggests that patient navigation services have had a positive impact on the healthcare system. As outlined earlier, navigation services are available through ONNs (iPAAC, 2021). By guiding patients in managing their symptoms, they contribute towards reduced ED presentations, hospitalisations, and overall health expenditure (Munoz et al., 2018; Chan et al., 2023). Subsequently, they enhance accessibility and continuity of care by supporting patients and their caregivers, navigate through the healthcare system, and overcome its barriers (Buddhe et al., 2022). To date, the local ONNs team consists of two ONNs each for colorectal, breast, and urological cancers, and one ONN for lung, upper GI and hepatobiliary cancers, head and neck, one for patients with brain, skin and sarcoma as well as haematologic malignancies. Upon starting treatment, patients are provided with

verbal and non-verbal information about their treatment, expected complications, and management strategies. Moreover, they are encouraged to contact their respective ONNs with any concerns during shift hours, via contact information provided (Budde et al., 2022). Such professions must be recognised and supported (RCR, 2020). Decision of ONN workload and resource assignment must rely on credible measures, which establish how these specialists support patient navigation (Oncology nursing forum, 2018). Therefore, data which establish clinical outcomes and economic return, may be measured through EHRs, and patient satisfaction may be measured through psychosocial and health assessments, and patient surveys (Goodman, 2015; Johnston et al., 2017). The local ONNs were praised by the WHO (2022), however, their impact on the local healthcare system have not been studied yet.

The chemotherapy practice nurse is another oncology professional who provides education and support to patients receiving chemotherapy, before, during, and after treatment. This clinician also delivers chemotherapy support through 24/7 telephone advice, and actions are documented on the patient's record. In certain cases where a rapid review is crucial, this specialist directly liaises with the ED lead doctor to ensure timely management.

Patients may also call the unit where they receive care for advice regarding their treatment (SACT and RT) or potential side effects. Therefore, it is critical that RNs from inpatient wards are trained and competent to safely deliver patient advice. As a result, the provision of standard and continuous training is paramount to ensure a uniform approach (Warrington et al., 2016; Haugstetter et al., 2022). Clinical judgement of the call is based on the UKONS Oncology/Haematology 24-hour triage toolkit (Appendix 6). Nonetheless, advice given must adhere to local SOPs, pathways, and guidelines (UKONS, 2024). Ultimately, documenting the call on the patient' record (MOSAIQ) must be emphasised, to ensure visibility to the caring teams, and continuity of care (AOG, 2019). Moreover, record-

ing such data is paramount as it also allows quality assessment, funding, and research (Ebbers et al., 2022). Essentially, patient and caregiver education on the service is paramount to eliminate confusion and maximise the effectiveness of such service (Gould Rothberg et al., 2022).

Although several ED presentations are inevitable, a considerable number of these visits may be potentially preventable (Fleshner et al., 2023). Several symptoms which urge patients with cancer to visit the ED such as pain, GI complaints, and respiratory concerns, are expected in this patient cohort, and may be treated outside the ED, especially when these symptoms are mild (Kirkland et al., 2020). This study revealed that 56.7% of patients presenting with pain were not admitted, consequently 33.7% of patients who complained of abdominal pain/distention and 43.9% presenting with diarrhoea were not admitted either. This implies that these ER visits could have been potentially prevented, specifically highlighting the importance of pain control in outpatient settings (Alishahi Tabriz et al., 2023). This can be improved by enhancing channels of communication between PCPs and oncology teams through shared EHR systems, which would allow PCPs stay connected not only with oncology teams, but also with their patients during acute oncology treatment (Tsui et al., 2019).

As outlined in the introductory chapter, the AO team currently consists of three General/Internal Medicine Consultants within the Department of Medicine in MAH, and one AO practice nurse recruited by the CCP directorate. This team cares for oncology patients admitted to acute medical wards in MAH who were admitted within six weeks of oncological treatment, or are within the palliative care (PC) services. This analysis indicated that on average this team received 3 new admissions daily while simultaneously caring for an average of 24 admitted patients daily. Nonetheless, this only accounts for patients receiving cancer treatment. Since the AO team also manages patients within PC services, an

investigation on this patient cohort, who no longer receives cancer treatment would provide the full picture of the AO team demands.

An AOS is considered as ‘the glue in the system’. Therefore, recognition and support towards the AOS team is paramount as an appropriately resourced service will alleviate the burden on emergency care, avoid hospitalisations through primary care support, bypass unnecessary investigations, and curtail LOS (RCR,2020). Ultimately, the team would be well-equipped to deliver optimal patient care and drive investment and advances in the AOS subspecialty, thus ensuring consistency of AO care management, education and training, AO data, and research (RCR, 2020).

5.5.3 Standard clinical pathways for symptom control

Clinical pathways (CP) are explicit documents which outline a roadmap for high-quality practice (Vettese et al., 2023). These are based on Clinical practice guidelines, which are systematically established statements developed to guide clinician and patient decisions regarding the appropriate approach for particular clinical complications (Institute of Medicine [IOM], 2011).

CPs and clinical practice guidelines on oncology-related symptoms and emergencies are available on the local hospital’s digital platform. Nonetheless, CPs must be periodically reviewed within the clinical setting since these apply current literature to practice (Trimarchi et al., 2021). As a result, although the present AOS pathway is a foundational pathway, reviewing such pathway is recommended following the development of the AO team, to ensure conformity with emerging needs.

Symptom control may be complex, which in turn may have significant repercussions on outcomes. Developing and updating CPs for symptom management enables a prompt and effective approach to treat complications through timely intervention, which ul-

timately leads to reduced variability of care and unplanned healthcare use (Cook, 2017). Ultimately, investing in clinician training and competency programmes ensures that these professionals are adequately skilled in managing symptoms and treatment-related toxicities (Yilmaz et al., 2025).

Pathway development may be achieved through a five-phase framework involving co-define, co-design, validation, implementation, and sustainability (Alberta Health Service [AHS], 2024). Co-definition starts from including experts from departments which will utilise the CPs and begin implementation planning, followed by the co-design for the development of a draft of symptom management algorithms. The UKONS (2023) provides guidelines for early management of symptoms or oncologic emergencies, directed at HCPs who may treat these patients at presentation. Through a collaborative approach, clinicians may refer to these guidelines to develop standard AO clinical pathways that adhere to the local SOP, protocols and guidelines (UKONS, 2023). CPs must undergo peer review for validation and feedback with potential recommendations (AHS, 2024). After acquiring feedback, the co-design reviews and amends the preliminary pathway accordingly prior to submitting it for quality assurance (Flores et al., 2019; AHS, 2024). The finalised CPs must be accessible and coherent to achieve successful implementation. This is subject to clinical settings and available resources, which shall be discussed by the developing team. Access of CPs on ehealth platforms avoids care variation, overcomes fragmented professional to professional communication, and enhances patient-centred care (Shelburne et al., 2022). The ultimate phase would be the sustain stage. The application of CPs and its impact on key performance indicators are monitored through data. In this context key performance indicators would be hospital metrics, patient outcomes and experience, and economic benefits.

With regard to oncology-specific guidelines in the ED, these CPs will contribute to a reduction in hospitalisation rates through an evaluation of patient, system, and societal

components. For instance, guidelines on febrile neutropenia could guide physicians to determine whether patients can be safely discharged on oral antibiotics, rather than being admitted for intravenous treatment. Nonetheless, this would require enhanced post- emergency communication between patients and caring teams (Shelbourne, 2022).

Nevertheless, symptom management relies on HCPs skills and knowledge (Cook, 2017). Therefore, professionals who may care for these patients must hold competency (UKONS, 2018). Apart from shared patient records and CPs, professionals who may be involved in responding to AO scenarios, including undergraduates, oncology specialists, and those in primary care and emergency medicine, should have training programmes scheduled in their curricula (RCP & RCR 2012, Bischof et al., 2022). Moreover, training programmes may be also delivered as an interactive educational workshop (Young et al., 2016). The provision of AO training for HCPs in these settings is paramount to ensuring that these professionals would be able to identify and manage AO complications and escalate care when required (UKONS, 2018).

The UKONS established a guidance framework, which may be referred to as a tool to deliver adequate training to HCPs working in the mentioned departments. Nonetheless, the guidance framework must be applied in conjunction with local role-specific competency frameworks (UKONS,2018, RCR, 2020).

5.5.4 Emergency oncology care approaches

As highlighted earlier, the ED remains the most common point of access for AO concerns. This tendency is determined by limited availability of same-day appointments in oncology departments, together with patients' hesitancy to report symptoms to their care teams until urgent management is deemed necessary (Gould Rothberg et al., 2022). Literature highlights the emerging need for increased oncology-dedicated acute care resources, as EDs are often ill-equipped to deliver adequate and cost-effective care for patients with cancer requiring urgent attention due to acute complications. Such innovations would allow

acute care specialists and health institutions to leverage these opportunities (Ayers, 2017; Handley et al., 2018).

Internationally, Oncology centres as well as tertiary hospitals successfully implemented dedicated cancer access clinics for patients who may develop complications during their cancer treatment. This AO's modality showed significant positive impacts on patient outcome and their respective health institutions (Antonuzzo et al., 2017; Kuo et al., 2017; Chen et al., 2019; Hong et al., 2019; Gould Rothberg et al., 2022; Haugstetter et al., 2022; D'Avella et al., 2024). Integration of a similar innovation would therefore elevate the current evolution of the local AOS.

A thorough discussion between the relevant service providers supported by collaborative leadership (Viggars et al., 2022) would be imperative to determine the ideal modality for care delivery. This would also incorporate clear parameters in regard to which HCPs should provide care, the geographical set-up, operation hours, and method of referral to admission process, to ensure holistic benefit for both patients and the healthcare system alike (RCP, 2018, Mitchell & Lawrence, 2020 RCR, 2020).

To ensure a seamless operation, it is recommended that the AO clinic would not be a walk-in service. Patients or caregivers on their behalf should seek advice through the nurse-led telephone advice line prior to presenting at the AO clinic. Depending on the symptom severity grading, patients will be instructed on self-management remedies, to refer to their GP or health centre, or to present at the AO clinic (Kuo et al., 2017). To ensure safe practice, emergent cases must be directed to the ED (Kuo et al., 2017; Chen et al., 2019; Hong et al., 2019; Gould Rothberg et al., 2022; Haugstetter et al., 2022; D'Avella et al., 2024).

This audit revealed that on a daily average, four patients undergoing cancer treatment presented to the ED. Recognising such data is critical to ensure careful contingency planning with regard to resources, such as human workforce and the physical infrastructure

(Squires et al., 2019). Although the average LOS was approx. 8 days, one must note how the mode was 1 day. This means that treatment in a dedicated clinic could have potentially avoided a short stay hospitalisation (Haugstetter et al., 2022).

Piloting this project would be and ideal way to examine the service within a practical setting, namely a manageable and small-scale environment (Vreugdenhil & Ker Rault, 2010; De Winter, 2020). This would narrow the risk of potential setbacks, unfavourable outcomes, and would allow actions to be modified (Musselin, 2005; Zurlo & Nunes. 2016; De Winter, 2020). During this study, patients presented mostly during clinical hours, followed by late afternoon hours. Moreover, according to the current pathway, patients may be directly admitted to an oncology bed from the ED between 8AM to 8PM (Appendix 9). Therefore, to resonate with the current data and practices, an AO clinic may initially start operating between these hours, while also accounting for the time frame until patients may be safely reviewed to allow a comprehensive examination (Worcestershire Acute Hospitals NHS trust, 2023). Patients may follow the same pathway if they require hospitalisation (Appendix 1).

Ultimately, it is imperative that service users are knowledgeable and well informed about the services available for enhanced collaboration with the team (Dijk et al., 2020).

Maintaining data is crucial to monitor outcome metrics. Both quantitative and qualitative data are critical to comprehend the performance of the service. Quantitative data may be acquired from EHRs to understand patient and hospital outcomes, while qualitative data can be obtained by a rollout of patient and staff survey with an open-ended response (Shah, 2019).

Such strategy is expected to enhance care through timely management, reduced hospitalisations, re-admissions, transfers, LOS, and overall hospital costs (Kuo et al., 2017; Chen et al., 2019; Haugstetter et al., 2022; D'Avella et al., 2024).

5.5.5 Early palliative care

Integrating early PC with oncology care in the preliminary phase of the disease, offers an array of advantages for both patients and carers, including more awareness on disease trajectory and enhanced QoL, decreased physical and emotional distress, and reduced healthcare use at the end of life (EOL) (Petrillo et al., 2024).

Although early PC incorporated with oncology is beneficial, integrating palliative with cancer care is frequently interrupted by the misconception of PC including hospice care (Cleveland Clinic, 2023) as EOL care, inadequate preparation regarding PC in medical practice, and insufficient reimbursement for PC services (Petrillo et al., 2024).

The WHO (2020) urges adequate national protocols, agendas, resources, and training HCPs on PC to enhance access. Consequently, Petrillo et al. (2024) identified four strategic categories to overcome these barriers and successfully incorporate early PC in oncology. These included primary PC, trigger for optimal PC referral, telehealth PC provision, and navigator-led care.

PC nurse navigation services are currently underway. Primary PC can be delivered by skilled oncology HCPs through a holistic approach which addresses both patient and caregiver needs. Conversely, oncology teams can trigger early specialist PC referrals by assessing patients using tools such as the Karnofsky and Edmonton symptom assessment scale (ESAS) (Vitorino et al., 2023).

Unplanned hospitalisations increase during the final months of life (Numico et al., 2020), and are burdensome for patients, carers, and the organisation (Hoverman et al., 2020). Advanced care planning and an early hospice care referral can have multi-faceted benefits (Singh et al., 2024; Cleveland Clinic, 2023). This non-profit organisation can pro-

vide interdisciplinary care and resources, so symptoms may be easily controlled in the comfort of the patient's home, which ultimately keeps them away from the ED (Hospice Malta, n.d; Cleveland Clinic, 2023).

Telehealth PC provision is already being offered by the PC team specialists. Telehealth PC provides a three-tier benefit, to patients, caregivers, and HCPs. Such modality is convenient to PC specialists as it allows remote assessment and monitoring of any changing demands (Imam et al., 2024, Haydon et al., 2025). Patients benefit from such service, since due to timely access and management, their symptoms would be better controlled, thereby minimising the risk of requiring acute care management (Haydon et al., 2025).

Ultimately, due to multifaceted benefits, international oncology organisations suggest early implementation of PC with cancer care for all individuals with advanced malignancies (Levy et al., 2016; Ferrel et al., 2017; Jordan et al., 2018).

Target dates for implementation

Successful project planning and execution heavily relies on accounting for the local context and determining potential contextual barriers (Nilsen & Bernhardsson, 2019; Rogers et al., 2020). As a result, target date setting must be a team-based decision to ensure that such aims are scientifically sound and pertinent for end-users (Heenan et al., 2022). Therefore, involving the relevant stakeholders from various departments is paramount as different perspectives are recognised, and solutions are accustomed with the exigencies of all stakeholders (Kumar& Vinati, 2024). Ultimately, a successful implementation requires cooperation and teamwork, particularly the establishment of an implementation team (Metz & Bartley, 2020). Primarily, the researcher, Director (CCP), Clinical Chairperson of Oncology and Haematology, Clinical Chairperson of the Emergency Department, a representative from the AO team, CEO of the local acute hospital, as well as other relevant stakeholders, will meet to discuss and evaluate how the strategies identified may be successfully implemented. Ultimately, proposing a QI plan to the involved policy makers is crucial as these

will provide support through funds and resources, and promote HCPs' engagement across the board (RCR, 2020).

Accountable teams

An implementation team, coordinates, governs, and is accountable to facilitate core functions in the choice, development, and ongoing progress of an innovation. While these stakeholders encourage implementation, they may identify skilled professionals to perform specific assignments or obtain necessary resources (Metz &Bartley, 2020). Starting with a pilot test in novel strategies, facilitates a smoother transition in the clinical setting and culture shaping institutions, as well as individual and team actions prompting change, cooperation, and service upgrade (Mansfield et al., 2020). Nonetheless, the institution must measure, observe, and analyse operation and compliance according to local standards. Consequently, the organisation must outline the frequency and extent of the measurement, observation, and analysis process (Worcestershire Acute Hospitals NHS trust, 2023). Table 5.1 summarises the recommended strategies mentioned above, indicating which professionals are best suited to assist or perform according to the specific strategy, and which evidence would measure the impact of such innovations.

Table 5.1

Strategies, accountable team, and validation metrics

Strategy	Associated team/s	Accountability	Outcome metric
Risk stratification program	Oncology clinicians, and IT systems team	Predictive model to determine high-risk patients Automatic alerts to linked HCPs	ED and hospitalisation rates (Daly et al., 2022)
Telephone advice line competency	Clinical educators (Warrington et al., 2016)	Provision of teletriage training and documenting calls	Number of achieved competencies Audit on recorded calls and ACU
Standard CPs for symptom control	Multidisciplinary	Standardised Evidence-based CPs	HCPs feedback Audit on clinical patient outcomes
Community-hospital interface	Oncology and primary care teams, IT system teams	Accessible patient records between primary and hospital care	Patient and HCPs feedback
AO training for non-oncology clinicians	Medical training groups	Training on AO complications to PCPs and ED clinicians	Achievement of competency (UKONS, 2018) Feedback from providers Audit on clinical patient outcomes

Strategy	Associated team/s	Accountability	Outcome metric
Designated AO clinic	Oncology teams, ED teams, administrative teams	Develop a designated area for patients requiring same day assessment.	Audit on acute care visits, hospitalisation trends, and expected costs
			Patient and provider feedback.
Early Palliative care	Palliative care leads, Oncology leads, administration teams	Stronger PC workforce both Medical and Nurse navigator services	Patient and provider satisfaction
		Optimal PC referral	Audit on PC, and hospice referrals against clinical outcomes.

Sharing the vision and effective communication are key to overcome conflict in a collaborative setting with several professionals involved (Sutherland, 2024). Communication before and along the process of executing any strategy is crucial to have the HCPs on board, ensure job satisfaction, and mitigate any barriers (Igoe, 2021). Nevertheless, inclusion and communication with every HCP especially those delivering direct patient care is crucial, as these may provide practical feedback on potential barriers when implementing strategies (Brennan & Wendt, 2021). Ultimately, structured communication is critical to ensure an adequate workflow design (Barrow & Annamaraju, 2022). The provisional period by which changes will be accomplished will be discussed during meetings with these stakeholders. Finally, since a clinical audit is an ongoing process, a re-audit must be performed after a strategy is implemented. Sufficient time was allowed for the implemented modifications to take effect (Blagburn, 2022), in line with the HSE's (2023) recommendations set at a maximum period of one year. Nonetheless, the methodology of the re-audit must reflect the preliminary audit, such as the dataset and timeframes, and the findings must be shared with the relevant stakeholders. Consequently, a clinical audit may also be shared on a national level through relevant sources such as clinical journals (HSE, 2023).

5.6 Conclusion

Introducing a single strategy was not sufficient to grasp the issues encountered along the pathway. Therefore, this QI plan utilised a process map to introduce innovations to identify patients at high risk for acute care, and interventions for early symptom management. Nonetheless, a significant number of cases would require immediate intervention, therefore this QI plan includes an emergency oncology innovation to ensure timely intervention. Patients with cancer experience detrimental effects resulting from their treatment, malignancy, or a combination of both. This plan addresses this issue, with hopes to alleviate the burden both on service users and the organisation. As mentioned in chapter 3, a clin-

ical audit is a component of the clinical governance framework. However, the recommended QI strategies encompass the seven pillars of the clinical governance framework. This is by aiming to provide patient-centred care, clinical efficacy through evidence based CP and guidelines, the maintenance of patient safety by anticipating and addressing complications promptly, governance and leadership by establishing accountabilities, information management by maintaining data on ACU, patient and clinical outcomes, supporting HCPs through continuous training and education, and monitoring the organisation's performance through regular clinical audits and service evaluations (Flint, 2024).

A well-established AOS encourages a collaborative working approach, to strengthen the professional rapport, enhancing the perceptibility of oncology, and enhance liaison with emergency medicine, general medicine, primary and palliative care disciplines (RCR, 2020).

The next chapter will summarise the entire study, and provide recommendations for future research, education and training, and highlight the strengths and limitations of this study.

Chapter 6

Conclusion and Recommendations

6.1 Introduction

This chapter will summarise and discuss the synthesis of findings in relation to the research question and current literature regarding the AO pathways and AOS to enhance care for patients undergoing cancer treatment. This is followed by a discussion of the implications of the audits's findings for theory, methods and practice and to conclude what QI strategies are likely to be effective. Finally, it outlines the study's strengths and limitations and provides recommendations for future work and an overall conclusion to this clinical audit.

6.2 Summary of the clinical audit

Advances in cancer therapeutics have transformed the oncology field; however these treatments are renowned for their unpredictable complications. While some symptoms may be managed in the outpatient setting, others may be an indication of an oncological emergency requiring timely specialist input to avoid undesirable repercussions. The primary point of care for these patients is the ED, where patients may require hospitalisation for further management. Locally, relevant stakeholders constantly strive to enhance and deliver timely and coordinated AO care for patients who endure complications along the cancer trajectory. For this rationale, the researcher was inspired to conduct a clinical audit of how patients move along the AO pathway when complications arise. The aims of this clinical audit were twofold; primarily to analyse the Maltese pilot AOS pathway launched for oncology patients presenting at the ED up to the point of discharge, specifically those undergoing anticancer treatment, or who had received such treatment within six weeks of their ED presentation. The second aim was that of providing a QI plan, identifying strategies that would enhance the AOS with the goal of optimising care for this patient cohort, one that would also lead to economic benefit for the healthcare system.

A primary search of the literature revealed that evidence which addresses such services for patients receiving cancer therapies is still in its infancy. Moreover, to the researcher's knowledge, up to the period of this study there exists no evidence of local research examining AO care for this patient cohort. Strategies to enhance the AOS emerged from the literature review were: nurse-led telephone triage, dedicated oncology clinics, and supportive care services.

This retrospective study targeted adult cancer patients receiving antineoplastic treatments in Malta's sole cancer centre. A quantitative, non-experimental approach was deemed appropriate to conduct this clinical audit, and a longitudinal descriptive design enabled a thorough analysis of the AOS pathway. The patients identified through secondary data collection, by the primary intermediary stood at 1,514 individuals. The secondary intermediary identified 1,775 unplanned hospital events for these patients. After analysing the triage notes to identify the presenting symptoms based on the UKONS triage criterion, the researcher identified 1,510 oncology related complaints.

A thorough statistical analysis involving descriptive and inferential statistics enabled the researcher to identify patterns of patient demographics, clinical characteristics, and hospital metrics. The application of the chi-square, Kruskal Wallis and Mann Whitney test revealed critical associations between these patterns along the AO pathway.

The analysis concluded that 54.7% of patients receiving treatment sought emergency services. From 1,514 patients receiving cancer treatment, 828 visited the ED and 638 were hospitalised. Consequently, 3 were recorded deceased at the ED, and 128 were recorded deceased while hospitalised. On a daily average, 4 patients presented to the ED. From 1,510 ED visits, 1,064 led to an inpatient admission. An average of approximately 3 hospitalisations were recorded daily, and the mean LOS was approximately 8 days. Consequently, on a daily average these patients occupied 24 beds.

Patients with breast cancer had the highest emergency visits, within the solid tumour group, while those with lymphoma had the most ED presentations among haematological cancers. Those receiving single agent chemotherapy recorded the most emergency visits. Patients presented at the ED approximately 12 days post treatment. However, this ranged significantly depending on the presenting complaints. The most prevalent presenting medical problem at the ED was fever, commonly reported approximately 10 days post treatment. This was mainly associated with breast cancer patients, but was also prevalent across the haematology cohort, followed by dysponea and pain reported approximately 13 days post treatment; which was mainly associated with lung cancer and breast cancer patients respectively. The 4th most prevalent complaints were vomiting (which was equally highly prevalent in breast and gynaecological cancer), and abdominal/pain distention (mostly reported by Upper GI cancer patients). Such symptoms were reported after approximately 11- and 14-days post-treatment respectively. Ultimately, patients presenting with fatigue/decreased performance status had the highest admission rates (95.2%).

Patients receiving combination chemotherapy regimens had the earliest presentations to the ED after approximately 10 days, while those receiving single hormone therapy presented after approximately 23 days. Patients receiving chemotherapeutic regimens, single agent targeted/immunotherapy, combination therapies, bisphosphonates and immunoglobulins mainly presented with fever. Those receiving RT or combination targeted/immunotherapy frequently reported pain, while those undergoing hormone therapy mainly presented with fever and consciousness/cognitive disturbances.

Most ED visits were reported in the morning. 72.65% of ED visits were triaged as ESI-2. Most ED admissions occurred at daytime. Although statistically insignificant, patients who visited the ED at night had the highest admission rates.

From 1,064 hospitalisations, only 33 (3.1%) were recorded to have followed the direct pathway from ED to an oncology unit, while 1,031 (96.9%) hospitalizations were reported as admissions to the MAH, with most patients being admitted to a general medical ward (40.9%). This may be explained either due to oncology beds electively occupied for treatment, or that admission was likely more appropriate in the MAH. Although some patients were hospitalised as outliers, a significant number of patients was admitted and transferred to specific wards according to their complaint. Although the association between presenting complaints with type of second ward transferred was not statistically insignificant, clinical judgement suggests otherwise.

From 1,064 hospitalisations, 360 episodes reported an inpatient transfer, of which 79 recorded a secondary transfer. Inpatient transfers were significantly associated with extended LOS.

Among all cancer types studied, patients with leukaemia were the eldest patients presenting at the ED with the highest hospitalisation rate and highest mean LOS of approximately 12 days, However, these observations were recorded within the broader haematology cohort. Subsequently, lung cancer patients had the highest hospitalisation rate among the solid tumour cohort, while patients with genitourinary cancer had the highest mean LOS of approximately 9 days. The highest ED visits and significant extended mean LOS were reported in males. Consequently, significantly extended mean LOS was also associated with aged ≥75 years. Besides, unspecified therapy regimen received by haematology patients, the highest mean LOS, was associated with bisphosphonates mostly administered as supportive therapy followed by RT. Although modest significance was reported, ocular complaints presentations had the highest mean LOS of approximately 17 days.

6.3 Recommendations for clinical practice

The previous chapter discussed the results that emerged from this study, which concluded that besides strategies to improve the AOS along the present pathway, interventions must also include strategies to reduce ACU and overall oncology care. These strategies include:

- Identifying patients at high risk of ACU through a risk stratification model. Consequently, the automated alerts from patients to HCPs leads to better accessibility and timely interventions.
- Enhance accessibility and care coordination through telephone advice line and recording patient calls, as well as enhancing community-hospital communication channels to promote continuity of care between linked HCPs.
- Sustain well-defined CPs for prevalent AO presentations extending care beyond conventional boundaries (RCR, 2020).
- Introducing a dedicated clinic for these patients to provide prompt management for acute cancer or treatment related complications.
- Ensuring timely referrals and supporting the PC workforce to promote timely PC input.
- Following the development of the AO team, it is recommended that the present AO pathway is updated.
- Enhance electronic health systems to ensure robust data collection, for enhanced clinical practice and research purposes (RCR, 2020).
- Evaluation of the AO team demands accounting for acute care patterns of patients on active treatment and those on the PC service.
- Following the implementation of strategies, stakeholders must study such action through clinical audits. Future audits may also involve users receiving care through interviews, surveys, and focus groups (HSE, 2023).

6.4 Recommendations for education and training

To ensure a standard approach to symptom management via telephone advice, HCPs providing such service should receive standardised training based on validated tools, adhering to local SOPs, and ensure that competencies are maintained. Consequently, it is emphasized that non-oncology providers are well-supported through adequate AO training, to ensure standard CPs for symptom management.

Nonetheless, educating the patients and their caregivers on symptom management is imperative. Thus, it is critical that HCPs provide updated and accurate information on the patient's condition, expected symptoms, management guidelines, and emergency contacts (Cubukcu et al., 2024).

6.5 Recommendations for research

In the dearth of evidence regarding clinical patterns of ACU and their impact on patient outcomes and health care expenses, prospective longitudinal studies evaluating the entire clinical patterns of AO care and pathways in systemic cancer management and best supportive care (Kuo et al., 2017; Gould Rothberg et al., 2021) would shed light on these trends and their impact on clinical outcomes, and potential shortcomings. Moreover, local studies are critical to evaluate and compare acute care patterns between the three types of AO presentations.

Qualitative studies are critical to explore the perspectives of oncology HCPs on AO and the local AOS, including their insights before and after the implementation of the service. Moreover, these studies can bridge this research gap on the role of PCPs and GPs and their involvement in AO management, by exploring their perspectives and challenges. As the ED currently remains the primary entry point for this patient cohort, qualitative studies investigating the perspectives and challenges of emergency clinicians can also give a deeper insight these professionals experience when caring for these patients. Subsequently,

qualitative studies can provide deeper insights on the perspectives of oncology patients on AO care during their treatment trajectory (Chen et al., 2019).

6.6 Strengths and limitations

A significant strength of this study is that, to the best of the researcher's knowledge at the time of writing, it is the first official study to analyse how patients undergoing cancer treatment navigated the local pilot AOS pathway.

Secondary data collection from health IT platforms, proved effective in achieving the pathway's aim, specifically, to map patient flow ED presentation to discharge. The acquisition of valuable data assisted the researcher in conducting rigorous analysis, and to fulfil the aims and objectives of the study. A rigorous data analysis provided insights on the acute event patterns, revealing associations between such patterns, which consequently allowed the researcher to pinpoint bottlenecks as well as to identify systemic shortcomings, that may be driving potentially preventable acute care use. To address these issues, the researcher did not only recommend strategies to ameliorate AO care within the hospital setting, but also included innovations to prevent acute care use for these patients, which ultimately provided a holistic strategic QI approach.

The QI plan introduced is a multi-faceted evidence-based strategic plan which covers aspects concerning primary care, emergency care, general medicine, oncology, and palliative care. The methodology of this audit may be replicated for oncology patients who are no longer on active treatment but solely under PC, because as stated in the introductory chapter, the AO team treats patients who develop treatment complications or are under the PC service.

The statistics showcased in this study are critical as they address a knowledge gap, with regards to AO care in Malta. Moreover, statistics may prove crucial to urge HCPs, researchers, relevant stakeholders and policymakers to drive evidence-based policymaking on

what needs to be modified (National Institute of Health, n.d), ameliorate operational effectiveness, resource management, and encourage innovation (Hossain, 2024).

Nevertheless, there are also some limitations to this study. Primarily, it is worth considering that the inquirer is a novice researcher, and this study was her first attempt in conducting a clinical audit. Although secondary data were collected by two professionals in the research field, one must recognise that such process is time-consuming. Patients who were only on oral cancer treatment could not be detected. The research manager communicated such issue with the Oncology systems lead to address such limitation, to enhance practice and for future clinical research.

This is a single-centre study conducted within a small island, therefore results and strategies may not be generalisable to larger settings in terms of patient demographics and scopes of practice.

Finally, the depth of this clinical audit was limited due to time constraints to complete this Master's Dissertation. Data collection from service users and providers would have given better insights on the service, and recommendations to improve care.

6.7 Reflection

As a nurse practicing within the oncology field for the past six years, I have truly witnessed remarkable advances in the local oncology department in terms of treatment and service provision. Nonetheless, facing the trials related to acute complications along the treatment trajectory remains a challenge for both patients and HCPs.

This clinical audit has undoubtedly contributed to a new level of academic, professional, clinical and personal growth. Along the audit process, I learned how research differs from clinical audits, and enhanced my abilities with regards to the critical appraisal of current evidence and analytical skills. This audit has strengthened my clinical growth by enriching my knowledge on AO complications that patients experience, and their patterns

within an acute care setting, which in turn helped me identify gaps in the care service. Moreover, this enabled me to propose QI strategies grounded on literature, clinical experience, and established national strategic plans, to ensure successful implementation, enhanced workflow and long-term sustainability. As a result, this process enhanced my expertise on healthcare policy making and collaborative leadership which are critical drivers of successful innovations. Personally, this audit has effectively assisted me to overcome setbacks and instilled a stronger sense of resilience.

This clinical audit was a starting point to direct all relevant stakeholders on the current scenario to the local situation of evolving AOS with regards to patients receiving cancer treatment.

This study reflects present practices and proposed actions for continued development within this subspecialty. The local healthcare system strives to deliver high-quality oncology care delivery. Investing in the AOS will reinforce this commitment to provide the best cancer care as recognized by the European Commission, striving towards excellence to ensure enhanced patient outcomes, and organisational stability, ensuring optimal healthcare delivery.

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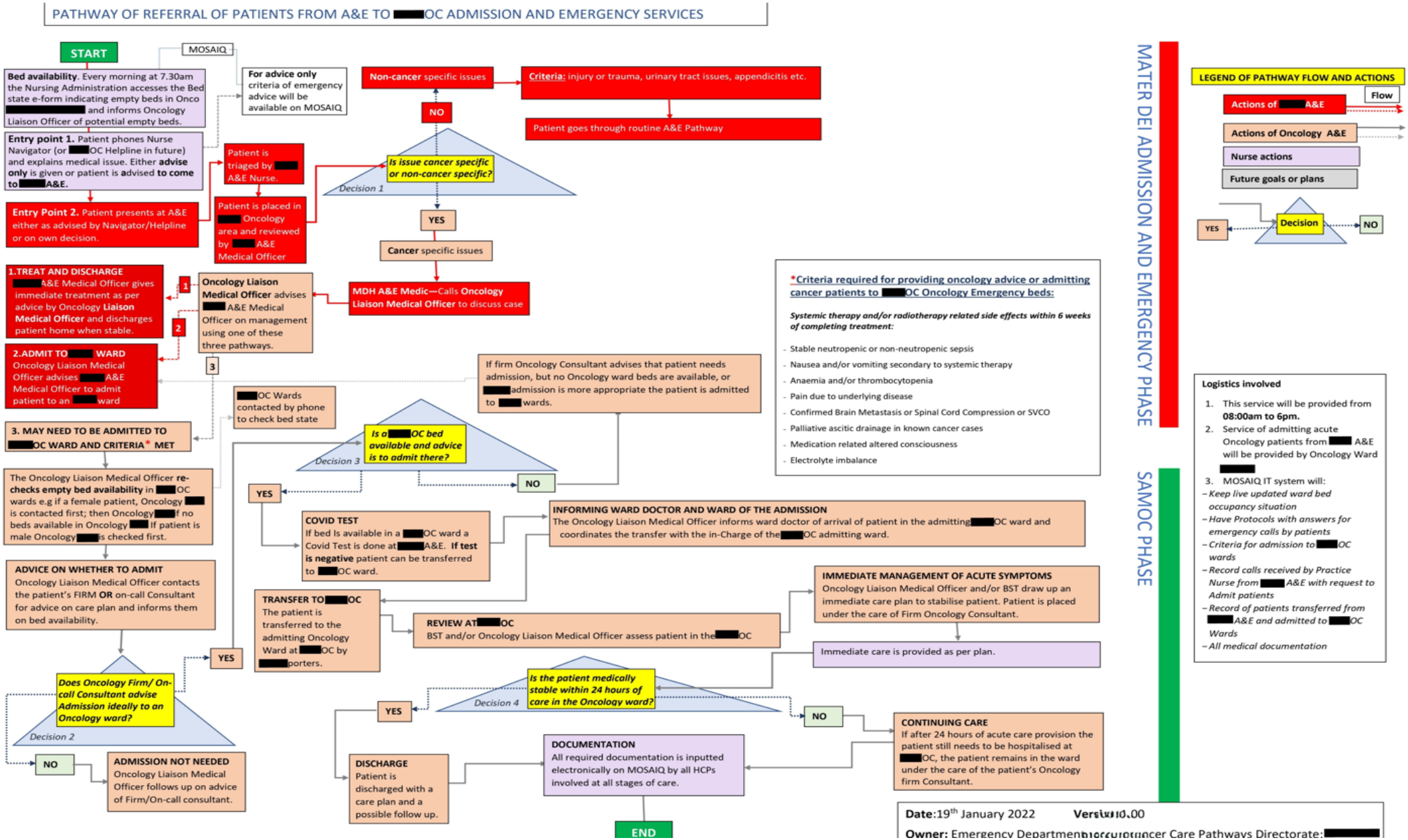
Ap**pendix 1 – Acute oncology service pathway**

(Refer to next page for visual)


PATHWAY OF REFERRAL OF PATIENTS FROM A&E TO [redacted]OC ADMISSION AND EMERGENCY SERVICES
START
MOSAIQ
Bed availability. Every morning at 7.30am the Nursing Administration accesses the Bed state e-form indicating empty beds in Onco [redacted] and informs Oncology Liaison Officer of potential empty beds.
For advice only criteria of emergency advice will be available on MOSAIQ
Non-cancer specific issues
Criteria: injury or trauma, urinary tract issues, appendicitis etc.
Patient goes through routine A&E Pathway
NO
Entry point 1. Patient phones Nurse Navigator (or [redacted]OC Helpline in future) and explains medical issue. Either advise only is given or patient is advised to come to [redacted]A&E.
Patient is triaged by [redacted] A&E Nurse.
Is issue cancer specific or non-cancer specific?
Decision 1
Entry Point 2. Patient presents at A&E either as advised by Navigator/Helpline or on own decision.
Patient is placed in [redacted] Oncology area and reviewed by [redacted] A&E Medical Officer
YES
Cancer specific issues
1.TREAT AND DISCHARGE [redacted] A&E Medical Officer gives immediate treatment as per advice by Oncology Liaison Medical Officer and discharges patient home when stable.
1
Oncology Liaison Medical Officer advises [redacted] A&E Medical Officer on management using one of these three pathways.
MDH A&E Medic—Calls Oncology Liaison Medical Officer to discuss case
2
2.ADMIT TO [redacted] WARD Oncology Liaison Medical Officer advises [redacted] A&E Medical Officer to admit patient to an [redacted] ward
3
If firm Oncology Consultant advises that patient needs admission, but no Oncology ward beds are available, or [redacted] admission is more appropriate the patient is admitted to [redacted] wards.
[redacted]OC Wards contacted by phone to check bed state
3. MAY NEED TO BE ADMITTED TO [redacted]OC WARD AND CRITERIA* MET
Is a [redacted]OC bed available and advice is to admit there?
Decision 3
NO
YES
The Oncology Liaison Medical Officer re-checks empty bed availability in [redacted]OC wards e.g if a female patient, Oncology [redacted] is contacted first; then Oncology [redacted] if no beds available in Oncology [redacted] If patient is male Oncology [redacted] is checked first.
COVID TEST
If bed Is available in a [redacted]OC ward a Covid Test is done at [redacted] A&E. If test is negative patient can be transferred to [redacted]OC ward.
INFORMING WARD DOCTOR AND WARD OF THE ADMISSION
The Oncology Liaison Medical Officer informs ward doctor of arrival of patient in the admitting [redacted]OC ward and coordinates the transfer with the in-Charge of the [redacted]OC admitting ward.
ADVICE ON WHETHER TO ADMIT
Oncology Liaison Medical Officer contacts the patient's FIRM OR on-call Consultant for advice on care plan and informs them on bed availability.
TRANSFER TO [redacted]OC
The patient is transferred to the admitting Oncology Ward at [redacted]OC by [redacted] porters.
REVIEW AT [redacted]OC
BST and/or Oncology Liaison Medical Officer assess patient in the [redacted]OC
IMMEDIATE MANAGEMENT OF ACUTE SYMPTOMS
Oncology Liaison Medical Officer and/or BST draw up an immediate care plan to stabilise patient. Patient is placed under the care of Firm Oncology Consultant.
Immediate care is provided as per plan.
YES
Does Oncology Firm/ On-call Consultant advise Admission ideally to an Oncology ward?
Decision 2
Is the patient medically stable within 24 hours of care in the Oncology ward?
Decision 4
YES
NO
NO
ADMISSION NOT NEEDED
Oncology Liaison Medical Officer follows up on advice of Firm/On-call consultant.
DISCHARGE
Patient is discharged with a care plan and a possible follow up.
DOCUMENTATION
All required documentation is inputted electronically on MOSAIQ by all HCPs involved at all stages of care.
CONTINUING CARE
If after 24 hours of acute care provision the patient still needs to be hospitalised at [redacted]OC, the patient remains in the ward under the care of the patient's Oncology firm Consultant.
END
*Criteria required for providing oncology advice or admitting cancer patients to [redacted]OC Oncology Emergency beds:
Systemic therapy and/or radiotherapy related side effects within 6 weeks of completing treatment:
- Stable neutropenic or non-neutropenic sepsis
- Nausea and/or vomiting secondary to systemic therapy
- Anaemia and/or thrombocytopenia
- Pain due to underlying disease
- Confirmed Brain Metastasis or Spinal Cord Compression or SVCO
- Palliative ascitic drainage in known cancer cases
- Medication related altered consciousness
- Electrolyte imbalance
MATER DEI ADMISSION AND EMERGENCY PHASE
SAMOC PHASE
LEGEND OF PATHWAY FLOW AND ACTIONS
Flow
Actions of [redacted] A&E
Actions of Oncology A&E
Nurse actions
Future goals or plans
YES
Decision
NO
Logistics involved
1. This service will be provided from 08:00am to 6pm.
2. Service of admitting acute Oncology patients from [redacted] A&E will be provided by Oncology Ward [redacted]
3. MOSAIQ IT system will:
– Keep live updated ward bed occupancy situation
– Have Protocols with answers for emergency calls by patients
– Criteria for admission to [redacted]OC wards
– Record calls received by Practice Nurse from [redacted] A&E with request to Admit patients
– Record of patients transferred from [redacted] A&E and admitted to [redacted]OC Wards
– All medical documentation
Date:19th January 2022 Version 00
Owner: Emergency Department [redacted] Cancer Care Pathways Directorate: [redacted]

Appendix 2 – Access to Oncology data

4.2.6 Access type should be filled in by specifying required security privileges.

4.2.7 Reason for request to access Mosaiq and reason for access type should be provided in the form, as well as where the system will be accessed from.

4.2.8 The filled in form, with all the obtained approvals, should be submitted to the Oncology Systems Lead, or delegate, or by email to [redacted].

4.3 Research and Data Collection

4.3.1 This policy **does not** apply for research purposes or data collection from any of the Oncology Systems within [redacted]OC.

4.3.2 All requests related to research should follow the department ethics committee pathway.

Refer to the following documents:

- **Policy**: Approval for the use of Radiotherapy related Patient Data for Audit/Research Purposes.
  Document code: RT-PD-001 Ver.02
- **Form**: Oncology Proposal/Approval Audit/ Research purposes.
  Document code: ONCO-GeFO-P/A-001. Ver.01
  Reference SOP: ONCO-Ge-PD.AP-001. Ver.01

5. Legislative Compliance

5.1 General Data Protection Regulation (EU) 2016/679 https://gdpr-info.eu/

Appendix 3 - Oncology approval for audit/ research purposes

SIR ANTHONY MAMO ONCOLOGY CENTRE

FORM :	Oncology Proposal/Approval Audit/ Research purposes
Document Code: ONCO-GeFO-P/A-001. Ver.01	Reference SOP : ONCO-Ge-PD.AP--001.Ver.01

PROJECT TITLE: An audit of the provision of acute oncology services in Malta.

Name & Surname (Researcher/ Student): Janice Galea

Email address: janice.galea.14@um.edu.mt

Tutor's name & Surname: Dr. Danika Marmara' (Supervisor) and Dr. Roderick Bugeja (Co-Supervisor)

Proposal

Introduction:

Acute Oncology (AO) is a developing sub-specialty within the oncology field which outlines a systemic approach, to the management of patients with cancer who develop acute complications due to their cancer treatment or malignancy (Palmer et al., 2023). It connects specialties from oncology, emergency, acute medicine and palliative care to ensure high-quality care delivery to patients requiring urgent care in the most suitable setting (UK Acute Oncology Society [UKAOS, n.d).

The local cancer incidence is increasing at an alarming rate with 1,800 new cases registered in 2017 (Ministry for Health, 2017) and 2,855 new cases registered in 2022 respectively (International Association of Cancer registries [IACR], 2024). While Systemic anti-cancer treatment (SACT) and radiotherapy (RT) may provide significant benefit to patients, it is also related to acute complications, which would require immediate care (Jairam et al., 2019). Currently, there is minimal evidence on patient data requiring acute care and their acute care trajectory. Gaps in existing knowledge relevant to the local acute oncology service include data on the incidence of patients requiring urgent care, rate of hospitalisations, and length of inpatient stays. As well as the role of the emergency department (ED) in cancer care, and how patient's acute care needs are addressed.

It is for this rationale, that this proposed study aims to utilise a quantitative approach to provide an insight on the local acute oncology care services by examining hospitalisation trends associated with adverse events from cancer treatment. This study will analyse the patients' journey when they require immediate care as they become acutely unwell due to complications while on active treatment. The analysis will commence

upon presentation to the ED until discharge. ED visits and inpatient stays will be characterised by demographic factors relevant to this study.

Aim/s:

The aim of this proposed study will be to analyse the local acute oncology care services for patients with cancer on active treatment,

Objectives:

- Examine hospitalisation patterns related to acute complications from active cancer treatment
- To identify gaps, that may hinder quality of care
- Serve as an evidence-based tool, establishing implications for practice that would enhance the acute oncology services aiming for high quality patient care, cost effectiveness and overall improve oncology care delivery

Method (include the sample size)

Since the purpose of this study aims to analyse the local acute oncology service of patients with cancer on active treatment, a quantitative approach with a descriptive design is deemed the most appropriate.
Data collection will commence after obtaining FREC and UREC clearance. Moreover, this clearance is only obtained after approvals from the Chief executive officer and Data protection officer, Clinical chairperson of Accident and Emergency from MDH, and Clinical Chairperson of Oncology and Haematology.

The eligible patients to be included in this audit are, adults aged 18 years and over, diagnosed with solid tumour/s or haematological malignancies and who are on active cancer treatment (SACT or RT), or have completed their treatment within the last eight weeks upon admission for symptom management.

This study will employ secondary data, where the research manager of the Cancer Care Pathways (Ms. Jasmine Gauci) will access and extract data of patients with cancer who were on active cancer treatment from 1st August 2023 to 1st August 2024. This data will be obtained from MOSAIQ, which is SAMOC's patient electronic health record (EHR). The relevant demographic factors contributing to this study will be

age, sex, tumour site, type of cancer treatment, complication and day from last treatment. The emergency severity index (ESI) category, the month and timeframe of ED visits, location of hospitalisation (MDH and SAMOC), and length of stay are also significant factors which will enable the researcher to conduct for a comprehensive analysis. The research manager will then hand over this data to the data controller (Dr. Sandra Distefano), enabling her to identify patients who are on active treatment admitted to the ED. The data of the identified patients will then be handed to the research manager, enabling her to access and extract the patient's episode. To ensure confidentiality and anonymity throughout this study, the data collected will be anonymised by the research manager, so patients are not identifiable to the researcher. Anonymised data is then handed the researcher for a thorough analysis. It is anticipated that the data will be collected over a period of 4 months upon granting approval from FREC and UREC. The researcher will analyse each episode from the provided data. The researcher will analyse the triage notes to determine which admissions were specifically related to SACT and RT complications. From the data provided, the researcher will also analyse and determine the number of hospitalisations, length of hospital stays and ultimately the care trajectory of the episode. Data analysis will be carried out using the software Statistical Package for the Social Sciences (SPSS).

References:

International Association of Cancer Registries (IACR). (2024). Global Cancer Observatory Malta Fact Sheet. Lyon.

Jairam, V., Lee, V., Park, H. S., Thomas, C. R., Melnick, E. R., Gross, C. P., Presley, C. J., Adelson, K. B., & Yu, J. B. (2019). Treatment-related complications of systemic therapy and radiotherapy. *JAMA Oncology*, *5*(7), 1028. https://doi.org/10.1001/jamaoncol.2019.0086

Ministry for Health (2017), The National Cancer Plan for the Maltese Islands 2017–2021. Ministry for Health, Valletta. https://health.gov.mt/wp-content/uploads/2023/04/The_National_Cancer_Plan_for_the_Maltese_Islands_2017%E2%80%932021_EN.pdf

Palmer, K., Wang, E., Mattu, R., & Tipples, K. (2023). The Essentials of Acute Oncology. *Clinical Medicine*, *23*(1), 45–51. https://doi.org/10.7861/clinmed.2022-0561

Clinical Consultant Oncologist/s:
Name and Surname (in block letters) and Signature

SIR ANTHONY MAMO ONCOLOGY CENTRE

FORM :	Oncology Proposal/Approval Audit/ Research purposes
Document Code: ONCO-GeFO-P/A-001. Ver.01	Reference SOP : ONCO-Ge-PD.AP--001.Ver.01

Heads of:
(Name, Surname and Section (in block letters) and Signature)

Radiotherapy Department: *(if applicable)*

Radiography

Medical Physics

Nursing

Other SAMOC Departments/ Wards:

RESEARCH MANAGER - JASMINE M GAUCI

Clinical Chairperson (Haematology - Oncology):
Name and Surname (in block letters) and Signature

Dr Nick Refalo
Chairman & Consultant Oncologist
Sir Anthony Mamo Oncology Centre
Reg No: 2662

30 VII 2024

Quality Assurance Manager:
Name and Surname (in block letters) and Signature:

MARIA VICTORIA CARUANA

An approval is granted to carry out the study/audit at any SAMOC Department. Patient information can be accessible only by complying with the following data protection principles, which are set out in the General Data Protection Regulation 2016. In summary these state that patient's data shall:

Appendix 4 – DPO approval

SPTAR MATER DEI

Data Protection Clearance Declaration Form

REF: 149/2024

I hereby declare that I will respect the confidentiality and privacy of any personal data or information that I will come across at Mater Dei and will in no circumstance disclose any such information to third parties.

I confirm that information submitted for Data Protection Clearance is correct and that I will abide with conditions issued in same clearance notice.

On the basis of the documentation you submitted, from the MDH data protection point of view you have been cleared to proceed with your study titled **An audit of the provision of acute oncology services in Malta** provided that you obtain approval from MDH CEO (ceo.mdh@gov.mt - please provide the relevant documents including Dr Nick Refalo's approval and this email).

All data will be provided to you already anonymised by your intermediary Ms Jasmine Gauci (Research Manager at SAMOC – MDH). Ms Gauci should not retain any personal details obtained from this research and these should be immediately destroyed.

Anonymisation, Data minimisation and Consent Criteria

- **This clearance does not allow you to view medical records or access to Health Information Systems.**
- **This clearance does not allow viewing or capturing of medical imaging.**
- **This clearance does not allow staff / patient contact / communication / observations / examinations.**
- **The identity of our Data Subjects cannot be divulged to anyone by Ms Jasmine Gauci not even to academic staff at UOM.**

Clarifications

- **This clearance does not cover ethical approval.**
- **Ms Jasmine Gauci must provide you age brackets instead of the actual age.**
- **Ms Jasmine Gauci cannot hand you any personal identifiable data including ID numbers; instead, you must generate a number yourself e.g. Patient 1, Patient 2 etc**
- **Ms Jasmine Gauci must exclude rare cases.**
- **This clearance is valid for your report to be included with your dissertation only and not in medical journals or elsewhere given that you are not obtaining approval from MDH legal office.**
- **Your submitted documentation must remain unchanged.**
- **What was declared during this clearance process is what you will abide to.**
- **You must abide with all the articles of the GDPR (EU) 2016 / 679 throughout the data collection process and thereafter.**
- **You are requested to submit a copy of your findings to this office at the end of your study.**
- **This clearance covers your research to be carried out only at SAMOC - MDH and not in any other department / institution such as Primary Healthcare, GGH, KGH, MHS, SVPR, DHIR or any other institution / department that doesn't form part of MDH Data Controller.**
- **Please communicate with Ms Jasmine Gauci before you start. You must also present this clearance email.**

SPTAR MATER DEI

Data Protection Clearance Declaration Form

REF: 149/2024

I also declare that I am aware of the provisions of the:

- General Data Protection Regulation (2016)

  (ref: https://idpc.org.mt/en/Pages/gdpr.aspx),

- Computer misuse provisions of the Criminal Code

  (ref: http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=8574),

and, the

- Professional Secrecy Act

  (ref: http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=8844&l=1)

and that I will abide by all Government and Hospital regulations related to data, information and use of IT Systems and services (ref: http://ictpolicies.gov.mt , http://www.kura.gov.mt).

Full Name: Janice Galea

ID Number: 0554794M

Approval Date from DPO: 07th August 2024

Approval Date from CEO: 15th August 2024

Data Collection Period (From – To): October 2024 – February 2025

MDH Official Approval Names: Dr N Refalo

Name of Study / Audit: An audit of the provision of acute oncology services in Malta

Applicant's Signature: Ms Janice Galea (Aug 19, 2024 09:55 GMT+2)

Appendix 5 – CEO and Research Support Lead approval

L-Università ta' Malta

Janice Galea <janice.galea.14@um.edu.mt>

Request for clearance: An audit of the provision of acute oncology services in Malta

Magri Caroline Jane at MHA - MDH <caroline-jane.magri@gov.mt> 15 August 2024 at 07:18
To: Janice Galea <janice.galea.14@um.edu.mt>

Dear Janice,

Thanks for the info provided. Approved from my end.

Regards

Dr. Caroline J. Magri

MD, MRCP (UK), FEFIM, MPhil (Melit), M. Int. Cardiol. (UniSR), MSc (Brighton), PhD (Melit), FESC, PG Cert EBM, MSc Healthcare Management & Leadership, FRCP (Edin)

Consultant Cardiologist

Research Support Lead, Office of the Medical Director, Mater Dei Hospital

Lead Clinician in Research in Cardiology, Mater Dei Hospital

Visiting Senior Lecturer University of Malta

Reader in Cardiology, Queen Mary University of London, Malta Campus

L-Università ta' Malta

Janice Galea <janice.galea.14@um.edu.mt>

Request for clearance: An audit of the provision of acute oncology services in Malta

CEO at MHA - MDH <ceo.mdh@gov.mt> 15 August 2024 at 17:53
To: Janice Galea <janice.galea.14@um.edu.mt>, CEO at MHA - MDH <ceo.mdh@gov.mt>
Cc: Marmara Danika at MHA - SAMOC <danika.marmara@gov.mt>, Roderick Bugeja <roderick.bugeja@um.edu.mt>

Dear Ms Galea,

Your study entitled "***An audit of the provision of acute oncology services in Malta***" is being approved on behalf of Ing. Keith Attard, CEO, Mater Dei Hospital.

Kindly make sure to ascertain that the guidelines provided by DPO are fully adhered to and ethical clearance is sought.

Good luck in your studies.

[Quoted text hidden]

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Appendix 6 – UKONS triage tool

UKONS Oncology Nursing Society

ONCOLOGY/HAEMATO-ONCOLOGY TRIAGE LINE
TRIAGE ASSESSMENT TOOL, VERSION 3

CAUTION! Please note patients who are receiving or have received **IMMUNE CHECK POINT INHIBITORS** may present with treatment related problems at anytime during treatment or even months to years after treatment has been completed. If you are unsure about the patient's regimen, be cautious and follow triage symptom assessment.

All Green = self care advice | 1 Amber = review within 24 hours | 2 or more amber = escalate to red | Red = arrange for a face to face assessment as soon as possible

Patients may present with problems other than those listed below, these would be captured as "other" on the log sheet checklist. Practitioners are advised to refer to the latest version of NCI-CTCAE common toxicity criteria to assess the severity of the problem and seek further clinical advice regarding management.

Toxicity/Symptom ↓ Grade →	0	1	2	3	4
1. Shortness of breath Is there any chest pain or tightness? - If yes refer to chest pain. Is this a new symptom? How long for? Is it getting worse? Do you have a cough? How long for? Is it productive? If yes, what colour is your phlegm/spit? **Consider:** SVCO/Anaemia/Pulmonary embolism/Pneumonitis/Infection.	None or no change from normal.	New onset shortness of breath with moderate exertion.	New onset shortness of breath with minimal exertion.	Shortness of breath at rest.	Life threatening symptoms. Advise 999 - Urgent assessment in ED.
2. Chest pain STOP oral and intravenous Systemic Anti-Cancer Treatment (SACT) until reviewed by oncology or haematology team.	None.	Advise URGENT ED for medical assessment- 999. NB if infusional SACT in place arrange for disconnection.			
3. Bleeding/Bruising Are you actively bleeding? Site of active bleeding? Injury, trauma related or spontaneous? Is the bleeding spraying, pouring or enough to make a puddle? Are you taking anticoagulants? Have you any new bruises? Localised or generalised? Related to any trauma? NB For Haematology patients please follow local policy.	None or no change from normal.	Mild, self limited controlled by conservative measures. Consider arranging a full blood count. Localised - single bruise in only one area.	Bleeding that is not self limiting and/or multiple sites of bruising or one large site. Advise 999 - Urgent assessment in ED.		
4. Consciousness/Cognitive disturbance Establish the patients level of consciousness. This may indicate the need for urgent action. **Consider:** Immune effector cell-associated neurotoxicty syndrome (ICANS).	None or no change from normal.	Mild disorientation not interfering with activities of daily living. Slight decrease in level of alertness.	Moderate cognitive disability and/or disorientation limiting activities of daily living.	Severe cognitive disability and/or severe confusion; severely limiting activities of daily living. Altered level of consciousness. Advise 999 - Urgent assessment in ED.	Life threatening consequences. Loss of consciousness/ unrousable. Advise 999 - Urgent assessment in ED.
5. Fever on SACT Within the last 6-8 weeks or immunocompromised. What time was temp last taken? Have you taken any antipyretic medication?	Normal 36.0 - 37.4 C.	IF TEMPERATURE 37.5˚C OR ABOVE OR BELOW 36.0˚C OR GENERALLY UNWELL - URGENT ASSESSMENT AND CLINICAL REVIEW - FOLLOW NEUTROPENIA PATHWAY. ALERT - patients who have taken analgesia or steroids or who may be dehydrated may not present with an abnormal temperature but may still have an infection and be at risk of sepsis - if in doubt do a count.			
6. Infection Have you taken your temperature? If so when? What is it? - if pyrexial see fever toxicity. Are there any specific symptoms, such as: pain, burning / stinging or difficulty passing urine? cough, any sputum, if so what colour? Any shivering, chills or shaking episodes? Localised signs of infection? e.g. redness, swelling, inflammation.	None.	Localised signs of infection otherwise generally well.	Signs of infection and generally unwell.	Signs of severe symptomatic infection.	Life threatening sepsis. Advise 999 - Urgent assessment in ED.
7. Fever NOT ON SACT **NOT** receiving Systemic Anti Cancer Treatment (SACT) and **NOT** at risk of immunosuppression. What time was temp last taken? Have you taken any antipyretic medication?	Normal 36.0 -37.4 C.		< 36.0˚c or > 37.5˚c - 38.0˚c.	> 38.0˚c - 40.0˚c.	> 40.0˚c.
8. Fatigue/Performance status Has there been a recent change in activity levels and ability to work or carry out self care? Is this a new problem? Is it getting worse? How many days? Any other associated symptoms? Do you feel exhausted?	No change from normal.	Fatigue relieved by rest; restricted in strenuous activity but ambulatory and able to carry out work of light nature.	Fatigue not relieved by rest; ambulatory and capable of self care but unable to carry out any work activities. **If patient is or has been on Immune Checkpoint Inhibitors, escalate to RED.**	Fatigue not relieved by rest, capable of only limited selfcare, confined to bed or chair more than 50% of waking hours.	Completely disabled. Cannot carry out any self care. Totally confined to bed or chair.
9. Ocular/Eye problems Is this a new problem? Any associated pain? Any visual disturbance? Any discharge/sticky eyes?	None or no change from normal.	Mild symptoms not interfering with function.	Moderate to severe symptoms interfering with function and/or any visual disturbance.		
10. Mucositis/Oral Are you able to eat or drink? Do you have any mouth ulcers and/or pain swallowing? If yes, How many days? Is there evidence of infection? Assess patient's urinary output and colour.	None or no change from normal.	Painless ulcers and/or erythema, mild soreness but able to eat and drink normally.	Painful ulcers and/or erythema, mild soreness but able to eat and drink normally.	Painful erythema, difficulty eating and drinking.	Significant pain, minimal intake and/or reduced urinary output.
11. Anorexia What is your appetite like? Has this recently changed? Do you feel hungry? Do you have difficulty eating or swallowing? Any recent weight loss? Any contributory factors, such as dehydration, nausea, vomiting, mucositis, diarrhoea or constipation - If yes refer to specific problem/symptom.	None or no change from normal.	Loss of appetite without alteration in eating habits.	Oral intake altered without significant weight loss or malnutrition.	Oral intake altered in association with significant weight loss/malnutrition.	Life threatening Symptoms. Advise 999 - Urgent assessment in ED.
12. Nausea How many days? What is your oral intake? Are you taking antiemetics as prescribed? Assess patient's urinary output and colour.	None.	Able to eat/drink reasonable intake.	Able to eat/drink but intake is significantly decreased.	No significant intake.	
13. Vomiting How many days? How many episodes? What is your oral intake? Is there any constipation or diarrhoea? - if yes see specific toxicity. Assess patient's urinary output and colour.	None.	1-2 episodes in 24 hours.	3-5 episodes in 24 hours.	6-10 episodes in 24 hours.	>10 episodes in 24 hours.
14. Diarrhoea How many days has this occurred for? How many times in a 24 hour period? Has there been an increase in ostomy output? How frequently are you emptying your bag? Is there any abdominal pain or discomfort? Is there any blood or mucus in the stool? Have you taken any antidiarrhoeal medication? Is there any change in urine output? Are you eating and drinking normally? Has there been any recent contact with anyone suffering with diarrhoea? **Consider:** Infection / Colitis / Constipation. N.B Patients receiving Immune check point inhibitors or Capecitabine should be managed according to the drug specific pathway and assessment arranged as required.	No change from normal.	Increase of up to 3 bowel movements a day over pre-treatment normal or mild increase in patients usual ostomy output.	Increase of up to 4-6 episodes a day or moderate increase in patients usual ostomy output or nocturnal movement or moderate cramping. **If diarrhoea persists after taking regimen specific antidiarrhoeal escalate to red.** **If patient is or has been on Immune check point inhibitors escalate to RED.**	Increase of up to 7-9 episodes a day or severe increase in patients usual ostomy output OR incontinence/severe cramping/ mucus/bloody diarrhoea.	Increase>10 episodes a day or grossly bloody diarrhoea.
15. Constipation How long since bowels opened? What is normal? Is there any abdominal pain and/or vomiting? Have you taken any medication? Are you passing wind? Is there any nausea? Have you taken any antidiarrhoeal medication? Assess the patients urinary output and colour.	None or no change from normal.	Mild - no bowel movement for 24 hours over pre-treatment normal.	Moderate - no bowel movement for 48 hours over pre-treatment normal.	Severe - no bowel movement for 72 hours over pre-treatment normal.	No bowel movement for >96 hours - consider paralytic ileus.
16. Urinary Is there an odour? Is there any incontinence, frequency or urgency? How long have you had the symptoms? Is there any pain or difficulty passing urine? Are you drinking normally, are you thirsty? Are you a diabetic? Have you checked your blood sugar? Has it changed from normal output? If so, How? Is it a new or worsening symptom? Do you have a catheter? **Consider:** Infection / Diabetes - existing or new onset.	None or no change from normal.	Mild symptoms. Minimal increase in frequency, urgency, dysuria or nocturia. Slight reduction in output.	Moderate symptoms. Moderate increase in frequency, urgency, dysuria nocturia, moderate reduction in output.	Severe symptoms. Possible obstruction/retention new incontinence, new or increasing haematuria, severe reduction in output.	Little or no urine output.
17. Skin Where is the problem? How much of the body is affected? How long have you had it? Is it getting worse? Is the area associated with a recent infusion/injection site? Are there any of the following symptoms - rash, pain, feeling generally unwell, broken or cracked skin, problems with nails, dry or itchy skin, weeping, swelling or warm to touch? Use the rule of 9's to assess the body service area affected. RULE OF 9's. **Consider:** Redness in white skin tones and subtle darkness, maroon/yellow/purple/grey appearance or darker than surrounding area in brown and black skin tones. Please follow local drug toxicity specific pathways.	None or no change from normal.	Rash/skin changes covering <10% of BSA with or without itching, redness, no pain	Rash/skin changes covering 10-30% BSA. Rash/skin changes limiting normal ADL's. With or without painful redness or swelling	Rash covering >30% BSA with or without associated symptoms; limiting self care activities, spontaneous bleeding or signs of associated infection, moist desquamation, ulceration, blistering and severe pain.	
18. Pain Is it a new problem? Where is it? How long have you had it? Have you taken any pain killers? Is there any swelling or redness? If pain associated with swelling or redness consider thrombosis or cellulitis. Back pain consider metastatic spinal cord compression (MSCC). Is the pain around or along an injection site? If yes, consider extravasation. Do you have a headache? consider ICANS/CRS	None or no change from normal.	Mild pain not interfering with daily activities.	Moderate pain interfering with daily activities.	Severe pain interfering with daily activities.	Severe disabling pain.
19. Neurosensory/Motor When did the problem start? Is it continuous? Is it getting worse? Is it affecting mobility/function? Any perineal or buttock numbness (saddle paresthesia)? Any constipation? Any urinary or faecal incontinence? Any visual disturbances? Is there any pain? If yes refer to specific problem/ symptom. **Consider:** metastatic spinal cord compression, cerebral metastases or cerebral event.	None or no change from normal.	Mild paresthesia, subjective weakness. No loss of function.	Mild or moderate sensory loss, moderate paresthesia, mild weakness with no loss of function.	Severe sensory loss, paresthesia or weakness that interferes with function.	Paralysis.

UKAOS UK Acute Oncology Society | MACMILLAN. CANCER SUPPORT

Appendix 7 – *FREC approval*

L-Università ta' Malta

Janice Galea <janice.galea.14@um.edu.mt>

FHS-2024-00517 Janice Galea

Research Ethics HEALTHSCI <research-ethics.healthsci@um.edu.mt> 17 September 2024 at 11:58
To: Janice Galea <janice.galea.14@um.edu.mt>
Cc: Paulann Grech <paulann.grech@um.edu.mt>, Danika Maria Marmara <datta06@um.edu.mt>

Dear Janice,

I am pleased to inform you that FREC has reviewed your application and it was found to be consistent with the University of Malta Research Code of Practice.

Approval is therefore granted and you may start collecting data.

Good Luck with your study!

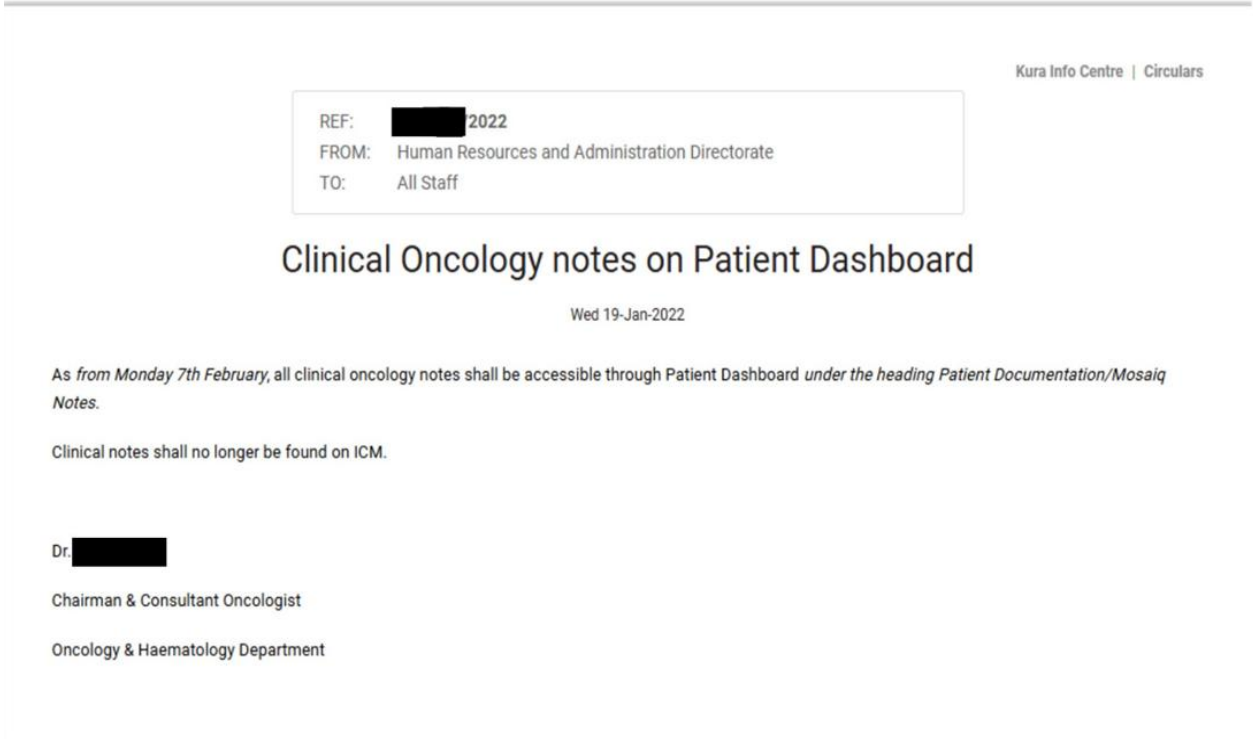
Sincere Regards,
Christabel

L-Università ta' Malta

Christabel Vella | Administration Specialist
B.A. (Hons) in Maltese

FREC Secretary
Faculty of Health Sciences
Room 6, Block A, Level 1
+356 2340 1575

Appendix 8 – *Clinical Oncology notes access*



Kura Info Centre | Circulars

REF: [redacted]2022
FROM: Human Resources and Administration Directorate
TO: All Staff

Clinical Oncology notes on Patient Dashboard

Wed 19-Jan-2022

As *from Monday 7th February,* all clinical oncology notes shall be accessible through Patient Dashboard *under the heading Patient Documentation/Mosaiq Notes.*

Clinical notes shall no longer be found on ICM.

Dr. [redacted]

Chairman & Consultant Oncologist

Oncology & Haematology Department

Appendix 9 – Direct admission hours update

Kura Info Centre | Circulars

REF: [redacted]2023
FROM: MDH
TO: All Staff

Extension of Hours for Direct Admissions

Fri 15-Dec-2023

As we strive to enhance the efficiency of our direct admissions process and better accommodate the needs of our patients, we would like to inform you that as from January 2024, *direct admissions from [redacted] A&E to [redacted]OC* are being **extended to 8pm**.

The new hours available for the Direct Admission Pathway are: 8am-8pm

Thank you for your cooperation.

Best regards,

Dr. [redacted]

[redacted]OC Clinical Chairperson

Dr. [redacted]

Deputy Chairperson, Emergency Department

Appendix 10 – COVID swabbing circular

REF: [redacted]2023
FROM: Human Resources and Administration Directorate
TO: All Staff

COVID-19 admission screening at [redacted] Hospital and quarantine of contacts

Thu 27-Apr-2023

Universal admission screening for COVID-19 infection

A recent guidance update from the European Centre for Disease Prevention & Control (ECDC) has recommended that universal COVID-19 admission screening is no longer necessary if community transmission is not high (https://www.ecdc.europa.eu/en/publications-data/considerations-infection-prevention-and-control-practices-relation-respiratory). Cases in Malta have been consistently less than 5 cases per 100,000 population for many weeks. As a result, this ECDC guidance will now be applied, following discussions between the Superintendence of Public Health and Infection Control.

As of **1 May 2023,** universal admission screening will no longer be required for patients admitted to [redacted]Hospital. This will apply both for patients admitted through A&E as well as elective patients. Therefore, the practice of screening patients pre-operatively will also cease for operations carried out from 1 May 2023.

Testing of patients presenting with signs and symptoms of respiratory infections

It is however essential that a respiratory screen including COVID-19 test is taken for all patients who are referred to hospital with signs and symptoms of respiratory infections or who develop them during their hospital stay. Patients with at least one of the following symptoms:

- Cough,
- sore throat,
- shortness of breath,
- coryza

or

- if it is a clinician's judgement that any respiratory illness is due to an infection

should have a respiratory screen taken immediately. As already stated in circular [redacted]2023, respiratory screens now routinely include COVID-19 testing.

Appendix A – CASP qualitative

Section A Are the results valid?	
1. Was there a clear statement of the aims of the research?	☐ Yes ☐ No ☐ Can't Tell
CONSIDER: • *what was the goal of the research?* • *why was it thought important?* • *its relevance*	
2. Is a qualitative methodology appropriate?	☐ Yes ☐ No ☐ Can't Tell
CONSIDER: • *If the research seeks to interpret or illuminate the actions and/or subjective experiences of research participants* • *Is qualitative research the right methodology for addressing the research goal?*	
3. Was the research design appropriate to address the aims of the research?	☐ Yes ☐ No ☐ Can't Tell
CONSIDER: • *if the researcher has justified the research design (e.g., have they discussed how they decided which method to use)*	
4. Was the recruitment strategy appropriate to the aims of the research?	☐ Yes ☐ No ☐ Can't Tell
CONSIDER: • *If the researcher has explained how the participants were selected* • *If they explained why the participants they selected were the most appropriate to provide access to the type of knowledge sought by the study* • *If there are any discussions around recruitment (e.g. why some people chose not to take part)*	

5. Was the data collected in a way that addressed the research issue?	☐ Yes ☐ No ☐ Can't Tell

CONSIDER:

- *If the setting for the data collection was justified*
- *If it is clear how data were collected (e.g. focus group, semi-structured interview etc.)*
- *If the researcher has justified the methods chosen*
- *If the researcher has made the methods explicit (e.g. for interview method, is there an indication of how interviews are conducted, or did they use a topic guide)*
- *If methods were modified during the study. If so, has the researcher explained how and why*
- *If the form of data is clear (e.g. tape recordings, video material, notes etc.)*
- *If the researcher has discussed saturation of data*

6. Has the relationship between researcher and participants been adequately considered?	☐ Yes ☐ No ☐ Can't Tell

CONSIDER:

- *If the researcher critically examined their own role, potential bias and influence during (a) formulation of the research questions (b) data collection, including sample recruitment and choice of location*
- *How the researcher responded to events during the study and whether they considered the implications of any changes in the research design*

Section B: What are the results?

7. Have ethical issues been taken into consideration?	☐ Yes ☐ No ☐ Can't Tell

CONSIDER:

- *If there are sufficient details of how the research was explained to participants for the reader to assess whether ethical standards were maintained*
- *If the researcher has discussed issues raised by the study (e.g. issues around informed consent or confidentiality or how they have handled the effects of the study on the participants during and after the study)*
- *If approval has been sought from the ethics committee*

8. Was the data analysis sufficiently rigorous?	☐ Yes ☐ No ☐ Can't Tell
CONSIDER: • *If there is an in-depth description of the analysis process* • *If thematic analysis is used. If so, is it clear how the categories/themes were derived from the data* • *Whether the researcher explains how the data presented were selected from the original sample to demonstrate the analysis process* • *If sufficient data are presented to support the findings* • *To what extent contradictory data are taken into account* • *Whether the researcher critically examined their own role, potential bias and influence during analysis and selection of data for presentation*	
9. Is there a clear statement of findings?	☐ Yes ☐ No ☐ Can't Tell
CONSIDER: • *If the findings are explicit* • *If there is adequate discussion of the evidence both for and against the researcher's arguments* • *If the researcher has discussed the credibility of their findings (e.g. triangulation, respondent validation, more than one analyst)* • *If the findings are discussed in relation to the original research question*	
Section C: Will the results help locally?	
10. How valuable is the research?	☐ Yes ☐ No ☐ Can't Tell
CONSIDER: • *If the researcher discusses the contribution the study makes to existing knowledge or understanding (e.g., do they consider the findings in relation to current practice or policy, or relevant research-based literature* • *If they identify new areas where research is necessary* • *If the researchers have discussed whether or how the findings can be transferred to other populations or considered other ways the research may be used*	

APPRAISAL SUMMARY: *List key points from your critical appraisal that need to be considered when assessing the validity of the results and their usefulness in decision-making.*		
Positive/Methodologically sound	**Negative/Relatively poor methodology**	**Unknowns**

Appendix B – Mixed methods appraisal

Part I: Mixed Methods Appraisal Tool (MMAT), version 2018

Category of study designs	Methodological quality criteria	Responses			
		Yes	No	Can't tell	Comments
Screening questions (for all types)	S1. Are there clear research questions?				
	S2. Do the collected data allow to address the research questions?				
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.				
1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?				
	1.2. Are the qualitative data collection methods adequate to address the research question?				
	1.3. Are the findings adequately derived from the data?				
	1.4. Is the interpretation of results sufficiently substantiated by data?				
	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?				
2. Quantitative randomized controlled trials	2.1. Is randomization appropriately performed?				
	2.2. Are the groups comparable at baseline?				
	2.3. Are there complete outcome data?				
	2.4. Are outcome assessors blinded to the intervention provided?				
	2.5 Did the participants adhere to the assigned intervention?				
3. Quantitative non-randomized	3.1. Are the participants representative of the target population?				
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?				
	3.3. Are there complete outcome data?				
	3.4. Are the confounders accounted for in the design and analysis?				
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?				
4. Quantitative descriptive	4.1. Is the sampling strategy relevant to address the research question?				
	4.2. Is the sample representative of the target population?				
	4.3. Are the measurements appropriate?				
	4.4. Is the risk of nonresponse bias low?				
	4.5. Is the statistical analysis appropriate to answer the research question?				
5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?				
	5.2. Are the different components of the study effectively integrated to answer the research question?				
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?				
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?				
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?				

tool

Appendix C – JBI quasi-experimental tool

JBI CRITICAL APPRAISAL CHECKLIST FOR QUASI-EXPERIMENTAL STUDIES

Reviewer_____ Date_____

Author_____ Year_____ Record Number_____

	Yes	No	Unclear	Not applicable
1. Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)?	☐	☐	☐	☐
2. Were the participants included in any comparisons similar?	☐	☐	☐	☐
3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	☐	☐	☐	☐
4. Was there a control group?	☐	☐	☐	☐
5. Were there multiple measurements of the outcome both pre and post the intervention/exposure?	☐	☐	☐	☐
6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	☐	☐	☐	☐
7. Were the outcomes of participants included in any comparisons measured in the same way?	☐	☐	☐	☐
8. Were outcomes measured in a reliable way?	☐	☐	☐	☐
9. Was appropriate statistical analysis used?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

_____

_____

_____

Appendix D – JBI cohort studies tool

JBI CRITICAL APPRAISAL CHECKLIST FOR COHORT STUDIES

Reviewer_____Date_____

Author_____Year_____ Record Number_____

	Yes	No	Unclear	Not applicable
1. Were the two groups similar and recruited from the same population?	☐	☐	☐	☐
2. Were the exposures measured similarly to assign people	☐	☐	☐	☐
3. to both exposed and unexposed groups?				
4. Was the exposure measured in a valid and reliable way?	☐	☐	☐	☐
5. Were confounding factors identified?	☐	☐	☐	☐
6. Were strategies to deal with confounding factors stated?	☐	☐	☐	☐
7. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	☐	☐	☐	☐
8. Were the outcomes measured in a valid and reliable way?	☐	☐	☐	☐
9. Was the follow up time reported and sufficient to be long enough for outcomes to occur?	☐	☐	☐	☐
10. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?	☐	☐	☐	☐
11. Were strategies to address incomplete follow up utilized?	☐	☐	☐	☐
12. Was appropriate statistical analysis used?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

Appendix E – Corresponding author correspondence, Dr. Gould Rothberg

L-Università ta' Malta

Janice Galea <janice.galea.14@um.edu.mt>

Inquiry on research article
3 messages

Janice Galea <janice.galea.14@um.edu.mt> 11 February 2025 at 21:26
To: bonnie.gouldrothberg@gmail.com

Dear Dr. Gould Rothberg,

Good morning, hope this email finds you well and in good health. I am Janice Galea and I am sending you this email, as I was reading your article titled: "Impact of a Dedicated Cancer Urgent Care Center on Acute Care Utilization", which I found incredibly insightful. I am currently conducting my Masters dissertation on acute oncology pathways for patients undergoing cancer treatment.
If it is possible, can you kindly provide specific information regarding the age range of the patients in your study? This information would be truly invaluable for my research.

Thank you for your time and assistance. I look forward to your response.

Kindest regards,
Janice

Bonnie Gould Rothberg <bonnie.gouldrothberg@gmail.com> 11 February 2025 at 21:53
To: Janice Galea <janice.galea.14@um.edu.mt>

Janice,

Thanks for your request.

Our clinic was for adults. None of our patients were under the age of 18 and only a handful under the age of 21 (most of the 18-21 year-olds are still seen in the pediatric practice since their cancers typically overlap with those seen in children).

At the upper extreme, we cared for patients in their 90s.

I hope this helps,

Bonnie

Bonnie E. Gould Rothberg, MD, PhD, MPH, MMM, FACP

Hindsight is 2020

> On Feb 11, 2025, at 3:26 PM, Janice Galea <janice.galea.14@um.edu.mt> wrote:
>
> [Quoted text hidden]

Janice Galea <janice.galea.14@um.edu.mt> 11 February 2025 at 21:58
To: Bonnie Gould Rothberg <bonnie.gouldrothberg@gmail.com>

Dear Dr. Gould Rothberg,

Thanks a lot for your prompt reply. That helps a lot, greatly appreciated. Thanks again and well done for this article.

Kindest regards,
Janice
[Quoted text hidden]

Appendix F – Corresponding author correspondence, Dr. D'Avella

L-Università ta' Malta

Janice Galea <janice.galea.14@um.edu.mt>

Inquiry on medical article - The impact of an oncology urgent care center on health-care utilization

7 messages

Janice Galea <janice.galea.14@um.edu.mt> 9 February 2025 at 22:43
To: christopher.davella@pennmedicine.upenn.edu

Dear Dr. D'Avella,

Good morning, hope this email finds you well and in good health. I am Janice Galea and I am sending you this email, as I was reading your article titled: "The impact of an oncology urgent care center on health-care utilization", which I found incredibly insightful. I am currently conducting my Masters dissertation on acute oncology pathways for patients undergoing cancer treatment.
If it is possible, can you kindly provide specific information regarding the age range of the patients in your study? This information would be truly invaluable for my research.

Thank you for your time and assistance. I look forward to your response.

Kindest regards,
Janice

D'Avella, Christopher <Christopher.DAvella@pennmedicine.upenn.edu> 13 February 2025 at 18:53
To: Janice Galea <janice.galea.14@um.edu.mt>, "brian.egleston@fccc.edu" <brian.egleston@fccc.edu>

Janice,

Sorry about the delayed response! I no longer work at the institution the study was completed at and don't have access to that data. Adding Brian, our statistician, who might be able to help.

Chris

From: Janice Galea <janice.galea.14@um.edu.mt>
Sent: Sunday, February 9, 2025 4:43 PM
To: D'Avella, Christopher <Christopher.DAvella@Pennmedicine.upenn.edu>
Subject: [External] Inquiry on medical article - The impact of an oncology urgent care center on health-care utilization

You don't often get email from janice.galea.14@um.edu.mt. Learn why this is important

[Quoted text hidden]

Janice Galea <janice.galea.14@um.edu.mt> 13 February 2025 at 19:44
To: "D'Avella, Christopher" <Christopher.DAvella@pennmedicine.upenn.edu>
Cc: "brian.egleston@fccc.edu" <brian.egleston@fccc.edu>

Dear Dr. D'Avella,

No worries at all! Thanks a lot, I truly appreciate that.

Kindest regards,
Janice
[Quoted text hidden]

Egleston, Brian <Brian.Egleston@fccc.edu> 26 February 2025 at 16:34
To: Janice Galea <janice.galea.14@um.edu.mt>, "D'Avella, Christopher" <Christopher.DAvella@pennmedicine.upenn.edu>

Hello Janice-

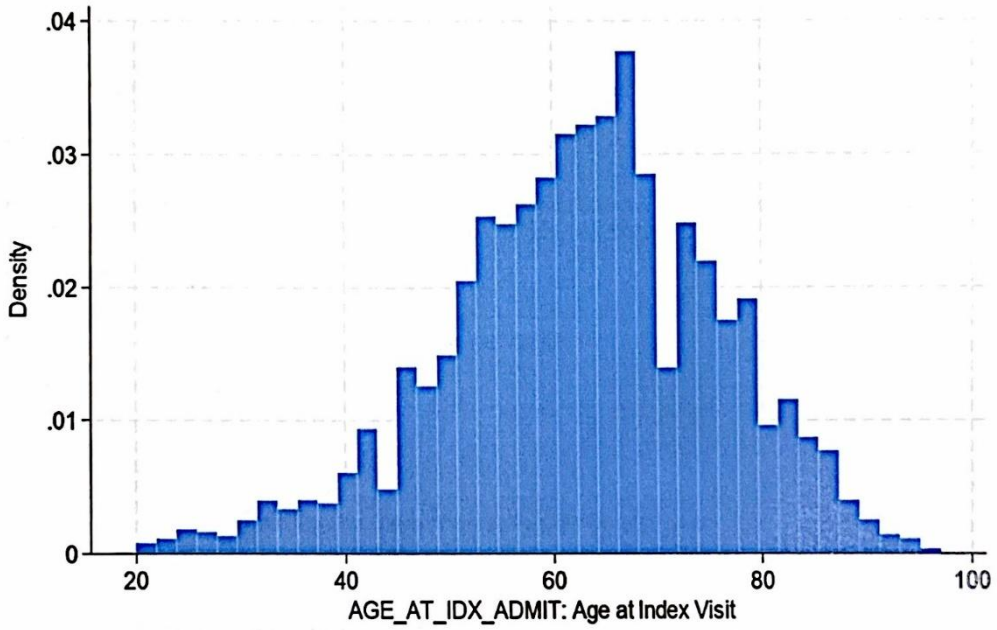
Sorry this took a while. The age range of the patients in our sample was 18 to 97 years old. In general, Fox Chase Cancer Center does not take care of minors. A histogram of the age distribution is also

below. Let me know if you need anything else.

Best, Brian Egleston

```
. summ age

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
age_at_idx~t |     13,114    62.69285    13.11017        18         97
```



From: Janice Galea <janice.galea.14@um.edu.mt>
Sent: Thursday, February 13, 2025 1:44 PM
To: D'Avella, Christopher <Christopher.DAvella@pennmedicine.upenn.edu>
Cc: Egleston, Brian <Brian.Egleston@fccc.edu>
Subject: Re: [External] Inquiry on medical article - The impact of an oncology urgent care center on health-care utilization

EXTERNAL sender! Do you TRUST this email? If you are unsure, send the email to InfoSec for review by using the Report Phish button.

[Quoted text hidden]

Appendix G – *Change of dissertation title*

L-Università ta' Malta

Janice Galea <janice.galea.14@um.edu.mt>

Dissertation title

10 messages

Janice Galea <janice.galea.14@um.edu.mt> 20 January 2025 at 14:14
To: paulann.grech@um.edu.mt
Cc: Roderick Bugeja <roderick.bugeja@um.edu.mt>, Marmara Danika at MHA - SAMOC <danika.marmara@gov.mt>, marthese.gauci@um.edu.mt, Research Ethics HEALTHSCI <research-ethics.healthsci@um.edu.mt>

Dear Prof. Paulann Grech,

Good morning, hope this email finds you well and in good health. I am sending you this email to kindly amend my dissertation title (MSc in Nursing Cancer Care cohort)

1. OLD TITLE: An audit of the provision of acute oncology services in Malta.
2. NEW TITLE: Emergency department to discharge pathways for oncology patients undergoing cancer treatment: A clinical audit
3. REASON FOR CHANGE: To bring more clarity on the content of the dissertation
4. A statement reflecting whether this change will affect the study design. The alteration in the wording of the title does not reflect a change in the study design.

Should you need further clarification please do not hesitate to contact me.

Thank you.
Kindest regards,
Janice

Paulann Grech <paulann.grech@um.edu.mt> 22 January 2025 at 11:10
To: Janice Galea <janice.galea.14@um.edu.mt>
Cc: Roderick Bugeja <roderick.bugeja@um.edu.mt>, Marmara Danika at MHA - SAMOC <danika.marmara@gov.mt>, Marthese Gauci <marthese.gauci@um.edu.mt>, Research Ethics HEALTHSCI <research-ethics.healthsci@um.edu.mt>

Dear Janice,

Your request for amendment in your dissertation title is approved oBo FREC. However, further approval is required from the Faculty Board. Your departmental secretary will forward your request to the board accordingly. Subsequently, we will update our records accordingly.

Best wishes,

Paulann

Prof. Paulann Grech

Department of Mental Health
Chairperson FREC - Faculty of Health Sciences
[Quoted text hidden]
The contents of this email are subject to ***these terms.***

Janice Galea <janice.galea.14@um.edu.mt> 22 January 2025 at 11:15
To: Paulann Grech <paulann.grech@um.edu.mt>
Cc: Roderick Bugeja <roderick.bugeja@um.edu.mt>, Marmara Danika at MHA - SAMOC <danika.marmara@gov.mt>, Marthese Gauci <marthese.gauci@um.edu.mt>, Research Ethics HEALTHSCI <research-ethics.healthsci@um.edu.mt>

Dear Prof. Grech,

Good morning, email noted. Thanks a lot for your kind explanation.

Kindest regards,