Falls in Community-dwelling Older Adults with Cancer: Impact on Cancer Treatment, Circumstances, Assessment, Management, and Reporting

by

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Falls are major health issues among older adults and even more so in older cancer patients due to cancer and its treatment. Knowledge on circumstances surrounding falls and fear of falling is vital for understanding how various factors may precipitate falls and for informing development of effective interventions to prevent falls in this population. Delays in cancer treatment caused by fall injuries may have significant implications on disease trajectory and patient outcomes. However, a systematic review found gaps in knowledge in terms of how falls impact cancer treatment in this population. The aim of this research was to explore the circumstances of falls and fear of falling in community-dwelling older adults with cancer, as well as to examine how falls are assessed, reported, and managed in outpatient oncology clinics, and how falls might impact cancer treatment in this population.

A cross-sectional study using a convergent-parallel mixed-methods design was conducted at the Princess Margaret Cancer Centre in Toronto, Canada. Data were collected by
self-reported survey, chart review, and open-ended interviews. One hundred older adults (aged \( \geq 65 \)) and 14 oncologists participated in this study.

Falls were not commonly reported by patients to their oncologists (43%), and were rarely assessed by oncologists (7%). One in twenty who fall appears to lead to change in cancer management. However, falls were not commonly reported by patients nor prioritized by oncologists. Older patients perceived falls as minor incidents not worth mentioning (57%). When a fall was reported, oncologists’ actions included determining cause of falls (64%), asking circumstances of falls (36%), and referrals (29%). Oncologists indicated that the majority of older patients were not forthcoming in reporting falls. Circumstances of falls seem to be similar to those in the general geriatric population. This research shows that incorporating routine fall assessment in oncology clinic appointments may help identify those at risk for falls so that timely interventions can be triggered. Additionally, strategies for fall prevention and management used in the general geriatric population can potentially benefit this population as well. Attention may be warranted regarding medication review, health-teaching on fall safety, home evaluation, and referral for balance training.
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Chapter 1
General Introduction

1.1. FALLS IN OLDER ADULTS

Falls are common among older adults and the incidence rises with increasing age (1). A fall, as defined by the World Health Organization (WHO), is “inadvertently coming to rest on the ground, floor, or other lower level, excluding intentional change in position to rest in furniture, wall, or other objects” (2). Each year, one-third of older adults living in the community experience a fall (2). Falls are attributed as the leading cause of hip fractures and nursing home placement (3) and the sixth leading cause of death among older adults (4,5). Approximately 1 in 10 falls result in serious injury, including, but not limited to, hip fracture, subdural hematoma, and traumatic brain injury (6). Every 17 seconds, an individual aged 65 years and over will fall and subsequently seek medical treatment in an emergency department (ED) (7). According to the U. S. Centers for Disease Control and Prevention, in 2013, 2.5 million older Americans were treated in ED for falls and over 734,000 of whom were hospitalized (7). The consequences of falls include not only severe injuries (e.g. fractures, intracranial hemorrhage) but also encompass nursing home placement, fear of falling and functional decline (8-10). It is important to note that even non-injurious falls could also place older individuals at higher risk for additional falls (11), as fear of falling again can result in activity restriction, depression, deconditioning, and further health and functional decline (11). Additionally, injurious falls are associated with increased risk of death and poorer quality of life (12,13).
1.2. FALLS IN OLDER ADULTS WITH CANCER

Falls in older adults living with cancer are of additional concern as cancer itself and some cancer treatments may bring unique risks of falling and fractures (14). Research hypothesized that falls in older cancer patients may lead to increased risks for injuries (15).

Falls can be more devastating for older cancer patients since cancer itself and certain cancer treatment modalities have been shown to affect bone health and could potentially lead to bone fractures that are pernicious and problematic. Bone malignancies and bone metastases are associated with disruption of bone-cell homeostasis and bone loss (16,17). Radiation therapy can cause interference in bone blood supply; in particular, the pelvic hip region is among the areas most vulnerable to radiation damage, which significantly increases the risk for hip and pelvic fractures in the event of a fall (18,19). It is well-established that chemical castration using androgen deprivation therapy (ADT), widely used to treat advanced or high-risk prostate cancer, and the use of aromatase inhibitors for breast cancer can result in osteoporosis and increased fracture risks (20-28). Research shows that prostate cancer patients using ADT for more than one year experience a 50% increase in bone fractures (29,30).

Additionally, certain cancer and cancer treatments can also result in thrombocytopenia which can lead to catastrophic hemorrhage in the event of a fall. Major bleeding episodes could also result in hospitalization and delays in treatment. In particular, older patients with cardiovascular disease and who are receiving anticoagulants are at compounded risk due to the combination of anticoagulation and decreased platelets (31).

Mucositis, a common complication of abdominal/pelvic radiation (32), and cytotoxic chemotherapeutic agents such as fluorinated pyrimidines, anthracyclines, and methotrexate
(33,34) can give rise to volume depletion related to dysphagia and diarrhea; older adults are especially at risk since diminished body water content and the associated changes in blood volume and blood pressure can contribute to fall risk. Additionally, fatigue, a nearly ubiquitous symptom in older cancer patients treated with chemotherapy and ADT/hormonal therapy, is associated with functional dependence, in particular, instrumental activities of daily living (IADL) (35); and IADL dependence has been shown to be a predictor of falls (36). Moreover, with increasing age, patients treated with chemotherapy agents such as alkaloids, taxanes, cisplatin, oxaliplatin, epipodophyllotoxins, and epothilones are more vulnerable to peripheral neuropathy (37) and may increase fall risks by compromising ADLs and IADLs (37). While loss of sensation in the upper extremities can give rise to dependence in basic activities of daily living (ADL) such as feeding, dressing, toileting, loss of sensation in lower extremities can contribute to ambulatory difficulties and falls. Anemia is of particular concern to cancer patients (38). Cancer and its treatment can give rise to anemia, and its risk increases with the progression of radiation therapy and chemotherapy (39). Older patients are more susceptible to hematological toxicity compared to younger patients (40). Evidence also suggests that chemotherapy-related anemia is linked to impairment of functional status (41), which, in turn, may portend falls.

Sarcopenia, the loss of skeletal muscle mass and function that accompanies aging (42), is known to be a contributor to frailty, falls, and loss of independence (43). The prevalence of sarcopenia among community-dwelling older adults is estimated to be around 25% (44). Muscle loss, which is common among cancer patients (45) and may result in balance problems (46), could be accelerated in older patients with cancer (27,47,48). Evidence suggests that men with sarcopenia are more likely to have experienced a fall within the past year; those with prostate cancer receiving ADT on a long-term basis have a high occurrence of functional impairments,
mobility issues, and falls due to increased fatigue, muscle weakness, and abnormal physical performance (48). Moreover, falls have also been found to be associated with increased risk of chemotherapy toxicity (49) and poorer survival (50) in older individuals with cancer, as functional problems may signal underlying issues which may indicate ability to tolerate chemotherapy treatment.

1.3. SIGNIFICANCE

The baby boomers started turning 65 years of age in 2010 (51). By 2030, the proportion of Canadians who are 65 years of age and above will increase to 25%, compared to the 16% in 2016 (52). According to the Canadian Cancer Society, the number of cancer cases is estimated to be more than double in adults 65 years of age and over (53). Cancer is a disease of aging, with individuals >65 years of age accounting for 60% of all newly diagnosed cancer and 70% of all cancer deaths (54). The age-adjusted cancer incidence rate is 2151/100,000 population for those >65 years of age compared to 208/100,000 for those <65 (54). As the population continues to age (55), concerns regarding falls and their sequelae in older cancer patients and their conceivable impact on cancer treatment will continue to be important issues confronting oncology care teams. Research shows that ninety percent of fractures are caused by falls (56). Therefore, as older cancer patients take up the majority of users of oncology services, oncology teams will be faced with the challenge of providing effective care for this growing population; how falls will impact cancer treatment will be one of the issues at the forefront on account of their potentially profound impact on cancer treatment and care plans. Understanding how a fall
impacts cancer treatment may help inform oncologists’ anticipatory care planning for this growing population. As well, understanding the circumstances of falls is key to the development and implementation of effective strategies and education interventions to mitigate falls and their potentially serious sequelae, and to inform care-planning and the development of support care-oriented services (57,58).

Although there is ample evidence on falls concerning the general geriatric population, data on falls in the geriatric oncology population is scant. First, there are currently no data on how falls may affect cancer treatments (e.g. treatment interruption, stoppage, cancellation, or change in type and/or dosage) within the geriatric oncology context (59). Data from studies conducted thus far are mostly limited to reporting types of fall injuries. Therefore, how falls impact cancer treatment and subsequent outcomes of the patients remain largely unknown. A fall may lead to injuries and hospitalization, and, in turn, could potentially lead to complications or delays in cancer treatment, which can have significant implications for cancer progression, as well as the survival trajectory of older cancer patients. Research shows that delay in cancer treatment was linked to a significantly higher risk of overall and cancer-related mortality among late-stage breast cancer patients (59). Even short delays in treatment (i.e. surgery, and/or radiation, and/or chemotherapy) were shown to be associated with a poor prognosis among patients diagnosed with non-small cell lung cancer (NSCLC) (60).

Second, there are few data on the circumstances of falls in geriatric-oncology (61). In order to develop relevant interventions and fall prevention strategies, it is imperative to acquire in-depth understanding of an important area such as circumstances surrounding falls. This includes activities at the time of the fall, circumstances preceding the falls (e.g. dizziness) as well as location of the fall. Such items can afford valuable insights into the physical function,
health status, as well as the individual’s perception of safety and ideas for interventions. This information is particularly important in older cancer patients due to their added vulnerability and activity restriction related to cancer and treatment, because, benign activities performed by healthy individuals in normal circumstances may be potentially dangerous in older cancer patients receiving cancer treatments.

Furthermore, there is not sufficient evidence to support that older cancer patients fall more often than their cancer-free counterparts (59). Underreporting of falls is a possibility; aside from referral bias (62) and simply forgetting, research in the general geriatric population shows that denial is a factor for underreporting among older individuals as it is common for them to attribute their falls to external, environmental factors rather than counting them as a “true” fall (63). Although research shows that many falls are preventable (58), there is currently little research in the geriatric oncology context that studies patients’ fall-reporting as well as oncologists’ efforts in assessing for falls.

Moreover, while research in the general geriatric population shows that there is no association between self-perceived fall risk and behaviours that are related to fall prevention (64), little is known about older adults with cancer in this aspect. Up to now, the issue of fear of falling and attitudes towards fall safety have not been researched in older adults with cancer. Data on fear of falling and perception on fall safety will create opportunities for education and inform fall safety interventions that are specifically tailored for older cancer patients receiving treatment. Given the great risk and cost/implication/consequences of falls in this population, it is imperative that we understand more about falls in the geriatric oncology context in order to inform targeted intervention to mitigate falls and its impact on older adults with cancer.
1.4. OBJECTIVES

This thesis focused on falls in older adults with cancer. Specifically, it aims to contribute to the literature by seeking to understand the impact of falls on cancer treatment in community-dwelling older cancer patients, the circumstances of their falls, and also fall reporting, assessment, and management in oncology clinics.

1.4.1. RESEARCH QUESTIONS

1) How do falls impact cancer treatment in community-dwelling older adults with cancer?

2) How are falls assessed and managed in oncology clinics?

3) What are the circumstances surrounding falls in this population?

4) What is the level of fear of falling (FOF) in the post-fall context in this population?

5) How do older patients report their falls?

6) How forthcoming are older patients in reporting falls from oncologists’ perspective?
1.5. STUDY DESIGN

1.5.1. Rationale for using a mixed methods design

Broadly speaking, there are three main methods or approaches for conducting research: quantitative, qualitative, and mixed-methods (65-67). One of the major strengths associated with the quantitative method is that it generates quantifiable data that may potentially be generalized to a larger population (66). However, a key weakness of the quantitative approach is that it often does not address the “why”. Often variables that could help explain phenomena are left out, and this methodology can decontextualize human behavior (66). According to Creswell and Plano-Clark (66), quantitative research is “weak in understanding the context or setting in which people talk…the voice of participants are not directly heard in quantitative research” (p.9). For instance, to understanding patients’ fall reporting, a yes/no answer may not be sufficient. To enrich the quantitative data and to add depth, additional data on patients’ perception about reporting fall and ‘why’ they did not report the fall is needed. A key strength of the qualitative methodology is that it bears the potential to create rich descriptions of participants’ thought processes and is inclined to focus on “why” a phenomenon arose (66). For example, in this study, qualitative methods could help explain patients’ fall reporting habits. However, qualitative methodology also comes with limitations. This method is often perceived as deficient by reason of “personal interpretation made by the researcher, the ensuing bias created by this, and the difficulty in generalizing findings to a large group because of the limited numbers of participants studied” (p.9).
By combining the two methodologies, the weakness of one method can be compensated by the strength of the other (66,69). According to Creswell and Plano-Clark (70), mixed methods research concerns the collection, analysis of both quantitative and qualitative data in one single study/series of studies. The central premise of mixed methods research is that the combination of quantitative and qualitative approaches can provide a better, more thorough understanding of the research problems compared to either approach alone (70). The mixed methods approach is a good fit for this study by virtue of the research questions, which concern not only the description of phenomena but also the exploration of the explanations/reasons behind them. For instance, Research Questions 2 and 5 sought to examine oncologists’ fall assessment and management, as well as older patients’ fall-reporting. In order to thoroughly understand this phenomenon, it is necessary to go beyond the ‘yes/no’ answer and delve deeper into the subject by exploring the reasons for assessing or reporting falls. Falls are major issues in older adults and should be adequately assessed and managed, especially for older patients. Therefore, it is necessary to first acquire an understanding of how falls are reported, assessed, and managed in this setting before proper recommendations can be formulated. The mixed methods design allowed for rich conceptualization of how falls are viewed and prioritized in oncology clinics from the perspective of older patients as well as their treating physicians. Therefore, the mixed-methods approach served the purpose of this study.
1.5.2. Convergent parallel design

This study used a convergent parallel design. In a convergent parallel design, quantitative and qualitative data are collected concurrently (in parallel) (70). The data are analysed independently before being merged for interpretation and discussion (70). The purpose of using a convergent design is to facilitate obtaining “different but complementary data on the same topic” (71). The choice of this particular design stemmed from the intention to achieve triangulation and completeness (70).

Triangulation

Triangulation allows for corroboration or divergence of results generated from the different qualitative and quantitative methods (70). For instance, to address the question about FOF – both quantitative and qualitative data were collected to look for corroboration and divergence. In other words, aside from quantitatively measuring the degree of fear of falling, qualitatively inquiring whether and how patients are taking steps to avoid further falls facilitated corroboration and divergence. This helped provide a more complete picture of patients’ FOF and their responses to this fear.

Completeness

Completeness allows for the augmentation and clarification of the results generated from one method with those generated from the other method (72). Collecting qualitative data on circumstances of falls helped augment the quantitative data. By collecting detailed, in-depth data on circumstances of falls, it helped enhance completeness of the picture and provided
contextual information about their falls, and, in turn, enriched the answer to the research question.

Weight

The priority or weight of each research strand can vary according to each individual research study (70). For this study, equal weight was given to the quantitative and qualitative strands.

Quantitative strand

The quantitative strand involved a cross-sectional survey of older cancer patients as well as medical chart review. According to Newman, Browner, and Cummings (73), cross-sectional design is particularly useful for describing phenomena/variables or for examining associations. The cross-sectional design was suitable for this study, which in part sought to describe impact of falls, circumstances of falls, FOF, and fall assessment and reporting in oncology clinics. See Figure 1 on p.12 for the convergent parallel mixed methods flowchart.

Qualitative strand

The qualitative strand involved open-ended interviews (with patients and oncologists separately) to collect data and sought to elaborate further on the quantitative survey. It also in part sought additional data for triangulating of the survey. The qualitative strand helped generate rich data regarding circumstances of falls, fall assessment and reporting, and FOF.
Research questions

1. What are the outcomes of falls in terms of impact on cancer treatment in community-dwelling older cancer patients?
2. How are falls assessed and managed in oncology clinics?
3. What are the circumstances surrounding falls in this population?
4. What is the level of fear of falling (FOF) in the post-fall context in this population?
5. Do older patients report their falls to their oncologists?
6. Are patients forthcoming in reporting falls from oncologists’ perspective?

Quantitative data collection
- Impact of falls on cancer treatment (patient survey, chart review) [RQ1]
- Oncologists’ fall assessment and management (patient survey, chart review) [RQ2]
- Circumstances of falls (patient survey) [RQ3]
- Level of fear of falling (patient survey) [RQ4]
- Patient’s fall reporting to oncologists (patient survey) [RQ5]

Qualitative data collection
- Impact of falls on treatment (oncologist interview) [RQ1]
- Fall assessment and management in oncology clinics (oncologist interview) [RQ2]
- Circumstances of falls (patient interview) [RQ3]
- Fear of falling (patient interview) [RQ4]
- Patient’s fall reporting (patient interview) [RQ5]
- Patients’ forthcomingness (oncologist interview) [RQ6]

Quantitative data analysis
- Descriptive statistics

Qualitative data analysis
- Thematic analysis

Merging/convergence of both sets of results
Integrated reporting of quantitative and qualitative results as they relate to impact on treatment, circumstances of falls, fear of falling, fall assessment and management, and patients’ fall reporting

Interpretation of the converged results
Discussion of how the results compared, contrasted, and complemented; and how together they produced a thorough understanding of the research questions

Figure 1. Convergent Parallel Mixed Methods Flowchart
Falls were assessed retrospectively for 12 months. The method of data collection included patient self-reported survey with nested open-ended questions (to ensure minimal burden), chart review and oncologist open-ended interview. Further details on data collection will be described in section 1.5.6 on p.17. See Table 1 below for an overview of data collection.
Table 1. Overview of data collection

<table>
<thead>
<tr>
<th>Research question</th>
<th>Quantitative data collection</th>
<th>Qualitative data collection</th>
<th>Benefit of using mixed methods approach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Patient self-report survey</td>
<td>Chart review</td>
<td>Patient interview</td>
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<tr>
<td>Research Q.1 – Impact of falls on treatment</td>
<td>✓</td>
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<tr>
<td>Research Q.2 – Oncologists’ fall assessment and management</td>
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<td>Research Q.3 – Circumstances of falls</td>
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<td>Research Q.4 – Fear of falling</td>
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<td>Research Q.5 – Older patients’ fall reporting</td>
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1.5.3. THEORETICAL UNDERPINNING/THEORETICAL FRAMEWORK

The impetus for mixing quantitative and qualitative models of research into one single study is the philosophical rationale of pragmatism. Pragmatism refers to the belief in choosing to do what works best to achieve the desired results (74). This underlying philosophy of inquiry supports researchers in deciding the best model of inquiry, with the research questions being addressed inherently determining which method is best suited (74). In other words, addressing the research questions with whatever methods that are the most appropriate is fundamental to mixed methods research (70). The pragmatic philosophical framework that underpinned this study allowed the systematic application of appropriate quantitative and qualitative methods to answer these research questions.

1.5.4. SAMPLE SIZE

Ideally, the number of cancer treatment plans impacted by falls should be used to guide the sample size calculation. However, this is the first known study that explored the impact of falls on those in cancer treatment. According to Castro et al. (76), sample size determination in mixed methods research calls for a broad integrative perspective. Such perspective entails balancing qualitative considerations that favor small, manageable samples for in-depth analysis (e.g. n= 20-40) against quantitative considerations that favor larger sample sizes (e.g. n= 40-200) for conducting reliable inferential statistical analyses. This study initially planned to recruit 60 patients to explore and describe the impact of falls on cancer treatment, circumstances of falls, as well as how falls are assessed, managed, and reported in this setting. However, the sample
size was modified to 100 to improve the opportunity to identify the impact of a fall on cancer treatment. An amendment to request for the change was submitted to and approved by the Research Ethics Boards (REB) of the University Health Network (UHN) and the Department of Health Sciences at the University of Toronto. The anticipated response rate was approximately 70% based on existing literature in this population (77).

1.5.5. RECRUITEMENT PROCEDURE

Clinic nurses and oncologists at the medical and radiation oncology clinics, and the Older Adults with Cancer Clinic (OACC) were approached on a daily basis during the clinic days (Monday through Friday) between October 27, 2016 and November 29, 2017 to inquire about availability of potential candidates. Potential candidates who fit the inclusion criteria were asked by clinical staff for permission to be approached by the researcher to explain the study. Patients who agreed were approached while waiting to be seen or after being seen by the oncologist and were invited to participate in the study. Additionally, posters were strategically placed in oncology clinics and chemo daycare area to advertise the study in order to capture those who had a fall but did not report the falls to their oncologists.

Details of the study, including the purpose, logistics, timeline, benefits, and risks, and what participating would entail, were explained clearly to interested candidates in order to ensure fully informed consent. Each patient who agreed to participate then signed the approved consent form prior to entering the study. Two copies of the consent form (see Appendix A) were signed by each participant and the researcher; one was given to the
participant and the other was retained by the researcher for record keeping. The informed consent procedure also included obtaining permission from the participants to access their electronic medical records and to contact their oncologists for further information pertaining to impact of fall(s) on cancer treatment. The collection of multiple sources of data is important within the context of a retrospective study design, which has been shown to be prone to recall bias (78). All of the participants’ oncologists were invited to participate in the study via email invitation from the researcher. If a participant had more than one oncologist, the primary oncologist involved in his/her care (as identified by the patient) was invited to participate. Recruitment of oncologists for interview occurred after patient recruitment and data collection (including patient survey and chart review) was completed in order to minimize burden on those who had multiple patients who participated in this study.

1.5.6. DATA COLLECTION

Data were collected via a one-time patient self-reported survey with embedded interview, chart review, and oncologist open-ended interview. For descriptive purposes, the survey collected sociodemographic information (i.e. age, gender, years of education, and living arrangement) as well as functional status (IADL), use of walking aids, medication use, and cancer and treatment history. Moreover, questions pertaining to falls, including number of falls, location and timing of falls, activities and sensations preceding the fall(s), whether the fall(s) resulted in injuries, and current FOF were also asked. Additionally, (if applicable), information on type of injuries, whether the fall had been reported (e.g. family physician, oncologist, etc.), whether medical attention was sought, and whether and how cancer treatment was affected
were also collected. The fall history assessment was based on the American Geriatrics Society/British Geriatrics Society (AGS/BGS) Clinical Practice Guideline (79). The time taken for participants to complete the entire survey ranged from 20 to 30 minutes. Chart review for each participant was completed immediately after the survey and interview had been completed. To minimize burden for oncologists, oncologist recruitment and interviews occurred after all patient recruitment had been completed so that those who had multiple patients in the study were not invited multiple times at different time points. As there was no existing tool for answering the research questions in this study, the tool and questions were developed with the expert consensus of members of the dissertation committee. Additionally, circumstances of falls were asked based on recommendations of the AGS/BGS Falls Guideline (79).

1. Patient self-reported survey: Sociodemographic information, medications, function, treatment history, and fall characteristics

   After informed consent was obtained, participants filled out a questionnaire which included questions regarding demographics and characteristics with the researcher’s assistance (please see Appendix B). Patients were offered the options to fill out the quantitative portion of the survey themselves, with the researcher’s assistance, or completing it verbally (with the researcher asking the questions and writing down the answers). Ensuring flexibility is important in conducting research concerning older adults in order to accommodate their different functional needs as well as personal preferences (80). For instance, patients with manual dexterity difficulties or visual impairment would benefit from an interviewer-administered
survey; whereas patients with hearing difficulties would likely prefer written, self-administered survey. The qualitative component of the survey (i.e. the open-ended questions related to Research Questions 3, 4, and 5) were conducted in the form of a short interview, with the researcher asking the specific questions and the patients answering verbally. However, patients were offered the choice of answering the open-ended questions in writing if they wished to. For those patients who chose to have the open-ended question interview recorded, the interviews were audio recorded (with permission). For those who declined audio recording (n=22), handwritten notes were made during the interview.

Measures

Attitudes toward fall safety

The Fall Efficacy Scale-International (FES-I) (81) was used to assess for the current attitude toward fall safety. This 16-item instrument was developed to measure FOF easily, as well as more challenging physical and social activities, such as walking on slippery, uneven, or sloping surfaces; going to a social event; going to a place that has crowds; and visiting friends or relatives. The level of concern regarding partaking in these activities was rated on a 4-point Likert scale (from 1 = not at all concerned to 4 = very concerned) (81). Scores >23 indicated high concern about falling (82). The FES-I has demonstrated excellent internal consistency (Cronbach’s alpha 0.96) and test-retest reliability (ICC = 0.96) in a community dwelling population (82). This tool has been used on different samples in various countries (83), including in older cancer populations in Canada (84). Another advantage of this tool is that it is socially acceptable and older individuals are more likely to disclose because it uses the word
‘concern’ about falling, which is closely related to fear and yet does not sound overly dramatic or emotional (81).

Circumstances surrounding falls

An individual’s activity at the time when the fall occurs has long been established as an important component in evaluating falls (85). Therefore, information regarding situational factors such as activities and location of fall can offer a glimpse of health status, physical function, as well as attitude towards fall safety. As per the Clinical Practice Guideline by the AGS/BGS (79), the 99-item survey questionnaire contained a component that explored falls in terms of the circumstances surrounding the falls, physical symptoms (e.g., dizziness, weakness, fatigue) preceding the fall(s), and the activity and physical environment at the time of the fall(s). (These questions were in the same survey as shown in Appendix B). As mentioned, to enrich data in this aspect, patients were also asked to elaborate the circumstances of their falls during the open-ended question interview.

Functional status

Functional status was assessed using the 7-item, validated Older Americans' Resources and Services (OARS) IADL scale (86), This instrument covers tasks necessary for independent living in the community, including telephone use, shopping, travelling, meal preparation, housekeeping, taking medications, and managing finances. It is rated on a 3-point Likert scale that measures the degree to which a task can be accomplished independently (2 points), with help (1 point), or completely unable (0 point). A total score of <2 on any item indicated IADL impairment (86).
2. Oncologist interview: Impact of falls on treatment, fall assessment, management, and reporting

With consent from participants, treating oncologists of participants were recruited and invited to complete a brief, open-ended interview (over the phone or in-person, based on each oncologist’s preference). The interview explored oncologists’ perceptions regarding how forthcoming older patients are in general in terms of fall-reporting. Additionally, oncologists were also asked how they assessed and managed falls in their oncologist clinics. Moreover, for those oncologists who had patient-participants with impacted treatment due to falls, these oncologists were also asked to share their insights in regard to how the fall and injury had altered the treatment plan and also the implications on the patients’ disease trajectory. For those patient-participants whose oncologists declined to participate, such participants were not excluded from the study (please see Appendix C for oncologist consent form and Appendix D for oncologist interview guide).

3. Chart review form

Comorbidities

For descriptive purposes, each patient’s chart was reviewed to collect information on numbers and types of comorbidities that were documented.
Cancer-related information

Information such as cancer diagnosis and stage were obtained from the patient’s chart. The Tumor Node Metastasis (TNM) staging system was utilized (87) to categorize cancer stages for solid tumours. Leukemia was classified based on the WHO classification system (88). The Ann Arbor Staging system (89) was used for classifying staging for lymphoma, and the Revised International Staging System (RISS) (90) was used for multiple myeloma. Treatment received, including type, class, line of treatment and drug name were obtained from the patients’ charts. Treatment was stratified as having received chemotherapy, radiation, or targeted therapy/biological therapy in combination with chemotherapy, or hormonal treatment; and by treatment intent (curative, palliative). For chemotherapy, type of treatment (i.e. neoadjuvant, adjuvant, or palliative) and classification of chemotherapeutic agents received (i.e. Alkylating agents, Antimetabolites, Anti-tumor antibiotics, Topoisomerase inhibitors, and Mitotic inhibitors); for radiation therapy, classification (i.e., External Beam Radiation Therapy [EBRT] or Internal Radiation Therapy [Brachytherapy]); for hormonal therapy, type of drug (e.g. tamoxifen and aromatase inhibitors) were recorded (91). Moreover, information such as documentation of treatment-related neuropathy and documentation of oncologists’ actions in response to the falls reported were also obtained from the chart for descriptive purposes. Please refer to Appendix E for Chart review form.
1.5.7. COMPENSATION

All patient-participants and oncologist-participants received a $10 gift card to Tim Hortons upon completion of their survey and interview (interview only for oncologists) as a token of appreciation for their time.

1.5.8. DATA HANDLING AND ANALYSIS

Data handling

All quantitative data were entered into IBM SPSS Version 23.0 (Chicago) for data analysis. Audio recordings from the qualitative interviews were transcribed verbatim. The de-identified data were stored simultaneously in an encrypted laptop in a locked cabinet in the dissertation supervisor’s office at the Lawrence S. Bloomberg Faculty of Nursing (LSBFON) at the University of Toronto, as well as in the faculty’s Research Department’s secured server. Participants’ surveys and chart review forms were stored in a locked cabinet in the research office at the University Health Network.

Data analysis

As alluded to above, the quantitative and qualitative data collected in parallel were analyzed independently using traditional techniques for each type of data before they were merged (convergence) in the interpretation and presentation of the results (79,75).
Quantitative analysis

Descriptive statistics (frequencies and proportions) were used for older participant characteristics (e.g. sociodemographic information, comorbidities, cancer and treatment related information, medications, performance status, fall history, oncologist-reported depression), number of falls, number of injurious falls, types of injuries, and number and proportions of cancer treatment interruptions and the types and lengths of treatment interruptions. Descriptive statistics were also used to analyze fall reporting, assessment and management, FOF, as well as circumstances of falls.

Qualitative analysis

Qualitative data collected from the open-ended question interviews (patients and oncologist interviews) were analysed using thematic analysis (94). To ensure rigor of the analysis, the 6-phase step-by-step guide to conduct thematic analysis as outlined by Braun & Clarke (95) was followed:

1. Familiarizing with the data (transcribing, reading and re-reading, and noting down ideas);
2. Generating initial codes (in a systematic manner, coding interesting features within the data in the data set and collating data that are relevant to each specific code);
3. Searching for themes (collating codes into potential themes);
4. Reviewing themes (examine themes to ensure they are relevant to the coded extracts; generate a thematic map);
5. Defining and naming themes (refine themes by means of ongoing analysis; generate clear definition for each theme identified); and
6. Producing the report.

1.5.9. DATA CONVERGENCE

The converging of the multiple sources of data occurred after all quantitative and qualitative analyses were completed. The converging/integrating of the data was facilitated using the meta-matrix, which is a tool for triangulation (96). The meta-matrix approach helps assemble and manage data in mixed methods studies in particular when there is a need to display a data set for triangulation. The meta-matrix is also useful when data sets are complex or are from different sources (96). The integrated reporting of results from all sources contributed to an enriched interpretation of results from each source. For instance, if quantitative results from the survey indicated that falls were not reported to healthcare providers, the qualitative results from the open-ended interviews could help explain ‘why’. Moreover, convergence also lends the opportunity for triangulation of findings. Triangulation allows for clarification the trustworthiness of findings with multiple data sources (97) and, thus, enhanced credibility of the results (97,98). Data on impact on cancer treatment from the three sources (oncologist interview, patient self-report survey, and chart review) were triangulated. Furthermore, triangulation provided opportunity for corroboration and for detecting discrepancies (99).

For those research questions that involved collecting data from more than one source, data analyses done separately before they were linked and/or compared. Any similarities or differences were highlighted and reported in findings.
Emerging research uses a multiple perspective approach to generate richer understanding of topics of interests (92,93). Multi-sourced data provided by different stakeholders in the research are compared and contrasted (e.g. patients, caregivers, health care professionals etc.). This approach has been shown to be useful for understanding of relationships and dynamics and for facilitating comparison of perceptions of different parties (93). This is a unique feature of this study and is of value in helping augment data in terms of patients’ fall-reporting patterns as well as oncologists’ fall assessment habits.

As mentioned above, for patients whose oncologists declined to participate, the patients’ data were not excluded from data analysis. However, for patients who had had fall-related injuries and subsequent treatment interruptions, oncologists’ declining participation meant certain analyses could not be performed. Specifically, oncologists’ insight into how the treatment interruption might have affected the patients’ disease progression were left uncaptured.

1.6. QUALITY OF THIS MIXED METHODS STUDY

To ensure quality and rigor, the Good Reporting of a Mixed Methods Study (GRAMMS) framework (100) was used to guide this study at every stage of its development (i.e. planning, execution, analysis, interpretation). Additionally, for all data collection, data entry and analyses, data quality and interpretive rigor was ensured by following procedures as described and in adherence with the traditions of both quantitative and qualitative methodologies. To further ensure rigor, documentation of all stages of the data analysis process was performed. Lastly,
documentation of themes, sub-themes, as well as early summaries were shared with the 
doctoral committee members for validation and discussion.

1.7. ETHICS APPROVAL AND INFORMED CONSENT

Prior to beginning data collection, the research protocol, along with related materials, 
including patient consent form, information sheet detailing the study (for oncologists), a copy 
of the patient survey, and a copy of the interview guides were submitted for approval from the 
Research Ethics Board at the University Health Network (UHN) and the University of Toronto 
Health Sciences Research Ethics Board. Potentially interested study participants for the study 
were provided full disclosure about the study in order to ensure informed consent. 
Participation in the study was completely voluntary and participants could withdraw from the 
study at any time; all potentially interested candidates for the study were informed as such 
prior to their consent. Two identical copies of the consent forms were signed by the researcher 
and by each participant; one of which was provided to the participant. See Figure 2 below for 
the flow of participants and Figure 3 for the flow of oncologists.
Figure 2. Flow of participants through recruitment

Figure 3. Flow of oncologists through recruitment

*2 of whom had patients (n=2) with impact on treatment
**2 of whom had patients (n=3) with impact on treatment
1.8. OUTLINE OF THIS THESIS

This thesis contains 5 chapters. Chapter 2 presents a systematic review on the prevalence of falls, injurious falls, and the impact of falls on cancer treatment in the older population. This chapter is particularly concerned with identifying the pertinent gaps in knowledge concerning falls in older adults with cancer.

Chapter 3 describes the results of a mixed-methods study that examined the impact of falls on cancer treatment in community-dwelling older cancer patients. Additionally, it also reports on findings regarding FOF, how oncologists assess for and manage falls, and oncologists’ perspective on whether older patients are forthcoming in reporting falls. Furthermore, it explores the reasons for not reporting falls to their oncologists. Research Questions 1, 2, 5 & 6 are addressed in this chapter. These findings provide insights into the attitude about falls from the perspective of older patients and oncologists.

Chapter 4 reports on findings regarding FOF and circumstances of falls in older adults with cancer in the same mixed-methods study. Research Questions 3 and 4 are addressed in this chapter, which reports on not only how falls happened but also provides context in terms of sensation, activities at the time of the falls, as well as the older participants’ FOF.

Chapter 5 summarizes the main findings of the study, provides substantive discussion of the findings and conclusions, limitations of the study, as well as directions for clinical practice and future research.

Chapters 2 to 4 were written as separate articles for publication in scientific journals. Some overlap in the chapters may exist in terms of research methodology/design.
References


83. Kempen GIJM. Cross-cultural validation of the Falls Efficacy Scale International (FES-I) in older people: Results from Germany, the Netherlands and the UK were satisfactory. Disabil Rehabil. 2007 Jan 1;29(2):155–62.


91. Management of cancer in the older patient [Internet]. St. Louis, Mo.: Elsevier/Saunders; 2012 [cited 2018 Jan 17]. Available from:


Chapter 2
Falls in Older Adults with Cancer: A Systematic Review of Prevalence, Injurious falls, and Impact on Cancer Treatment

2.1. ABSTRACT

**Purpose:** The purpose of this systematic review was to update and expand the existing systematic review with the aim to answer the following questions: 1) How often do older adults (OA)s with cancer fall? 2) What are the predictors of falls in OA with cancer? 3) What is the rate of injurious falls and predictors of injurious falls in OA with cancer? 4) What are the circumstances and outcomes of falls in this population? 5) How do falls in cancer patients affect subsequent cancer treatment?

**Methods:** Medline, Pubmed, Embase, and CINAHL were searched. Eligible studies included clinical trials, cross-sectional, cohort, case-control, and qualitative studies in which the entire sample or a sub-group of the sample were OA aged 60 and above, had cancer, in which falls were examined as a primary or secondary outcome and published in English.

**Results:** Twenty-seven studies met our inclusion criteria with most involving the outpatient setting. Fall rates and injurious fall rates varied widely. Consistent predictors of falls were prior falls among outpatients and cognitive impairment among inpatients. There were no data on impact of falls on cancer treatment. Data on circumstances of falls were limited.

**Conclusion:** Falls and fall-related injuries are common in older cancer patients. However, little is known about circumstances of falls and impact of falls on cancer treatment. Many known fall predictors in community-dwelling OA have not been explored in oncology. More research is needed to address gaps in these areas.
Keywords: falls, systematic review, geriatric oncology, cancer treatment
2.2. INTRODUCTION

Falls are common among older adults and portend serious consequences (1,2). One-third of individuals aged 65 years and above experience a fall at least once a year (3); up to half of those fall recurrently (4–7). Approximately 1 in 10 falls result in serious injury including, hip fracture, subdural hematoma, and traumatic brain injury (8–10). Every 17 seconds, an individual aged 65 years and over will fall and subsequently seek medical treatment in an emergency department (11).

Falls in older adults living with cancer are of additional concern, as cancer disease and treatment may bring unique risks, in particular falls with injuries (12–23). The consequences of falls may extend beyond injuries and hospitalization to encompass delays in delivery of and complications from cancer treatments, which, in turn, may alter the trajectory of the disease progression, care planning, and prognosis. Since cancer is a disease of aging (20), as the population continues to age and as the incidence of cancer in older adults is expected to increase (24), falls in this population and their impact on cancer treatment will continue to be important issues confronting oncologists. Understanding of fall predictors, how and when older patients fall, and how falls can impact cancer treatment are key to informing the development of strategies to target modifiable risk factors to mitigate falls and their potentially serious sequelae.

A systematic review by Wildes et al. (25) concluded that falls in older adults with cancer may be more common than in the general population. In addition, dependence on activities of daily living (ADL), prior history of falls (outpatient setting) and brain metastases (inpatient
setting) were some of the predictors for falls in this population. However, little is known regarding circumstances surrounding falls (e.g. what happened at the time of the fall, location of the fall, activity at the time of the fall, and time of day, etc.), outcomes of the falls, and impact on cancer treatment. Therefore, the purpose of the current systematic review was to update and expand the existing systematic review with the aim to answer the following questions:

1) How often do older adults (OA) with cancer fall?
2) What are the predictors of falls in OA with cancer?
3) What is the rate of injurious falls and predictors of injurious falls in OA with cancer?
4) What are the circumstances and outcomes of falls in this population?
5) How do falls in cancer patients affect subsequent cancer treatment (i.e. treatment delay, dose-reduction, treatment discontinuation, and/or any other treatment modifications)?

2.3. METHODS

2.3.1. PATIENTS AND SAMPLE

Search strategy and selection criteria

This review entailed a systematic and comprehensive search of Medline (including Medline-in-process), Embase, Pubmed, and CINAHL, from inception to the 3rd week of September, 2015. The Cochrane review guidelines (26) and the PRISMA statement were followed (27). Eligible studies encompassed clinical trials, prospective or retrospective cohort
studies, case-control studies, cross-sectional studies, and qualitative studies, in which falls was examined or reported as a primary or secondary outcome, and in which either all patients had a diagnosis of cancer or a subgroup analysis of those who had cancer was conducted. A study was deemed eligible if published in English. The mean age of the study population had to be ≥60 years or above or include a subgroup analysis of older individuals with a mean age ≥60.

The search was conducted by the expert librarian on our team (RF). Keywords or free-text words were utilized in combination with appropriate subject headings and included: cancer/neoplasm AND aged 60 and older AND falls/accidental falls. Please see the PRISMA flow diagram in Figure 1 and the Medline search strategies in online Supplementary Appendix A.

Two study authors independently scanned the titles and abstracts of articles and selected studies for subsequent full text review (SS and MP). When multiple articles reporting similar results were encountered, the article containing more detailed or current information was retained. Reference lists of selected articles were also reviewed to search for additional articles. When an article referred to additional publications to obtain further details concerning study methods, these were retrieved and reviewed.

Please see Fig. 4 for the PRISMA flow diagram on p.53 and the Medline search strategies in Table 2 below.
Table 2. MEDLINE search strategies

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2.3.2. DATA ABSTRACTION

Information abstracted included study aim, design, and location, sampling method, sample size, source of data, recruitment type, characteristics of participants, method of fall assessment and ascertainment, cancer diagnosis and treatment, fall rate (stratified by settings – as we anticipated fall rate to be higher in the inpatient setting due to the higher number of ill patients in this setting; study designs; and treatment status), fall predictors examined,
circumstances surrounding the fall, outcomes of fall, impact of the fall on cancer treatment, and details of statistical analysis. In terms of identifying independent fall predictors, only findings adjusted for either age or gender or both, were included, since age and gender are well-established, non-modifiable risk factors for falls (28). As well, a predictor was included only if it had been examined in at least two prospective studies in a given setting (associations or correlations from retrospective studies were excluded). Findings were considered consistent (either significant or non-significant) if two or more included studies reported the same direction of the relationship (e.g. protective or risk factor for falls). For all articles with missing details, corresponding authors were contacted via email to request the information. Data were extracted using a standardized Microsoft Excel sheet by the same two authors independently.

2.3.3. QUALITY ASSESSMENT

Both qualitative and quantitative research studies were eligible for inclusion. Therefore, we utilized the Mixed Methods Assessment Tool (MMAT) for quality assessment (29). The MMAT is designed for scoring mixed studies reviews and research studies of mixed methods designs and, according to the authors, this tool has so far been used worldwide for critical appraisal of over 50 systematic mixed studies reviews. This user-friendly scoring system has the capacity to evaluate five types of studies: quantitative randomized controlled trials, quantitative non-randomized, mixed methods, quantitative descriptive, and qualitative studies. Due to the distribution of the types of studies in the current review, there were not sufficient representation in some of the categories; therefore, it was not feasible to stratify them based on quality and perform a sensitivity analysis. In this review, the quality assessment was
therefore intended to provide a comprehensive overview of the quality of the studies and to highlight any potential weaknesses. No study was excluded from the review based on quality as the authors would like to provide a comprehensive overview. See Table 3 below.
### Table 3. Quality assessment using the Mixed Methods Appraisal tool

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</tr>
<tr>
<td>Capone</td>
<td>case-control</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Chen</td>
<td>cohort</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Flood</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Gewandter</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>First author</td>
<td>Type of study</td>
<td>Screening questions:</td>
<td>Quantitative non-randomized</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------</td>
<td>-----------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Gewandter$^{25}$</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Goodridge$^{26}$</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Guerard$^{28}$</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hussain$^{48}$</td>
<td>cohort</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Luce$^{46}$</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mariano$^{45}$</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mohile$^{55}$</td>
<td>cohort</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Overcash$^{17}$</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Overcash$^{18}$</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>First author</td>
<td>Type of study</td>
<td>Screening questions:</td>
<td>Quantitative non-randomized</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------</td>
<td>-----------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Overcash$^{39}$</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pautex$^{49}$</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pearse$^{20}$</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Potter$^{22}$</td>
<td>cohort</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Puts$^{34}$</td>
<td>cohort</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
As there were no randomized studies, quantitative non-randomized or mixed methods studies, these criteria are not included in the table.

<table>
<thead>
<tr>
<th>First author</th>
<th>Type of study</th>
<th>Screening questions:</th>
<th>Quantitative descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spoelstra 40</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Spoelstra 41</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Stone 30</td>
<td>cohort</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Vande Walle 31</td>
<td>cohort</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ward 32</td>
<td>cohort</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Williams 43</td>
<td>cross-sectional</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>To 42</td>
<td>descriptive</td>
<td>Can’t tell</td>
<td>Yes</td>
</tr>
</tbody>
</table>
2.4. RESULTS

Please see Figure 4 for the flow chart. Initially, 6770 titles were screened and duplicates were removed. In the next step, 6577 titles and abstracts did not meet the inclusion criteria and were removed, and 56 were kept for full text review. Twenty-nine studies did not meet the inclusion criteria and were removed (reasons are shown in Figure 4 below). Twenty-seven manuscripts reporting on 27 unique studies that examined falls in older persons with cancer were included in this review.

![Flowchart of study selection](image)

**Figure 4.** PRISMA flow diagram of study selection
2.4.1. QUALITY ASSESSMENT

Overall, the quality of included studies was good, with clearly described methodology, acceptable response rates, and sampling strategies that ensured representativeness of population. Among the quantitative studies in which response rates were indicated, only one was below 60% (30). Loss-to-follow-up ranged from 13% (31) to 42% (32). For the one qualitative study (33), information on details of data analysis was lacking; and issues concerning reflexivity were not discussed. Characteristics of the 27 included studies are shown in Tables 4 and 5 below.
<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Type of Study</th>
<th>Sample Size</th>
<th>Response rate</th>
<th>Type of Cancer</th>
<th>Type of cancer treatment</th>
<th>Age</th>
<th>Setting/source of data</th>
<th>Falls assessment: retrospective or prospective</th>
<th>How falls were assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bylow et al.</td>
<td>2008</td>
<td>Prospective observational</td>
<td>50 (initial assessment) 40 (second assessment)</td>
<td>N/A</td>
<td>Prostate</td>
<td>ADT</td>
<td>Median 78</td>
<td>Outpatient</td>
<td>Retrospective and Prospective</td>
<td>CGA falls screening</td>
</tr>
<tr>
<td>Capone et al.</td>
<td>2012</td>
<td>Retrospective case-control</td>
<td>288</td>
<td>N/A</td>
<td>Hematology with or without bone marrow transplantation, solid tumor, brain tumor</td>
<td>Any</td>
<td>Mean 60.9 (SD 13.7)</td>
<td>Inpatient</td>
<td>Retrospective</td>
<td>Online event reporting tool completed by nurse managers</td>
</tr>
<tr>
<td>Chen &amp; Janke</td>
<td>2014</td>
<td>Prospective observational</td>
<td>1630</td>
<td>74%</td>
<td>Any (excluding skin)</td>
<td>NR</td>
<td>Mean 75 (SD 7.05)</td>
<td>Community</td>
<td>Retrospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>Flood et al.</td>
<td>2006</td>
<td>Retrospective observational</td>
<td>119</td>
<td>100%</td>
<td>Primary oncologic or hematological diagnosis</td>
<td>NR</td>
<td>Mean 74.1 (5.9)</td>
<td>Inpatient</td>
<td>Retrospective</td>
<td>Medical Data</td>
</tr>
<tr>
<td>Gewandter et al.</td>
<td>2013</td>
<td>Cross-sectional</td>
<td>421</td>
<td>NR</td>
<td>Varied</td>
<td>Chemo therapy</td>
<td>Mean 60 (range 28-86)</td>
<td>Outpatient</td>
<td>Retrospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>Gewandter et al.</td>
<td>2015</td>
<td>Cross-sectional</td>
<td>174 (150 had fall data)</td>
<td>NR</td>
<td>Varied</td>
<td>Varied</td>
<td>Median 80 (range 76-85)</td>
<td>Outpatient</td>
<td>Retrospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>Goodridge &amp; Marr</td>
<td>2002</td>
<td>Retrospective observational</td>
<td>357</td>
<td>N/A</td>
<td>Any</td>
<td>NR</td>
<td>Mean 70.9 (SD 12.9)</td>
<td>Inpatient</td>
<td>Retrospective</td>
<td>Incident report forms</td>
</tr>
<tr>
<td>Guerard et al.</td>
<td>2015</td>
<td>Cross-sectional</td>
<td>528</td>
<td>N/A</td>
<td>Any</td>
<td>NR</td>
<td>Median 71</td>
<td>Outpatient</td>
<td>Retrospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>Author</td>
<td>Year</td>
<td>Type of Study</td>
<td>Sample Size</td>
<td>Response rate</td>
<td>Type of Cancer</td>
<td>Type of cancer treatment</td>
<td>Age</td>
<td>Setting/source of data</td>
<td>Falls assessment: retrospective or prospective</td>
<td>How falls were assessed</td>
</tr>
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<td>----------------------------------------</td>
<td>---------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Hussain et al.</td>
<td>2010</td>
<td>Observational</td>
<td>260</td>
<td>NR</td>
<td>Prostate</td>
<td>Three groups (ADT; no ADT; healthy older adults)</td>
<td>Mean 68-69</td>
<td>Outpatient</td>
<td>Prospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>Luce et al.</td>
<td>2012</td>
<td>Cross-sectional</td>
<td>211</td>
<td>NR</td>
<td>Any</td>
<td>NR</td>
<td>Mean 78 (SD 6)</td>
<td>Inpatient/Outpatient</td>
<td>Retrospective</td>
<td>CGA falls screening</td>
</tr>
<tr>
<td>Mariano et al.</td>
<td>2015</td>
<td>Cross-sectional</td>
<td>90</td>
<td>63%</td>
<td>Any</td>
<td>NR</td>
<td>Mean 77 (± 6.3)</td>
<td>Inpatient</td>
<td>Retrospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>Mohile et al.</td>
<td>2011</td>
<td>cohort</td>
<td>12480</td>
<td>N/A</td>
<td>Any</td>
<td>NR</td>
<td>Mean 76</td>
<td>Medicare Current Beneficiary Survey</td>
<td>Retrospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>Overcash</td>
<td>2007</td>
<td>Cross-sectional</td>
<td>165</td>
<td>N/A</td>
<td>Any</td>
<td>Any</td>
<td>Mean 77.6</td>
<td>Community</td>
<td>Prospective</td>
<td>AGS guidelines using the Kellogg International Work Group definition of falls</td>
</tr>
<tr>
<td>Overcash &amp; Beckstead</td>
<td>2008</td>
<td>Cross-sectional</td>
<td>352 (297 had cancer)</td>
<td>N/A</td>
<td>Any (except skin)</td>
<td>Chemo therapy or none</td>
<td>Mean 78-80</td>
<td>Outpatient</td>
<td>Retrospective</td>
<td>CGA falls screening</td>
</tr>
<tr>
<td>Author</td>
<td>Year</td>
<td>Type of Study</td>
<td>Sample Size</td>
<td>Response Rate</td>
<td>Type of Cancer</td>
<td>Type of cancer treatment</td>
<td>Age</td>
<td>Setting/source of data</td>
<td>Falls assessment: retrospective or prospective</td>
<td>How falls were assessed</td>
</tr>
<tr>
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<td>------------------------</td>
<td>-----------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Overcash &amp; Rivera</td>
<td>2008</td>
<td>Cross-sectional</td>
<td>20</td>
<td>N/A</td>
<td>Any</td>
<td>NR</td>
<td>Mean 75.5</td>
<td>Outpatient</td>
<td>Retrospective</td>
<td>AGS guidelines, Kellogg International work group definition of falls, and patient self-report</td>
</tr>
<tr>
<td>Overcash et al.</td>
<td>2010</td>
<td>Qualitative</td>
<td>20</td>
<td>N/A</td>
<td>Any</td>
<td>Varied</td>
<td>Mean 76.4</td>
<td>Community</td>
<td>Retrospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>Pautex</td>
<td>2008</td>
<td>Retrospective observational</td>
<td>198</td>
<td>N/A</td>
<td>Advanced Cancer</td>
<td>Varied</td>
<td>Mean 71 (SD 12.1)</td>
<td>Inpatient Palliative Care</td>
<td>Retrospective</td>
<td>Institutiona l Report Form</td>
</tr>
<tr>
<td>Pearse</td>
<td>2004</td>
<td>Prospective observational</td>
<td>Prospective: 102</td>
<td>N/A</td>
<td>NR, recruited in hospice</td>
<td>NR</td>
<td>Mean 67 (range 31-94)</td>
<td>Inpatient hospice</td>
<td>Retrospective</td>
<td>Review of accident forms</td>
</tr>
<tr>
<td>Potter et al.</td>
<td>2012</td>
<td>Intervention pre- and post-evaluation</td>
<td>38 patient-caregiver dyads (22 returned fall diaries)</td>
<td>N/A</td>
<td>NR</td>
<td>NR</td>
<td>Mean 65</td>
<td>Outpatient</td>
<td>Retrospective and Prospective</td>
<td>Fall diaries</td>
</tr>
<tr>
<td>Puts et al.</td>
<td>2013</td>
<td>Prospective observational</td>
<td>112</td>
<td>72%</td>
<td>Lung, breast, colorectal, lymphoma, myeloma</td>
<td>Varied</td>
<td>Mean 74.2 (SD 6)</td>
<td>Outpatient</td>
<td>Prospective</td>
<td>CGA falls screening</td>
</tr>
<tr>
<td>Spoolstra et al.</td>
<td>2010</td>
<td>Retrospective population</td>
<td>7448 total (967 with cancer)</td>
<td>N/A</td>
<td>NR</td>
<td>NR</td>
<td>Range 65 and older</td>
<td>Outpatient</td>
<td>Retrospective</td>
<td>MDS: falls over past 6 months</td>
</tr>
<tr>
<td>Author</td>
<td>Year</td>
<td>Type of Study</td>
<td>Sample Size</td>
<td>Response Rate</td>
<td>Type of Cancer</td>
<td>Type of cancer treatment</td>
<td>Age</td>
<td>Setting/source of data</td>
<td>Falls assessment: retrospective or prospective</td>
<td>How falls were assessed</td>
</tr>
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<td>---------------------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Spoelstra et al. 41</td>
<td>2013</td>
<td>Retrospective population</td>
<td>9481</td>
<td>N/A</td>
<td>NR</td>
<td>NR</td>
<td>Mean 77</td>
<td>Outpatient</td>
<td>Retrospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>Stone et al. 30</td>
<td>2012</td>
<td>Prospective observational</td>
<td>185</td>
<td>43%</td>
<td>Metastatic or locoregionally advanced cancer</td>
<td>NR</td>
<td>Mean 68 (SD 12.6)</td>
<td>Inpatient or Outpatient</td>
<td>Prospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>To et al. 42</td>
<td>2010</td>
<td>Cross-sectional</td>
<td>200</td>
<td>100%</td>
<td>Gastrointestinal, lung, genitourinary, breast, other</td>
<td>Varied</td>
<td>Mean 76.7 (range 70-92)</td>
<td>Outpatient</td>
<td>Retrospective</td>
<td>GA</td>
</tr>
<tr>
<td>Vande Walle et al. 31</td>
<td>2014</td>
<td>Prospective observational</td>
<td>937</td>
<td>88%</td>
<td>Breast, colorectal, ovarian, prostate, lung, hematological</td>
<td>Varied</td>
<td>Median 76 (range 70-95)</td>
<td>Outpatients</td>
<td>Prospective</td>
<td>Patient self-report</td>
</tr>
<tr>
<td>Ward et al. 52</td>
<td>2014</td>
<td>Retrospective observational</td>
<td>65311</td>
<td>N/A</td>
<td>Breast, colon, lung, prostate</td>
<td>Chemotherapy</td>
<td>Range 65 – 80+</td>
<td>SEER-Medicare</td>
<td>Retrospective</td>
<td>ICD-9 CM codes related to fall injuries</td>
</tr>
<tr>
<td>Williams et al. 43</td>
<td>2015</td>
<td>Cross-sectional</td>
<td>1172</td>
<td>N/A</td>
<td>Any</td>
<td>NR</td>
<td>Mean 73 (65-99)</td>
<td>Carolina Senior Registry</td>
<td>Retrospective</td>
<td>Patient self-report</td>
</tr>
</tbody>
</table>
### Table 5. Details on falls

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Recurrent fall risk factors examined?</th>
<th>Circumstances of falls examined?</th>
<th>Fall-related injury reported/examined?</th>
<th>Other outcomes of fall reported/examined?</th>
<th>Impact on cancer treatment examined?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bylow et al. 53</td>
<td>2008</td>
<td>56%</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Capone et al. 54</td>
<td>2012</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Chen &amp; Janke 46</td>
<td>2014</td>
<td>16% at time 1 (2006); 24% at time 2 (2008)</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Flood et al. 47</td>
<td>2006</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Gewandter et al. 54</td>
<td>2013</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Gewandter et al. 55</td>
<td>2015</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Goodridge &amp; Marr et al. 56</td>
<td>2002</td>
<td>63% of the fallers had fallen prior to admission</td>
<td>This information was available in only 66% of the reports. 44% of falls occurred from bed; 39% from a standing position; 25% while getting to/from toilet</td>
<td>53.5% had light injuries; 16.4% moderate injuries; 4.1% had serious injuries (fractures)</td>
<td>20% died within one week of the fall</td>
<td>NR</td>
</tr>
<tr>
<td>Guerard et al. 44</td>
<td>2015</td>
<td>25% had two falls; 22% had three or more falls</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Hussain et al. 48</td>
<td>2010</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Luce et al. 56</td>
<td>2012</td>
<td>NR</td>
<td>NR</td>
<td>29% of falls complicated by fracture</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Mariano et al. 55</td>
<td>2015</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Mohile et al. 53</td>
<td>2011</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Overcash 37</td>
<td>2007</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Overcash &amp; Beckstead 58</td>
<td>2008</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Overcash &amp; Rivera 39</td>
<td>2008</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Overcash et al. 33</td>
<td>2010</td>
<td>NR</td>
<td>Yes</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Author</td>
<td>Year</td>
<td>Recurrent fall risk factors examined?</td>
<td>Circumstances of falls examined?</td>
<td>Fall-related injury reported/examined?</td>
<td>Other outcomes of fall reported/examined?</td>
<td>Impact on cancer treatment examined?</td>
</tr>
<tr>
<td>-----------------</td>
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<td>--------------------------------------</td>
<td>---------------------------------</td>
<td>----------------------------------------</td>
<td>------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Pautex et al.</td>
<td>2008</td>
<td>7% (3 persons out of 43 fallers fell twice)</td>
<td>18 pts were attempting to move from bed; 7 from chair; 17 were standing up/walking</td>
<td>Superficial wound (n=15); pain (n=11); hematoma (n=4)</td>
<td>One patient died of unknown cause the day after the fall with no severe injury detected.</td>
<td>NR</td>
</tr>
<tr>
<td>Pearse et al.</td>
<td>2004</td>
<td>74%</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Potter et al.</td>
<td>2012</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Puts et al.</td>
<td>2013</td>
<td>13% 3 months prior to diagnosis; 18.7% within 6 months of dx</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Spoelstra et al.</td>
<td>2010</td>
<td>Among fallers, 47% had more than 1 fall</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Spoelstra et al.</td>
<td>2013</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Stone et al.</td>
<td>2012</td>
<td>NR</td>
<td>NR</td>
<td>Of those who fell, 35 (37.6%) sustained soft tissue injuries, three (3.2%) sustained fractures, and one sustained a dislocation.</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>To et al.</td>
<td>2010</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Author</td>
<td>Year</td>
<td>Recurrent fall risk factors examined?</td>
<td>Circumstances of falls examined?</td>
<td>Fall-related injury reported/examined?</td>
<td>Other outcomes of fall reported/examined?</td>
<td>Impact on cancer treatment examined?</td>
</tr>
<tr>
<td>-------------------</td>
<td>------</td>
<td>--------------------------------------</td>
<td>----------------------------------</td>
<td>----------------------------------------</td>
<td>------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Vande-Walle et al. (^{31})</td>
<td>2014</td>
<td>Of those 17.6 percent that fell, 51.4% fell more than once</td>
<td>NR</td>
<td>NR142 (17.6%) patients fell, of whom 51.4% fell recurrently and 17.6% reported a major injury prior to baseline 88 had major injury as result of fall</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Ward et al. (^{32})</td>
<td>2014</td>
<td>NR</td>
<td>NR</td>
<td>Fracture, dislocation, head injury</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Williams et al. (^{43})</td>
<td>2015</td>
<td>6% had two falls 1% had three falls 3% had four or more falls</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>
2.4.2. STUDY CHARACTERISTICS

Most studies used a cross-sectional design (34–44). There were no randomized controlled trials. Most studies used primary data collection (30–39,42,45–52). Most studies used consecutive sampling strategy. Sample sizes varied from n = 20 (39) to n = 65,311 (52). For the eleven studies in which response rate was applicable, seven reported a response rate (30,31,42,45–47,51), which ranged from 43.6% (30) to 100% (42,47). In two studies participants were receiving or had received androgen deprivation therapy (ADT) (48,53) and the majority reported that some or all participants had received or were receiving chemotherapy at the time of the study (31,34,35,37–41,43–46,51,52,54).

2.4.3. FALL ASSESSMENT

Falls assessments were mainly retrospective and varied across studies. The most common form of fall assessment was by patient self-report (30,31,34–39,42,45,46,48,51,53,55). Only one study used a fall diary (32). Two studies used the Kellogg definition for falls [37,39], one study used the WHO definition (51), and five studies (30,31,40,50,56) used other definitions such as “unexpectedly comes to rest on the floor in a sitting, lying, or kneeling position.” The remainder of the studies did not specify which fall definition was used.
2.4.4. RESEARCH QUESTION 1: FALL RATE

Fall rates ranged widely in every setting. Specifically, from 3% over one year (54) to 23% over two months (50) in the inpatient and hospice setting; from 15% over one year (48) to 79% over three months (39) in the outpatient setting; 31% over one year (36) to 50% over six months (30) in the mixed in- and outpatient setting; and from 24% over two years (46) to 24% over six months (44) among studies that utilized administrative/clinical data. The fall rates were reported using different time periods and fall definitions and therefore, were not suitable to be compared to one another or combined quantitatively. In one study with comparison groups, fall rate of the group with cancer was 33% while it was 30% for the group without cancer (41). Similarly, in another large population-based study, the fall rate of the group with cancer was 26% versus 22% for those without cancer (55). Both studies were population-based and information on current treatment and cancer stage were not available. See Table 6 below.

Table 6. Fall rates by setting, study design, and treatment status

<table>
<thead>
<tr>
<th>Setting</th>
<th>Design</th>
<th>Treatment status</th>
<th>Fall rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient</td>
<td>Prospective</td>
<td>Prior to treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No active treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td>Did not indicate</td>
<td></td>
<td>22.5% over 2 months prior to hospice admission. 5.7 per bed per year in hospice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Retrospective</td>
<td>Prior to treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No active treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td>Mixed</td>
<td></td>
<td>Did not indicate</td>
<td>• 34% in past 6 months (^{45})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Did not indicate</td>
<td>• 27.5% (all palliative patients in 1999)(^{36})</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 5% over 1 year (^{47})</td>
</tr>
<tr>
<td>Setting</td>
<td>Design</td>
<td>Treatment status</td>
<td>Fall rates</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------</td>
<td>------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Outpatient</td>
<td>Prospective</td>
<td>Prior to treatment</td>
<td>• At baseline, 22% reported falls in past 3 months(^{53})</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Pre-treatment fall rate was 15% in the past 12 months(^{48})</td>
</tr>
<tr>
<td>No active</td>
<td></td>
<td></td>
<td>• Not studied</td>
</tr>
<tr>
<td>treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On treatment</td>
<td></td>
<td></td>
<td>• 18.2% in 4 months after intervention(^{52})</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• For those who had a previous history of fall, 56% had additional falls at 3-month follow up (while on ADT)(^{53})</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Of those with no history of fall, 12% had new fall (while on ADT)(^{53})</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 35% at 12-month follow up after starting ADT(^{48})</td>
</tr>
<tr>
<td>Mixed</td>
<td></td>
<td></td>
<td>• 21% over past year. (Treatment varied: hormone; chemotherapy, radiation, observation)(^{37})</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 65% in past year; 78.9% in past 3 months; 60% since diagnosis(^{39})</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 13% in the 3 months prior to cancer diagnosis. 19% had ≥ 1 fall in 6 months after diagnosis(^{51})</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 31.5% in the past 12 months. 17.6% reported falling at 2-3 month follow up. Recurrent fall rate 51.4%(^{31})</td>
</tr>
<tr>
<td>Did not indicate</td>
<td></td>
<td></td>
<td>At time 1, 30% reported fall; 16% experienced recurrent falls. At time 2 (two years later), 40% reported fall and 24% experienced recurrent falls(^{46})</td>
</tr>
<tr>
<td>Retrospective</td>
<td>Prior to treatment</td>
<td></td>
<td>• 22% in past 6 months (at the time of referral to oncology services)(^{42})</td>
</tr>
<tr>
<td>No active</td>
<td></td>
<td></td>
<td>• 25% in past year (non-chemo group)(^{38})</td>
</tr>
<tr>
<td>treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On treatment</td>
<td></td>
<td></td>
<td>• 40.9% reported falls within 3 months prior to the study and 18.2% reported falls during the 4 months(^{47})</td>
</tr>
<tr>
<td>Setting</td>
<td>Design</td>
<td>Treatment status</td>
<td>Fall rates</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------------</td>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mixed in- &amp; out patient</td>
<td>Prospective</td>
<td>Prior to treatment</td>
<td>• 33% in past year (chemo group) 25% in the cancer no treatment group in past year[^38]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No active treatment</td>
<td>• 36% in past year (patients who have recently started on treatment or in the process of deciding which treatment; some have received radiation, surgery, and chemotherapy before)[^35]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On treatment</td>
<td>• 11.9% overall[^34]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Did not indicate</td>
<td>• 31.5% reported falling in the past 12 months (did not indicate what types of treatment and treatment history, and some may have declined treatment[^31])</td>
</tr>
<tr>
<td>Did not indicate</td>
<td></td>
<td></td>
<td>• Not studied</td>
</tr>
<tr>
<td>Retrospective</td>
<td></td>
<td>Prior to treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No active treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Did not indicate</td>
<td>• 50.3% over 6 months[^30]</td>
</tr>
<tr>
<td>Administrative database/Clinical records/population based studies</td>
<td>N/A</td>
<td>Prior to treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No active treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On treatment</td>
<td>• Not studied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mixed</td>
<td>• 24% in past 6 months[^44] 22% reported ≥ 1 falls in past 6 months[^43] (Fall rate pre-treatment 22%; during treatment 24%; post-treatment 19%) (12% reported 1 fall; 6% reported 2 falls; 1% reported 3 falls; 3% reported ≥ 4 falls)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Did not indicate</td>
<td>• 33% for those with cancer; 29% for those without cancer (falls were examined for 90-180 days)[^41] 26.4% for the 2013 MCBS[^55] At time 1: 30% fell and 16% had</td>
</tr>
</tbody>
</table>
2.4.5. RESEARCH QUESTION 2: FALL PREDICTORS

Only fall predictors examined in at least two prospective studies in a given clinical setting and controlled for age and/or gender are included. A total of two inpatient studies (50,54) and three outpatient studies (31,48,51) contributed to the findings for this research question. Out of these studies, three (48,50,54) adjusted for age, one adjusted for gender (51), and one adjusted for both (31).

Inpatient studies

Cognitive impairment was a significant fall predictor in two of two studies (50,54).

Outpatient studies

Prior falls was a significant fall predictor in two of three studies (31,48). Non-significant fall predictors examined in at least two studies included: age (31,51), gender (31, 51), comorbidity (31,48,51), nutrition (31,51), ECOG (31,51), IADL dependence (21,51), ADL dependence (48,51), depression (31,51), and cognitive impairment (31,51). Fatigue was not significant in Puts et al. (51), while it was a protective factor in Vande Walle et al. (31).
Table 7. Fall predictors in all settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Inpatient</th>
<th>Outpatient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study design</td>
<td>Prospective</td>
<td>Prospective</td>
</tr>
<tr>
<td>Treatment status</td>
<td>On chemotherapy treatment/previous treated</td>
<td>On various treatment</td>
</tr>
<tr>
<td>First author</td>
<td>Capone\textsuperscript{j}</td>
<td>Puts\textsuperscript{j}</td>
</tr>
<tr>
<td></td>
<td>Pearse\textsuperscript{a,k}</td>
<td>Vande Walle\textsuperscript{m}</td>
</tr>
<tr>
<td></td>
<td>Hussain\textsuperscript{d,n}</td>
<td></td>
</tr>
<tr>
<td>Sociodemographic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>NS</td>
<td>NS\textsuperscript{e}</td>
</tr>
<tr>
<td>Gender</td>
<td>NS</td>
<td>NS\textsuperscript{e}</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>NS\textsuperscript{e}</td>
</tr>
<tr>
<td>Living arrangement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alone</td>
<td>NS</td>
<td>+</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Working status</td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IADL</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>ADL</td>
<td>NS\textsuperscript{f}</td>
<td>-\textsuperscript{f}</td>
</tr>
<tr>
<td>Comorbidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac disease</td>
<td>NS</td>
<td>+\textsuperscript{e}</td>
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<tr>
<td>COPD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arthritis</td>
<td></td>
<td>+\textsuperscript{n}</td>
</tr>
<tr>
<td>Liver dysfunction</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Comorbidity</td>
<td>NS</td>
<td>NS\textsuperscript{e}</td>
</tr>
<tr>
<td>Neuropathy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance status</td>
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</tr>
<tr>
<td>ECOG</td>
<td>NS</td>
<td>NS\textsuperscript{e}</td>
</tr>
<tr>
<td>6-minute walk</td>
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<td>NS\textsuperscript{e}</td>
</tr>
<tr>
<td>PPM</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Impaired gait</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>TUG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grip strength</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Prior falls</td>
<td>+</td>
<td>NS\textsuperscript{e}</td>
</tr>
<tr>
<td>Assistive devices</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Loss of balance/balance difficulty</td>
<td></td>
<td>+\textsuperscript{n}</td>
</tr>
<tr>
<td>Mobility</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Setting</td>
<td>Inpatient</td>
<td>Outpatient</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Study design</strong></td>
<td>Prospective</td>
<td>Prospective</td>
</tr>
<tr>
<td><strong>Treatment status</strong></td>
<td>On chemotherapy treatment/previou sly treated</td>
<td>On various treatment</td>
</tr>
<tr>
<td><strong>First author</strong></td>
<td>Capone\textsuperscript{j} Pearse\textsubscript{a,k} Puts\textsuperscript{j}</td>
<td>Vande Walle\textsuperscript{m} Hussain\textsuperscript{d,n}</td>
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<tr>
<td><strong>Impairment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Medications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td># of medications</td>
<td>+</td>
<td>+\textsuperscript{e}</td>
</tr>
<tr>
<td>Use of any at risk medications</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Antipsychotics</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Antidepressants</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Opiates</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Sedatives</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Neuroleptics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diuretics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>+</td>
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</tr>
<tr>
<td>Cognitive impairment</td>
<td>+</td>
<td>NS\textsuperscript{e}</td>
</tr>
<tr>
<td><strong>Cancer &amp; treatment factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>ADT users</td>
<td></td>
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</tr>
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<td>Cancer type</td>
<td>+</td>
<td>NS</td>
</tr>
<tr>
<td>Cancer stage</td>
<td>+</td>
<td>NS</td>
</tr>
<tr>
<td>Brain metastasis</td>
<td></td>
<td></td>
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<tr>
<td>Bone metastasis</td>
<td>+</td>
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</tr>
<tr>
<td>Pain</td>
<td>-</td>
<td>NS\textsuperscript{-}</td>
</tr>
<tr>
<td>Fatigue</td>
<td>NS\textsuperscript{-}</td>
<td>+\textsuperscript{e}</td>
</tr>
<tr>
<td># of chemo and cycle/dose</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Setting</td>
<td>Inpatient</td>
<td>Outpatient</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Study design</td>
<td>Prospective</td>
<td>Prospective</td>
</tr>
<tr>
<td>Treatment status</td>
<td>On chemotherapy treatment/previou sly treated</td>
<td>On various treatment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>First author</th>
<th>Capone&lt;sup&gt;j&lt;/sup&gt;</th>
<th>Pearse&lt;sup&gt;a,k&lt;/sup&gt;</th>
<th>Puts&lt;sup&gt;l&lt;/sup&gt;</th>
<th>Vande Walle&lt;sup&gt;m&lt;/sup&gt;</th>
<th>Hussain&lt;sup&gt;d,n&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemo toxicity</td>
<td>NS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition</td>
<td>NS</td>
<td>NS</td>
<td>+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Sensory impairment | | | | | |
|-------------------|---|---|---|---|
| Visual            | NS<sup>b</sup> | NS | |
| Fever             | + | | | |
| Blood product transfusion | + | | | |
| BP                | -<sup>c</sup> | | | |

| Delirium | |
|----------|
| Frailty markers | NS |

| Geriatric risk profile by G8 | - | - | |

| Alcohol consumption | | | NS |

+ -- positive relationship
- -- negative relationship
NS -- not significant
Blank space -- not studied
Rec -- Recurrent fall predictors

<sup>a</sup> palliative/hospice setting
<sup>b</sup> variable entered in initial model but did not make it into final model
<sup>c</sup> "lying" blood pressure
<sup>d</sup> men treated with ADT
<sup>e</sup> univariate model
<sup>f</sup> ADL dependence as protective factor
<sup>g</sup> not significant in the reduced multivariable model
<sup>h</sup> significant in the reduced multivariable model
<sup>i</sup> no fatigue as protective factor
<sup>j</sup> univariate analysis; adjusted for age
<sup>l</sup> univariate analysis; adjusted for gender
<sup>k</sup> univariate analysis, adjusted for age and gender
<sup>m</sup> univariate analysis, adjusted for age
Table 8. Summary of fall predictors across settings*

<table>
<thead>
<tr>
<th>Fall Predictor</th>
<th>Inpatient setting</th>
<th>Outpatient setting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of studies which examined it</td>
<td>Number of studies which found it significant</td>
</tr>
<tr>
<td></td>
<td>Number of studies which examined it</td>
<td>Number of studies which found it significant</td>
</tr>
<tr>
<td>Sociodemographic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Gender</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Living arrangement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alone</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Functional impairment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IADL</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>ADL</td>
<td>3</td>
<td>1**</td>
</tr>
<tr>
<td>Having Comorbidity</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>ECOG</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Prior falls</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Depression</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Cognitive impairment</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Fatigue</td>
<td>2</td>
<td>1^</td>
</tr>
<tr>
<td>Nutrition</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

* A predictor is included in this table only if it has been examined by a minimum of two prospective studies in a given setting

** ADL independence was a protective factor for falls

^ No fatigue was a protective factor for falls

2.4.6. RESEARCH QUESTION 3: INJURIOUS FALLS

Injurious fall rates were reported in five studies (30,31,36,52,56). Overall, the injurious fall rates ranged from 29% in the past year (36) to 74% in the past year (31). In Ward et al. (52), the injurious fall rates were 9.15 per 1000 person-month among individuals on neurotoxic doublet chemotherapy, 7.76 per 1000 person-month among those who were on single neurotoxic types, and 5.19 per 1000 person-month among those who were on non-neurotoxic
types. Age, gender, comorbidity, chemotherapy, and cancer stage, and osteoporosis were significant predictors for fall-related injuries in the same study (52). However, these findings were from a single study. (See Table 9 for injurious fall rates).

Table 9. Injurious fall rates

<table>
<thead>
<tr>
<th>Setting</th>
<th>Design</th>
<th>Treatment Status</th>
<th>Injurious fall rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative database/Clinical</td>
<td>N/A</td>
<td>On treatment/treated</td>
<td>• 9.15 per 1000 person-month (doublet); 7.76 per 1000 person-month (single); 5.19 per 1000 person-month (non-neurotoxic)</td>
</tr>
<tr>
<td>records/population based studies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient</td>
<td>Prospective</td>
<td>Mixed on treatment and no treatment</td>
<td>• 74.2% (based on a 31.5% fall rate in the past 12 months)</td>
</tr>
<tr>
<td>Inpatient palliative</td>
<td>Retrospective</td>
<td>NR</td>
<td>• 43.9% [53.5% of fallers incurred light injuries (required no treatment); 16.4% of fallers incurred moderate injuries (minimal treatment); 4.1% incurred serious injuries such as fracture (significant treatment)]</td>
</tr>
<tr>
<td>Mixed in- and outpatient</td>
<td>Retrospective</td>
<td>NR</td>
<td>• 29% (fracture rate; based on a 31% fall rate in the past 12 months)</td>
</tr>
<tr>
<td>Mixed in- and outpatient</td>
<td>Prospective</td>
<td>NR</td>
<td>• 42% (based on a 50.3% fall rate over a follow up period of 6 months or until time of fall or death)</td>
</tr>
</tbody>
</table>
2.4.7. RESEARCH QUESTION 4: CIRCUMSTANCES AND OUTCOMES OF FALLS

Circumstances

Circumstances surrounding falls were described in two quantitative inpatient studies (49,56) and the outpatient qualitative study (33). Circumstantial data from one study (56) indicated that 44% of the falls occurred “from bed” and 38.8% from a standing position. In the other study, falls occurred in patient rooms; and the majority was during transfers from bed or while standing or walking (49). In the qualitative study, most of the falls occurred at home; walking, general weakness, and physical problems were the themes (33).

Outcomes of falls

Of the studies that reported outcomes of falls, the populations were predominantly inpatients in palliative care or had advanced cancer. Types and/or severity of injury were described in six studies (30,31,36,49,52,56); which ranged from contusion, pain and soft tissue injuries to dislocations, fractures, and hematoma. The fracture rate ranged from 3.2% (30) to 78.3% (52). One study (56) reported that 20% of the fallers in the palliative care setting died within one week of falling (there was no control group to compare with). In another study one patient died of unknown cause the day after falling despite having no severe injury (49).
2.4.8. RESEARCH QUESTION 5: HOW FALLS AFFECT SUBSEQUENT CANCER TREATMENT

None of the studies examined how cancer treatment was impacted by falls.

2.5. DISCUSSION

Although some evidence seems to suggest that falls may be more common among older adults with a cancer diagnosis compared to those without (41, 55), studies included in this systematic review did not seem to consistently demonstrate that older cancer patients have a higher fall rate than their cancer-free counterparts, which is between 30-40% per year (3, 7, 57-60). Findings seem to suggest that: 1) falls are common among older adults with cancer; 2) older cancer patients receiving chemotherapy or ADT may be more at risk for falling than non-users; and 3) advanced stage or palliative patients may be more likely to fall and to sustain injury from the falls than patients in other studies. However, the studies that examined falls in this context did not include a comparison/matched group. Therefore, it is difficult to contextualize these findings. Nonetheless, it is important to be cognizant that fall data relying on incident reports as sources can lead to underestimation of fall events (57, 58). Additionally, given the wide range of fall rates reported among the studies, we were unable to conclude that fall rates of older adults with cancer are higher than that of the general geriatric population. According to the conclusion of the Wildes et al. review (25), falls in older adults with cancer may be more common than in the general geriatric population. Therefore, our conclusion with
regard to fall rates, in essence, is not dissimilar to that of the Wildes et al. review. So far, research has not been able to consistently demonstrate that falls are more common in the geriatric oncology context than in the general geriatric medicine setting.

As observed by Wildes et al. (25), recall bias was evident in the retrospective study of Overcash and Rivera (39) as some participants who recalled having fallen in the past 3 months did not report having fallen in the past year. Although seldom discussed in research studies, recall bias does exist (59), meaning that falls in this vulnerable population are likely underestimated. Moreover, retrospective design relies on the use of existing data, which means there was no way of asking more in-depth questions concerning individual falls and how falls were ascertained. Ideally, ascertainment of falls should be performed prospectively by means of daily recording (60). In this review, only nine studies examined falls prospectively (30–32,37,46,48,50,51,53).

While depression (61–65) and cognitive impairment (6,66) are known risk factors for falls in community-dwelling older adults, neither factor was significant in the outpatient setting in this review. The lack of positive findings for cognitive impairment might be attributable in part to the fact that older adults with cognitive impairment are often less likely to be eligible for, or offered participation in research (67). Notably, studies examining these fall predictors were few in number. Prior falls as a significant predictor in the outpatient setting agrees with findings in the general geriatric population (68,69,70). Cognitive impairment as a significant fall predictor in the inpatient setting also appears to be in line with findings in the general geriatric population (69). However, so far, no cancer-specific fall predictors are found in this review. This may have been due to the paucity of studies that examined these factors. Further prospective studies are needed to examine fall predictors that are specific to the geriatric
oncology setting while including more fall risk factors known in the general geriatric population such as age and gender.

Although age and gender are common fall risk factors in the general geriatric population (28), they were not included in the analyses in many of the studies in this review. Considering the wide age range in most of the studies, the potential to report spurious relationships (e.g. reporting a potential predictor while the results are driven by age or gender) is thus real and therefore we choose to only include studies that adjusted for age and gender.

Impairment in functional status is a known fall risk factor in the general geriatric population (6,70) but not in the current review. Further research is needed to explore whether it is plausible that the effect of cancer and its treatment may render functional status no longer relevant.

ADL impairment was not a significant fall predictor in this review while it was identified as a significant fall risk factor in the Wildes et al. (25) review. Differences in inclusion criteria for the fall risk factors/predictors may have led to this discrepancy. An explicit choice was made in the current review to include only prospective studies to identify predictors for falls while the Wildes et al. review included cross-sectional studies that examined correlations and was therefore more inclusive but less clear on the predictive ability of these factors associated with falls. In particular, the association between ADL impairment and falls identified in the Wildes et al. review was supported only by cross-sectional studies.

The role of chemotherapy treatment in falls and fall-related outcomes among older cancer patients is suggested by the findings in Ward et al. (52) in which patients receiving neurotoxic doublet therapy had a higher rate of fall-related injuries compared to those receiving a single neurotoxic agent and those receiving non-neurotoxic chemotherapy.
Research showed that prior injurious falls will predict future injurious falls (71). However, the majority of the studies in this review did not examine injurious fall rate or attempt to predict injurious falls in their regression models. Ward et al. (52) reported a fracture rate of 78%, and reported neurotoxic chemotherapy as a significant predictor for fall-related injury. However, in the same analysis, peripheral neuropathy (PN) was not found to be a predictor. If neurotoxic chemotherapy were indeed significant but not PN, it could mean that PN may be a poor proxy for measuring the impact of neurotoxic chemotherapy, as neurotoxic chemotherapy could cause falls in ways other than via PN. Importantly, the role of neurotoxic chemotherapy remains inconclusive as a predictor for fall-related injuries as so far no prospective studies have examined this predictor. This is an important area for future research.

The lack of data on circumstances surrounding falls reveals another important gap in the literature. Information on circumstances of falls such as what happened at the time of the fall, location of the fall, and activity at the time of the fall (72) are recommended as part of a focused falls assessment by the American and British Geriatric Societies (73). Such information may provide insight into the mechanism of the fall as well as the individual’s health, overall function, and attitude toward safety, which are important to know within the oncology context where cancer and its treatment may increase falls and fall-related injuries. In turn, this can inform interventions designed to reduce falls. Additionally, few studies examined the outcomes of falls; in particular, outpatient studies. Two inpatient studies reported on death after the fall incidents (49,56). However, it was unclear whether the falls were the cause of the deaths, or whether it is because the patients in the inpatient settings had advanced stage disease. Falling was perhaps one of the signs of the end drawing near (74).
Research suggests that cancer patients are more likely to experience complications related to traumatic injury from falls including cerebral edema/anoxic encephalopathy, cardiac arrest, acute respiratory failure, and hypotensive shock than non-cancer patients (74). However, none of the studies in our current review explored these sequelae in the geriatric oncology context, which could have major implications on cancer treatment, disease trajectory, and mortality. Findings in our review in terms of fall-related injuries point to the need of identifying those who are high-risk fallers. No other outcomes besides injuries and death were examined in the studies; therefore, how falls impacted cancer treatment and subsequent outcomes and trajectory of these patients remain unknown.

2.6. RECOMMENDATIONS FOR CLINICAL CARE

More efforts to understand situational and/or circumstantial factors surrounding falls may create opportunities to assess for need for daily living support, to enhance understanding regarding safety, and to implement strategies to reduce risk of future falls (75). As well, findings from this study also underscore the importance of implementing current fall screening guidelines in oncology settings, such as the Clinical Fall Screening Guideline recommended by The American/British Geriatrics Society (73).
2.7. RECOMMENDATIONS FOR FUTURE RESEARCH

Research on falls in the geriatric oncology context calls for specific emphasis on circumstances on falls, recurrent falls, and location of falls. We propose that such crucial information concerning falls should be incorporated not only in routine fall assessment in geriatric oncology clinical settings but also in research. As well, prospective study designs, more validated forms of ascertainment to support patient self-report, larger sample size, adequate response rate, and adjustment for pertinent confounders to explore fall predictors are needed. More importantly, the vacuum in knowledge in terms of ways to identify high-risk fallers as well as how falls may impact cancer treatment needs to be studied.

2.8. STRENGTHS AND WEAKNESSES

The strength of this review include: a systematic approach to appraise the literature, following the PRISMA statement and Cochrane Systematic Review methodology including multiple databases. The current review examined and revealed important knowledge gaps. Second, the entire review was performed by two reviewers including abstracts reviewing and data abstraction.

However, this review also has some limitations. First, the findings of this systematic review are restricted by the methodological designs of the included studies. Second, it is important to take into consideration the possibility of referral bias in which healthier patients
are more likely to get referred/recommended by their physicians or oncologists for research studies than sicker, frailer patients, who might have been more at risk for falling (76). Third, several studies utilized convenience sampling; thus, the findings might not be representative of the population. Additionally, further research is needed to explore the role of denial as well as the possibility of (and, if applicable, the reasons for) older cancer patients underreporting falls as it is commonplace for older adults in the general geriatric population to blame external causes for their fall rather than counting it as a “true” fall (77). As well, the heterogeneity of the populations across studies, compounded by the issue of inconsistent fall ascertainment methods, fall definitions used, durations of follow-up and methodological designs, may explain the discrepant findings. Moreover, the lack of literature that evaluated falls in this population, superimposed on the fact that most of the included studies utilized cross-sectional rather than longitudinal methodology, hinders this review from yielding robust fall predictors. Likewise, it was not possible to conduct a meta-analysis due to the heterogeneity of the studies. In particular, there was heterogeneity in terms of the study populations, method of ascertainment, inclusion, setting, data collection methods, lack of adjustment for prominent confounders such as age and gender, and lack of standardized definition of falls and ascertainment method. Finally, only studies published in English were included in this review.
2.9. CONCLUSION

This review demonstrates that falls and fall-related injuries are common among older adults with cancer. Cancer and its related treatment can put this population at greater risk for falls and fall-related injuries. However, there is little information regarding predictors for falls and fall-related injuries, circumstances of falls, the impact of falls on cancer treatment, as well as outcomes of falls. More research with rigorous methodological designs is needed to address this gap in knowledge.
References


28. Ageing WHO, Unit LC. WHO global report on falls prevention in older age [Internet]. World Health Organization; 2008 [cited 2015 Jan 28]. Available from: http://trafficlight.bitdefender.com/info?url=http%3A//books.google.ca/books%3Fhl%3Den%26lr%3D%26id%3Dms9o2dvfaQkC%26oi%3Dfnd%26pg%3DPA1%26dq%3Dwho+gl


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Chapter 3
The impact of falls on cancer treatment in community-dwelling older cancer patients: Results from an embedded mixed-methods study

3.1. ABSTRACT

BACKGROUND

Falls are major health issues among older adults and even more so in older cancer patients due to cancer and its treatment. Delays in cancer treatment caused by injuries from falls may have significant implications on the disease trajectory and patient outcomes. However, it is not known how falls impact cancer treatment in this population.

METHODS

We conducted a convergent-parallel mixed-methods study at the Princess Margaret Cancer Centre in Toronto, Canada, to examine how falls impact cancer treatment in community-dwelling cancer patients aged >=65, patient reporting of falls and how falls were assessed and managed in oncology clinics. Data were collected by self-reported survey, chart review, and individual open-ended interviews.

RESULTS

One hundred older adults (median age 76) and 14 oncologists participated. Falls were not commonly reported by patients to their oncologists (43%), and were rarely assessed by oncologists (7%). Falls impacted cancer treatment in 5 of 100 participants (5%). Older patients perceived falls as minor incidents not worth mentioning (57%). When a fall was reported, oncologists’ actions included determining cause of falls (64%), asking circumstances of falls
(36%), and referrals (29%). Oncologists indicated that the majority of older patients were not forthcoming in reporting falls.

CONCLUSION

One in twenty who fall appears to lead to change in cancer management. However, falls were not commonly reported by patients nor adequately prioritized by oncologists. Incorporating routine fall assessment in oncology clinic appointments may help identify those at risk for falls so that timely interventions can be triggered.
3.2. INTRODUCTION

Falls are common among older adults and the incidence rises with increasing age (1). Each year, one-third of older adults living in the community experience a fall (2). Older adults with cancer are at higher risk of fall-related injuries compared to those without cancer (3) as cancer itself and cancer treatments could bring unique risks of a fall and fall injuries in this population (4–7). We hypothesized that a fall may lead to an injury and subsequent hospitalization, and, in turn, could lead to delay in cancer treatment. Delay in treatment, in turn, can have significant implications for cancer progression and survival of older cancer patients. Research shows that delay in cancer treatment is linked to a significantly higher risk of cancer-related mortality among late-stage breast cancer patients (8); and poor prognosis among patients with non-small cell lung cancer (9).

A recent systematic review (10) of 27 studies found little evidence on the impact of a fall on cancer treatment delivery in the older adult population. Therefore, the aim of this study was to explore how falls were assessed, managed, and reported during clinic appointments to provide context. The research questions were:

1. How do falls impact cancer treatment in community-dwelling older cancer patients?
2. How do oncologists assess and manage falls in older patients?
3. How do older patients report their falls?
4. How forthcoming are older patients in reporting falls from oncologists’ perspectives?
3.3. METHODS

3.3.1. STUDY DESIGN

This was a cross-sectional study with a convergent parallel mixed methods design (11). Quantitative and qualitative data were collected concurrently and analysed independently before they were merged for interpretation and discussion (11).

3.3.2. STUDY POPULATION AND SAMPLE

Patient recruitment occurred between October 27, 2016 and November 29, 2017. Clinic staff of the medical and radiation oncology clinics, and an older adult with cancer clinic (OACC) were approached five days a week (Monday to Friday) to inquire if there were older patients deemed eligible. Those who fit the inclusion criteria were asked by a member of the patient’s circle of care team for permission to approach the patient to explain the study. Patients who agreed were approached by the first author (a registered nurse) while waiting for their appointment. Of the 110 eligible patients, 92% (100) participated. Reasons for refusal to participate included family refusal (n=4), ‘not interested’ (n=4), and ‘in another study’ (n=1). One eligible patient was deemed by his treating oncologist to not be well enough to participate and was not invited. One participant under 65 was recruited in error due to miscommunication with clinic staff. Fourteen oncologists were invited to participate, and 58% (n=8) agreed. Reasons for declining participation were not known, as responses were not received following the invitation or when a reminder email was sent.
3.3.3. DATA COLLECTION

Data were collected using a self-reported survey that included open-ended questions (patient), chart review, and face-to-face interviews with open-ended questions (oncologists). Data collected from patients and oncologists were linked during the analysis to answering the research questions. As there was no existing validated tool to assess impact of falls and patient fall reporting, the patient survey, as well as the patient and oncologist interview guides, were developed by the authors, who have expertise in geriatric oncology and falls.

3.3.4. REB APPROVAL AND INFORMED CONSENT

Ethics approvals were obtained from the Research Ethics Boards at the University Health Network (UHN) and the University of Toronto prior to the start of the study. Patients were invited to participate (and to provide permission to invite their treating oncologists to discuss their treatments) via informed consent prior to data collection. Oncologists were invited to participate after all data collection from patient-participants had been completed to minimize their burden.

3.3.5. INCLUSION CRITERIA

Patient-participant inclusion criteria:

- community-dwelling adults aged 65 and above;
- referred to the medical or radiation oncology clinics of Princess Margaret Cancer Centre, University Health Network, Toronto, Ontario, Canada;
- diagnosis of any solid tumor (except primary brain tumor and brain metastases) or hematological malignancies;
- had a fall within the past 12 months;
- receiving/planning cancer treatment at the time of the fall;
- physician-estimated life expectancy >6 months; and
- able to communicate in English.
- no significant cognitive impairment (as per oncologist assessment)

Oncologist inclusion criteria:
- treating oncologist of the patient-participant

3.3.6 DATA COLLECTION PROCEDURES

The time to complete data collection for participants ranged from 20-30 minutes. For the surveys, older adults had the option to self-complete or to have the interviewer administer the survey. The open-ended interviews were conducted by the PI, and were audio recorded and transcribed verbatim.

Patient-participant characteristics

Age, sex, years of education, and living arrangement were collected from the chart. Use of walking aids (yes/no) and number and types of medication use were also asked in the survey. Comorbidities and cancer related information were collected from the participants’ electronic charts. Treatment received, including intent, type, class, and drug name, was obtained from the patients’ charts. Functional status was assessed using the 7-item, validated Older Americans’
Resources and Services [OARS] instrumental activities of daily living scale [IADL]) scale (12) that was included in the survey. A total score of <2 on any item was used to indicate IADL impairment (12).

Fall history & impact of falls

Fall history was collected using patient self-report on a survey developed based on the assessment recommended in the AGS/BGS clinical guideline for fall prevention (13). Information on type of injuries, whether and how the injuries were reported was collected from patient. Furthermore, it was asked whether treatment was sought/received for the injury; and, if yes, what type. Lastly, the participant was asked how their cancer treatment was affected by the fall. Impact on cancer treatment was defined as any interruption, stoppage, cancellation, or change in type and/or doses of chemotherapy treatment (and coded as yes/no).

Patient fall reporting

The Patient was asked to whom he/she reported their fall in the survey as well in the open-ended interview to obtain more details on the reporting and subsequent action taken by the oncologist.

Oncologist interview

The oncologists were asked if the older adult had reported their fall to them and, if yes, what action they had taken in response to the fall. For participants who had their treatment impacted, the interview also included impact of the fall(s) on the cancer treatments and their
observations of how the fall(s) had altered the disease trajectory and prognosis. Questions regarding how the oncologists normally assessed and responded to a fall were also asked. Description of the oncologist’s action (if any) in response to a reported fall were also collected via chart review. Oncologist interviews were conducted in the oncologist’s office at a time chosen by the oncologist and ranged from 5 to 20 minutes.

3.3.7. DATA ANALYSIS

Quantitative data analysis

Descriptive statistics (means, frequencies, and proportions) were used to examine sample characteristics, impact of falls, fall management and fall reporting. Analyses were conducted utilizing SPSS version 20.

Qualitative data analysis

Patient-participant and oncologist interviews were analyzed using thematic analysis following the 6-phase step-by-step guide as outlined by Braun & Clarke (14). To ensure quality and rigor, the Good Reporting of a Mixed Methods Study (GRAMMS) framework (15) guided this study at every stage of its development and execution.

3.4. RESULTS

A total of 100 older adults participated. Of those, 62 (62%) were male and 38 (38%) were female. These older adults were care for by 28 oncologists; of whom, 14 agreed to
participate in the study. See Table 10 below for older adult participants’ characteristics. Age ranged from 62 to 95 (median 76) years. Of the 100 participants, 44% (n=44) had one fall in the past 12 months while 56% (n=56) had >=2 falls. A total of 168 falls were reported by these 100 participants. The most common cancer site was prostate (34%) with advanced stage (III and IV) predominant (81%). The majority of the participants (62%) had been treated prior to the falls with multiple types/combinations of oncologic treatments. Of these 168 falls, 76 (45%) resulted in injury; with fractures and head injury accounting for 13%. Table 11 shows the details on types of injuries.

Table 10. Participant characteristics

<table>
<thead>
<tr>
<th>Participant characteristics</th>
<th>n=100 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age, years</td>
<td>76 (Range 62-95, SD 7.5)</td>
</tr>
<tr>
<td>Women</td>
<td>38 (38%)</td>
</tr>
<tr>
<td>Living alone</td>
<td>18 (18%)</td>
</tr>
<tr>
<td>Years of education</td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>6 (6%)</td>
</tr>
<tr>
<td>5-8</td>
<td>8 (8%)</td>
</tr>
<tr>
<td>9-12</td>
<td>29 (29%)</td>
</tr>
<tr>
<td>13 or more</td>
<td>57 (57%)</td>
</tr>
<tr>
<td>Fall frequency</td>
<td></td>
</tr>
<tr>
<td>1 fall</td>
<td>44 (44%)</td>
</tr>
<tr>
<td>&gt;=2 falls</td>
<td>66 (66%)</td>
</tr>
<tr>
<td>Injurious fall rate*</td>
<td>45%</td>
</tr>
<tr>
<td>Cancer diagnosis</td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>34 (34%)</td>
</tr>
<tr>
<td>Gynecological</td>
<td>14 (14%)</td>
</tr>
<tr>
<td>Breast</td>
<td>12 (12%)</td>
</tr>
<tr>
<td>Hematological</td>
<td>10 (10%)</td>
</tr>
<tr>
<td>Others</td>
<td>10 (10%)</td>
</tr>
<tr>
<td>Lung</td>
<td>7 (7%)</td>
</tr>
<tr>
<td>Head &amp; neck</td>
<td>5 (5%)</td>
</tr>
<tr>
<td>Pancreatic</td>
<td>5 (5%)</td>
</tr>
<tr>
<td>Skin Melanoma</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Colorectal</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Cancer stage</td>
<td></td>
</tr>
<tr>
<td>I-II</td>
<td>19 (19%)</td>
</tr>
<tr>
<td>III-IV</td>
<td>81 (81%)</td>
</tr>
<tr>
<td>Participant characteristics</td>
<td>n=100 (%)</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Treatment at time of fall</strong></td>
<td></td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>38(38%)</td>
</tr>
<tr>
<td>Hormone</td>
<td>31(31%)</td>
</tr>
<tr>
<td>Targeted therapy</td>
<td>9(9%)</td>
</tr>
<tr>
<td>Radiation</td>
<td>8(8%)</td>
</tr>
<tr>
<td>Others</td>
<td>3(3%)</td>
</tr>
<tr>
<td>Chemoradiation</td>
<td>3(3%)</td>
</tr>
<tr>
<td>Radiation + hormone</td>
<td>2(2%)</td>
</tr>
<tr>
<td>Chemotherapy + targeted therapy</td>
<td>2(2%)</td>
</tr>
<tr>
<td>Pre-treatment</td>
<td>2(2%)</td>
</tr>
<tr>
<td>Chemotherapy + hormone</td>
<td>1(1%)</td>
</tr>
<tr>
<td>Hormone + targeted therapy</td>
<td>1(1%)</td>
</tr>
<tr>
<td><strong>Functional status</strong></td>
<td></td>
</tr>
<tr>
<td>Use of walking aid</td>
<td>55 (55%)</td>
</tr>
<tr>
<td>IADL(^a) impairment</td>
<td>66 (66%)</td>
</tr>
<tr>
<td><strong>Comorbidities &amp; medications</strong></td>
<td></td>
</tr>
<tr>
<td>Median number of comorbidities</td>
<td>3 (SD 2.4)</td>
</tr>
<tr>
<td>Depression</td>
<td>12 (12%)</td>
</tr>
<tr>
<td>&gt;= 5 medications</td>
<td>65 (65%)</td>
</tr>
</tbody>
</table>

* Based on 76 injurious falls out of 168 total falls
** Based on 100 participants
*** At time of survey
\(^a\) SD – Standard deviation
\(^b\) IADL - Instrumental Activities of Daily living
Table 11. Types of injuries sustained from falls

<table>
<thead>
<tr>
<th>Injury type</th>
<th>Out of 76 injurious falls</th>
</tr>
</thead>
<tbody>
<tr>
<td>No injury</td>
<td>N/A</td>
</tr>
<tr>
<td>Bruise</td>
<td>22 (29%)</td>
</tr>
<tr>
<td>Fracture</td>
<td>19 (25%)</td>
</tr>
<tr>
<td>Laceration</td>
<td>12 (13%)</td>
</tr>
<tr>
<td>Open wound bleeding</td>
<td>8 (11%)</td>
</tr>
<tr>
<td>Abrasion</td>
<td>6 (8%)</td>
</tr>
<tr>
<td>Sprain</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>Retinal tear</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Cranial bleed</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Broken tooth</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Tumor bleed</td>
<td>1 (1%)</td>
</tr>
</tbody>
</table>

Note: some participants sustained more than one type of injury

3.4.1. RESEARCH QUESTION 1: WHAT ARE THE OUTCOMES OF FALLS IN TERMS OF IMPACT ON CANCER TREATMENT IN COMMUNITY-DWELLING OLDER CANCER PATIENTS?

Based on the 72 falls reported to the oncologists, five participants (5%) (95% CI 2-11%) experienced cancer treatment interruptions as a result of fall and/or fall-related injury. Of those, three experienced interruption of chemotherapy treatment (ranging from 3 weeks to 3 months); one had hormonal treatment stopped; and one had a chemotherapy dose reduction. While chart review and/or oncology interviews revealed five participants had experienced impact on treatment, only two participant’s recalled/reported impact on treatment in the survey. Additionally, one participant reported that chemotherapy was interrupted for one week while chart review and the oncologist interview confirmed the treatment interruption was three weeks.

The five cases of treatment interruptions involved four oncologists. Of these four, two did not consent to participate in the study. The two oncologists who participated reported their
respective patients’ falls led to interruptions in their cancer treatments. However, the oncologists reported that the interruption in treatment had no impact on the patients’ disease trajectory and prognosis (they had metastatic diagnoses).

3.4.2. RESEARCH QUESTION 2: HOW ARE FALLS ASSESSED AND MANAGED IN ONCOLOGY CLINICS?

Of the 14 oncologists interviewed, 93% (n=13) indicated that they do not routinely assess falls. This was supported by chart review, in which only 11 participants had fall assessment recorded in their charts. Of the 40 participants who reported that they had told their oncologists about their fall, only 24 of these participants’ charts had documentation of such falls. Of note, one oncologist indicated use of an early-referral approach (16), with referral of patients with metastatic disease to palliative care early in that phase of care. The oncologist assumed that the palliative physicians would address issues such as falls. Based on our thematic analysis, key themes from oncologist interviews related to this research question were “fall assessment not a priority/not feasible” (n=13) and “lack of resources for referral/follow up” (n=3) (see Table 3 below for quotes). The majority (93%) of oncologists stated that falls were not routinely assessed in their clinics. However, they did ask about falls in patients who were visibly frail, those with gait/balance difficulties, or those with bone metastases. Out of the total of 72 falls reported (by 40 participants) to oncologists, the most common actions when a fall was reported included determining cause of falls (64%), asking circumstances surrounding falls (36%), eliciting consequences of a fall (36%), referrals to manage after a fall (29%), and physical
examination (21%). Table 12 below shows details on actions taken by the oncologist in response to a fall. This is in agreement with data from patient surveys (n=72 falls), in which oncologists responses to the falls included asking circumstances of falls (51%), performing physical examination (14%), and making referrals (13%). From chart reviews, the most common responses to falls documented in the charts were referrals (e.g. falls clinic, geriatrician, etc.) (26%), ordering tests (7%), and asking about circumstances (7%). Oncologist interviews also revealed uncertainty of where to refer patients as well as frustration with regard to inadequacy of resources for follow-up and referral after a fall.

Table 12. Overview of oncologist actions in response to reported falls

<table>
<thead>
<tr>
<th>Actions in response to reported falls</th>
<th>Frequency (%) (out of 14 oncologists)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine the cause of fall</td>
<td>9 (64%)</td>
</tr>
<tr>
<td>Ask circumstances of fall</td>
<td>5 (36%)</td>
</tr>
<tr>
<td>Determine consequence (e.g. any major injuries such as fracture, subdural hematoma etc.)</td>
<td>5 (36%)</td>
</tr>
<tr>
<td>Referral (e.g. Falls clinic)</td>
<td>4 (29%)</td>
</tr>
<tr>
<td>Order tests</td>
<td>3 (21%)</td>
</tr>
<tr>
<td>Determine if single or recurrent fall</td>
<td>3 (21%)</td>
</tr>
<tr>
<td>Physical examination (including checking blood pressure)</td>
<td>3 (21%)</td>
</tr>
<tr>
<td>Review medication</td>
<td>2 (14%)</td>
</tr>
<tr>
<td>Assess gait and balance (by asking patient to demonstrate walking)</td>
<td></td>
</tr>
<tr>
<td>Ask question about home environment to determine if additional support is required</td>
<td>2 (14%)</td>
</tr>
</tbody>
</table>

Note: oncologists described multiple actions
3.4.3. RESEARCH QUESTION 3: HOW DO OLDER PATIENTS REPORT THEIR FALLS?

Of the 100 participants, 40 reported their falls to their oncologists, 36 did not report to their oncologists, while 15 reported some of their falls but not others. See Table 4 for an overview of falls reported.

Table 13. Overview of fall reporting to oncologists

<table>
<thead>
<tr>
<th>Fall reporting to oncologist</th>
<th>Out of 100 participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes all falls were reported</td>
<td>40</td>
</tr>
<tr>
<td>None of the falls reported</td>
<td>36</td>
</tr>
<tr>
<td>Sometimes yes, sometimes no</td>
<td>15</td>
</tr>
<tr>
<td>Cannot recall</td>
<td>9</td>
</tr>
</tbody>
</table>

From interviews with participants, the main themes with regarding to fall reporting were “perception of falls” and “communication”. Over half the participants had the perception that falls are something insignificant to mention, something that comes along with aging, and that it is not the job of oncologists to hear about falls. Many of these participants also indicated that their family physicians did not know about the fall as they had not gone back to see the family physician ever since they had started receiving care at the cancer centre. See Table 14 for themes and quotes from older adult interviews.
Table 14. Themes, subthemes and quotes from older adult interviews

<table>
<thead>
<tr>
<th>THEMES AND SUBTHEMES</th>
<th>QUOTES</th>
</tr>
</thead>
</table>
| **Perception of fall:**          | **1. Not a fall**  
Patients attributed the fall to external causes or frame it as something else | “Now, it wasn’t what I’d really call a fall.” (Male, 83, pancreatic cancer)  
Interviewer: within this past 12 months how many times did you fall?  
Participant: well, I guess only that one....  
Family: Two. The one in July, and the one at my house. So two.  
Participant: well that was a little.....that was your nails sticking out (from floor).  
(Female, 80, gynecological cancer)  
Participant: I didn’t fall.....I didn’t go all the way down but I didn’t have enough muscle power to get myself back up...... I couldn’t get up to a kneeling position.....well actually I was on my bum, I couldn’t get all the way up  
Family: So you did fall.... so you were falling down.  
Participant: Well.....yeah.  
(Male, 83, prostate cancer) |
| **Perception of fall:**          | **2. Accepting the fact that one is aging**  
The belief that functional decline/falls are inevitable as one ages | “You know I have no control over... There’s nothing that I can do because no matter how careful I am for some reason I just go down at times you know. (Female, 83, breast cancer)  
“I am upset with myself, I should have prevented it, be careful. What can you do? I’m 81. (Male, 81, prostate cancer)  
"When you get old, you balance less”. (Male, 95, head and neck cancer) |
| **Perception of fall:**          | **3. Exercising extra caution to avoid further falls**  
Participants exercising extra caution in the post-fall context or taking steps to increase/maintain strength to avoid further falls | “More careful nowadays.” (Male, 90, prostate cancer)  
“I’m more cautious. I try to be more careful when walking, this and that, yeah. I mean just prudent.” (Male, 74, lung cancer)  
“The only thing is that, I’m really concerned about going to the gym by myself..... because uh, I really don’t know how much I should be pushing myself. Because I’m accustomed to pushing myself, I’m concerned about going to the gym by myself, that’s why one of my clients – he used to be my client – he’s now my workout partner....we go together.” (Male, 68, hematological cancer) |
| **Perception of fall:**          | **4. Fall was more funny than scary**  
Participants approached the subject with a light-hearted attitude | Interviewer: And you mentioned you weren’t feeling dizzy or weak or....  
Participant: I was feeling stupid (laughs).  
(Male, 68, prostate cancer)  
Interviewer: And were you able to get up yourself?  
Participant: I dragged myself upstairs, just scooting and pushing, and I took the sewing machine with me too.  
Interviewer: That must’ve been so difficult!  
Participant: it was fun. (Male, 80, hematological cancer) |
<table>
<thead>
<tr>
<th>THEMES AND SUBTHEMES</th>
<th>QUOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quotes</strong></td>
<td>“That’s pretty funny. Why are you so concerned about this ‘fall’? .......Don’t make a big deal about it, that’s not something.......why don’t you just interview my dog!” (Male, 68, prostate cancer)</td>
</tr>
<tr>
<td></td>
<td>“......nothing was broken. My pride was hurt that that was it. But that can be fixed with a compliment.” (Male, 80, prostate cancer)</td>
</tr>
<tr>
<td><strong>Communication: 1. Minor thing</strong></td>
<td>“(Laughs).These falls, you know, once they are over, and if there’s no damage done, tend to go out of my mind you know.” (Male, 80, prostate cancer)</td>
</tr>
<tr>
<td>Fall was not reported to oncologists because participants considered the fall as something insignificant or ‘no big deal’</td>
<td>“I was in a car accident in 1958 and the doctor told me I would never walk ever again. I didn’t complain back then. If you don’t complain about that, it’s hard to complain here now about these little things.” (Female, 74, breast cancer)</td>
</tr>
<tr>
<td></td>
<td>“I didn’t think it was significant.” (Male, 75, prostate cancer)</td>
</tr>
<tr>
<td><strong>Communication: 2. Oncologist did not ask</strong></td>
<td>“You are the first person who asked me (about falls).” (Male. 82, prostate cancer)</td>
</tr>
<tr>
<td>Participants indicated that oncologist did not ask about falls/do not routinely ask about falls</td>
<td>“I don’t think anyone’s ever asked me that.” (Male, 70, prostate cancer)</td>
</tr>
<tr>
<td></td>
<td>“They never ask.” (Female, 81, skin melanoma)</td>
</tr>
<tr>
<td><strong>Communication: 3. Not oncologist’s specialty</strong></td>
<td>“He’s a cancer doctor, not a fall doctor.” (Male, 82, prostate cancer)</td>
</tr>
<tr>
<td>Participants did not report falls to their oncologists because they felt it was not the oncologist’s job to hear about falls</td>
<td>“It had nothing to do with cancer.” (Male, 71, head and neck cancer)</td>
</tr>
<tr>
<td></td>
<td>“No, because this is not the hospital, this is a cancer hospital.” (Female, 76, breast cancer)</td>
</tr>
<tr>
<td><strong>Communication: 4. Not seeing family doctor</strong></td>
<td>“I see enough doctors, you know, I’m 83.” (Male, 83, prostate cancer)</td>
</tr>
<tr>
<td>Participants did not report falls to their family doctors because they rarely go back to see the family doctor ever since they began receiving care at the cancer centre.</td>
<td>“I spend my life in the hospital (cancer centre) now, I don’t need to see my family doctor.” (Male, 70, hematological cancer)</td>
</tr>
<tr>
<td></td>
<td>“I’m not seeing him right now. I.....the clinic is looking after me. I assume he might’ve gotten the report about it from the clinic; but I didn’t mention to him directly.” (Male, 65, hematological cancer)</td>
</tr>
<tr>
<td></td>
<td>“I didn’t go see my family doctor; I got enough doctors down here now.” (Female, 69, lung cancer)</td>
</tr>
</tbody>
</table>
3.4.4. RESEARCH QUESTION 4: HOW FORTHCOMING ARE OLDER PATIENTS IN REPORTING FALLS FROM ONCOLOGISTS’ PERSPECTIVES

The key theme pertaining to this research question was “not forthcoming and tend to downplay falls” (n=13). Oncologists indicated that many older patients rarely mention their falls unless they were directly asked. Even when the subject does come up (e.g. oncologist asks/family member bring it up etc.), older patients tend to minimize their falls. When falls were reported it was usually by family members rather than older patients themselves. This corroborates with findings from patient surveys, which showed that at least half the falls were not reported to oncologists. See Table 15 below for themes and quotes from oncologist interviews.
Table 15. Themes and quotes from oncologist interviews

<table>
<thead>
<tr>
<th>THEME</th>
<th>QUOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall assessment not a priority/not feasible</td>
<td>“It isn’t something like every single time that I ask.” (Oncologist X)</td>
</tr>
<tr>
<td>Only certain patients are asked about falls. Not all patients are</td>
<td>“It’s not really....... I think this is where geriatricians may take it slightly differently— as somebody who treat patients at any age— is that we focus on the medical diagnoses; and of course falls is not really a medical diagnosis — unless you actually go out and said--have you ever fallen?-- I don’t think it will come up in our standard screening questions.” (Oncologist Y)</td>
</tr>
<tr>
<td>asked about falls - only those who are very vulnerable/have history</td>
<td>(Fall assessment) not as a general routine. So if I have concerns in patients with bone metastases, osteoporosis, I may pay attention to that; but often times there are many other things to discuss, so that may be one thing that I don’t think about as often as I should. (Oncologist Z).</td>
</tr>
<tr>
<td>of falls/mobility issues/bony metastases/something comes up in</td>
<td>“But you know, is not a standard part of our oncologic assessment, we usually ask patients questions about how they’re feeling, if they have any symptoms, and we have them fill out these symptoms surveys. Sometimes it’s like do you have any worsening pain, shortness of breath, or if they are feeling anxious; but, falls are not really a part of our routine assessment. But obviously for some of our patients it’s important – it should be (part of the routine assessment).” (Oncologist H)</td>
</tr>
<tr>
<td>conversations that suggests fall risk factors</td>
<td>“There isn’t enough time to ask all of the different questions.” (Oncologist R)</td>
</tr>
<tr>
<td></td>
<td>“The issue is having the time to ask about so many different possible symptoms.” (Oncologist S)</td>
</tr>
<tr>
<td></td>
<td>I think it’s a great idea to ask the nurses if THEY ask these kinds of questions. Because that should be part of their assessment as well. I think that it is one of the reasons that they’re (nurses are) physically IN the clinic. I’m not satisfied with how much they are actually screening patients..... because, the clinics are getting busier and busier, and the province is not giving adequate nursing staff. So they’re not really monitoring the patients as well as they should. (Oncologist T)</td>
</tr>
</tbody>
</table>
| Lack of resources for referral/follow-up                            | “….and to highlight sort of like an institution viewpoint, we have no physiotherapy or occupational therapy in outpatient, there’s a few clinics that would probably have someone from inpatient or may be doing some sort of research program etc., I think the Older Adults clinic I think that may have some PT OT potential for assessment; other clinics don’t. There’s no way..... there’s no outpatient as a resource whatsoever. The only way
<table>
<thead>
<tr>
<th>THEME</th>
<th>QUOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>(e.g. occupational therapists)</td>
<td>as a resource we use only when we mark it is usually 2 to 3 week turnaround time or sometimes 4 to 6 week, so if I ask for home safety assessment it will trigger OT, PT and triggers for looking at the home environment to decrease risk of falls and to get assistive devices etc., I’m not happy with the turnaround time.” (Oncologist Z)</td>
</tr>
<tr>
<td></td>
<td>“And for recommendations other than the geriatric team I don’t know what else, PT or OT through home care? I don’t know if there are other options. There is no access to like, like a walk in clinic where they can do assessment for safety. (Oncologist C)</td>
</tr>
<tr>
<td></td>
<td>“I don’t know where I would refer the patient if they were having some frailty falls, if there is geriatric assessment that could be done I guess that would be the only.....coz most of them would fall into the geriatric category – not all of them – most of them were. Um, there’s one of my patients who had falls and she was admitted to the Hospital X because of falls, she was discharged because they were short of beds, then she fell and then broke something and then went into the Hospital Y, and I think it may have finally been addressed, but it was known that she had been having recurrent falls, unrelated to her cancer or its treatment. But it was unfortunate because that was an orthopedic problem that was preventable......(I’m) quite annoyed.” (Oncologist X)</td>
</tr>
<tr>
<td>THEME</td>
<td>QUOTES</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Not forthcoming and tend to downplay falls</strong></td>
<td>“I think if you don’t ask them specifically, they won’t tell you.” (Oncologist Y)</td>
</tr>
<tr>
<td>Older patients are not forthcoming in reporting falls during clinic appointments, and do not usually voluntarily mention about falls unless they are asked directly or if their injuries required care. Normally caregivers/family members report falls more than patients do</td>
<td>“Not unless they are injured to the point where they had some impact upon their treatment. I mean, frequently, I mean on more than one occasion...uh....I noticed a bruise on the patient’s forehead, and I say ‘what’s that?’ And then they will tell me. But they would never have mentioned it otherwise. Falls don’t seem to appear on anyone’s radar. Either patients, family members, or staff, to be honest. I rather suspect that patients are very un-forthcoming both to their family and to their caregivers; unless the falls are actually witnessed, it goes undocumented.” (Oncologist A)</td>
</tr>
<tr>
<td></td>
<td>“Not unless you specifically ask, or they sustain some kind of injury. And sometimes you even have to ask very pointed questions. I recall some patients come in with bruises or lacerations and things like that, and I’d ask: “have you fallen?” But they wouldn’t report it unless we ask.” (Oncologist D)</td>
</tr>
<tr>
<td></td>
<td>“They usually downplay it.” (Oncologist X)</td>
</tr>
<tr>
<td></td>
<td>“There’s no doubt the patients try to downplay it. ‘I tripped over this’, or ‘this happened’ or ‘that happened’, as a way of explaining it.... so.... and I’ll be honest with you some cases I’m sure that’s actually it’s a true reflection of what actually happened, um, but there is a little bit of inconsistency sometimes, yes.” (Oncologist B)</td>
</tr>
<tr>
<td></td>
<td>“Most of them are dismissive of it, I don’t know if it’s because they have recurrent episodes, or they’re embarrassed, or the word about being frail and not being able to function independently.... especially when their caregivers in front of them..... So, I think that’s generally the reaction, yeah. (Oncologist Y)</td>
</tr>
</tbody>
</table>
3.5. DISCUSSION

Findings from this study seem to suggest that falls were not commonly reported by older cancer patients to their oncologists, oncologists rarely asked about falls, and falls did not impact their cancer treatment regimens very often. Many participants do not see their FP regularly nor have they visited their FP since the cancer diagnosis. Many falls reported by older adults to their oncologist were not documented. This further supports previous evidence that shows that falls in older patients with cancer are rarely recorded or responded to (17).

The seemingly small percentage of impact on treatment found in this study should not negate the importance of fall assessment in the outpatient oncology setting. It is important to consider the high prevalence of injuries (45%) and the prevalence of falls in older cancer patients, which can be as high as 74% (10). This rate is much higher compared that of the general older population, which is at about 30% (18). A systematic review found fracture rates were 3.2% - 78.3% (10); and the rate in this study (11%) was within this broad range. Additionally, while recent research shows that fracture risk in older patients with cancer is almost three times higher than that of the general older adult population (19), this study also found a higher rate of fracture (11%) compared to that of the general geriatric population (1-2%) (20,21). Notably, evidence shows that prior injurious falls are predictive of future injurious falls (22). That means at least half of our participants will continue to fall and potentially sustain injuries.

Discrepancies were noted in terms of patient self-report of impact on treatment. This may have been due to recall bias or lack of understanding of one’s own treatment plan. Our findings align with research on community-dwelling older adults with cancer, which shows that
falls in this population may go undetected during clinic appointments unless the persons are directly asked about it (23). Evidence shows that falls in older adults in general often go unnoticed by clinicians due to a number of reasons including: 1) avoidance of discussion of falls for fear of loss of independence; 2) little or no injury was incurred from the fall; 3) clinicians fail to ask about falls; and 4) the perception of falls as part of the aging process (24). All of which are similar to our findings. This not only elucidates an underestimation of personal perceived fall risk (25) but also possibly of disconnect in communication regarding falls in the oncology setting. Oncologists and patients alike did not usually bring up the subject, and both expressed that the other party did not bring up the subject of falls. Moreover, reluctance to report falls may also be in part explained by existing evidence which shows that many older adults tend to reject the notion of “being at risk for falls” because they consider it as a suggestion of dependency and incompetence (26). The oncology team should take this into consideration when bringing up the subject of falls or when promoting exercises. Additionally, it is important to be cognizant that patients often ‘put on a good face’ at clinic appointments. Therefore, asking specific questions, particularly regarding a fall, is essential (23). Missed opportunities to prevent future incidents will exist if falls are not specifically asked (27). Fall assessment is of particular importance since evidence from this study as well as from existing literature (17) demonstrates that many older patients with cancer rarely go back to their family physicians and increasingly utilize their treating oncologists as their primary care physician (17). In fact, older patients may even expect their oncologists to effectively take on the role of their primary care physician even though oncologists may not be aware of such expectations (28). Although oncologists should not be expected to function as geriatricians, the oncology community is facing mounting pressure to incorporate geriatric principles into their daily practices (29). Given
the imposed time constraints within oncology clinics, asking older patients whether a fall has occurred since the last visit (by the oncology clinic nurse/clinical nurse specialist) to triage for those who may require follow-up with the falls clinics or geriatrician could be a simple and important start.

### 3.6. STRENGTHS & LIMITATIONS

We enrolled patients from one comprehensive cancer centre in an urban area; therefore, generalizability is an issue. Second, referral bias in which healthier older patients are connected with major cancer centres (30) may to some extent explain our findings. Frail, weaker patients who might experience more serious injuries and more pronounced impact on functional status (and vice versa) and impact on cancer treatment might not have been referred. Third, we only explored falls in relation to impact on cancer treatment for the past 12 months. Thus it is possible that older adults with falls that impacted their treatment prior to the past year were missed. Additionally, some who had a fall who sustained fractures were receiving hormonal treatment, which often involved oral medications or depot injection every few months; this may in part explain the paucity of treatment interruptions. This mode of treatment at the time of the fall made it less likely to affect their treatment regimen, as opposed to weekly chemotherapy or radiation treatment – which some of these patients had also received at different time points in the past. Therefore, the true impact of a fall on treatment may not have been fully explored. In light of the above, we cannot safely exclude the possibility that the number and magnitude of impact of falls on cancer treatment in this population may have been
underestimated in this study. Lastly, since this study involved retrospective recalling of falls, therefore, we cannot exclude the possibility of recall bias, which is common in retrospective study designs (31).

3.7. CONCLUSION

At least one in three older adults with cancer will fall in a year, and one in twenty who falls appear to have a change in cancer management. However, falls are not commonly reported by patients nor adequately addressed/prioritized by oncologists. Incorporating routine fall assessment in oncology clinic appointments may identify those at risk for falls so that timely interventions to manage after a fall or prevent a future fall can be triggered.
References


22. Pohl P, Nordin E, Lundquist A, Bergström U. Community-dwelling older people with an injurious fall are likely to sustain new injurious falls within 5 years - a prospective long-term follow-up study. BMC Geriatr. 2014;14(1):120.


Chapter 4
Circumstances of falls and fear of falling in community-dwelling older cancer patients: Results from a mixed-methods study

4.1. ABSTRACT

BACKGROUND

Falls are common among older adults and are of added concern among older cancer patients due to cancer and its treatment. Knowledge on circumstances surrounding falls and fear of falling is vital for understanding how various factors may precipitate falls as well as for informing development of effective interventions to prevent falls in older adults. The aim of the study was to explore the circumstances of falls and fear of falling in community-dwelling older adults with cancer.

METHOD

A convergent-parallel mixed-methods design was used in this cross-sectional study. Community-dwelling older adults (aged 65 and older) with cancer who experienced ≥1 fall in the past year were recruited (N=100) from the Princess Margaret Cancer Centre in Toronto, Canada. Data collection included patient self-reported survey and open-ended interview. Descriptive statistics for quantitative data and thematic analyses for qualitative data were conducted.

RESULTS

One hundred sixty-eight falls were recounted. Falls occurred mostly indoor, during the day and during normal, non-hazardous activities. Many participants had a fall when not using their
walking aid. While some participants (15%) attributed their falls to bad turns or tripping, others blamed themselves for being careless or foolish. Themes from qualitative interviews included ‘cognitive appraisal of falls’, ‘mobility-related fall reasons’, and ‘opportunity for health-teaching’.

CONCLUSION

Circumstances of falls seem to be similar as those in the general geriatric population. Strategies for fall prevention and management used in the general geriatric population can potentially benefit this population as well. Attention may be warranted specifically regarding medication review, health-teaching on fall safety, home safety evaluation, and referral for balance training.
4.2. INTRODUCTION

Falls are a major health concern in individuals ≥65 years of age, with at least one in three elders who live in the community sustaining a fall each year (1,2). Older adults with cancer have added risks of falling due to the cancer itself and/or the toxicities of cancer treatments (3,4). Research suggests that nearly 20% of newly diagnosed older cancer patients have ≥1 fall in a six-month period (5); and the fall rate in those with advanced cancer can be as high as 53% over six months (6). Consequently, increase in the population of those who are older with cancer may lead to an increase in those who fall within the oncology setting.

Research shows that falls can lead to fear of falling (FOF), which can foreshadow activity restrictions and subsequent falls (7). Additionally, the activity an individual is conducting at the time the fall occurs has long been established as an important component of evaluating a fall (8). Knowledge regarding the circumstances surrounding falls is vital for understanding how various factors (e.g. intrinsic, environment, and behaviors) may precipitate a fall as well as for informing development of effective interventions to prevent falls in older adults (9). This paper reports on findings on circumstances of falls and older patient FOF in the post-fall context, which is part of the investigation of a larger, mixed-methods study exploring assessment, management, and impact of falls (these findings are reported separately and have been submitted for publication) (10).

Fall assessment in an older person should include a detailed description of the symptoms preceding the fall, as well as circumstances of the fall (11). This information is particularly important in older cancer patients due to their added vulnerability related to their
cancer and cancer treatment. A recent systematic review (12) revealed that there is a paucity of published information on circumstances related to a fall in older cancer patients. The current study seeks to address this gap.

The research questions were:

1. What are the circumstances of falls in community-dwelling older adults with cancer (who are on treatment or referred for treatment)?
2. What is the level of fear of falling (FOF) in the post-fall context in this population?

4.3. METHODS

4.3.1. STUDY DESIGN

Utilizing a convergent parallel mixed methods design (13), this cross-sectional study collected quantitative and qualitative data concurrently regarding circumstances of falls and FOF.

4.3.2. REB APPROVAL AND INFORMED CONSENT

Approvals were obtained from the Research Ethics Boards at the University Health Network (UHN) and the University of Toronto prior to the start of the study. Written informed consent was obtained from all participants prior to data collection (including audio-recording the interview).
4.3.3. SAMPLE AND SETTING

The sample size of this exploratory study was 100.

Inclusion criteria:

- community-dwelling and aged aged 65 and older;
- receiving/planned cancer treatment at the medical or radiation oncology clinics of Princess Margaret Cancer Centre, Toronto;
- diagnosed with any solid tumor or hematological malignancy;
- a fall within the past 12 months;
- life expectancy >6 months
- able to communicate in English and provide informed consent.

4.3.4. RECRUITMENT PROCEDURE

Patient recruitment took place from October 27, 2016 to November 29, 2017. Staff in the medical and radiation oncology clinics, and the Older Adults with Cancer Clinic (OACC) were asked daily during weekdays if there was any older patient deemed eligible. Those fitting the inclusion criteria were asked by a member of the patient’s circle of care team for permission to be approached to explain the study. Ten eligible patients did not participate: refusal (n=4), ‘not interested’ (n=4), ‘already in another study’ (n=1), and deemed unfit by oncologist (n=1). One participant under 65 was mistakenly recruited due to miscommunication with clinic staff.
4.3.5. DATA COLLECTION PROCEDURES

Data collection occurred during the clinic visit. Patients completed a survey and a semi-structured interview with the study PI (SS) after survey completion. The survey and the interview took place during the same encounter. As there were no existing tools to measure circumstances of falls, the patient survey and interview guide were developed with expert consensus of the research team and based on the fall preventions guidelines of the American Geriatrics Society/British Geriatrics Society (AGS/BGS) (11). Patients were given the options to fill out the survey themselves or to complete it verbally (with the PI asking them the questions and writing down answers) to ensure flexibility (14). On average it took 20-30 minutes to complete the survey and interview.

4.3.6. MEASURES

Falls were assessed retrospectively for 12 months by self-report. Information on circumstances of falls, including time, location, physical sensations, physical environment and activities at the time of the fall were collected via a survey developed following the Clinical Practice Guideline by the AGS/BGS (11). Open-ended interview questions (developed also following the AGS/BGS guideline) (11) asked patients to elaborate on the circumstances of their fall. See Appendix F for older adult interview topic guide.
Fear of Falling

The Fall Efficacy Scale-International (FES-I) (15) was used to assess for current attitude toward fall safety. This validated instrument (16) and has been used in cancer population in Canada (17). The level of fear of falling was dichotomized as high/low based on the cut off score of 23 to distinguish level of concern about falls (16).

4.3.7. DATA ANALYSIS

For the quantitative data, descriptive statistics (means, frequencies, and proportions) were used to describe participant characteristics, circumstances of falls, location, timing, activity, physical sensation, and use of walking aid when the falls occurred utilizing SPSS version 20. Qualitative data were examined using thematic analysis following the 6-phase step-by-step guide to thematic analysis as prescribed by Braun & Clarke (18). To ensure quality and rigor, the Good Reporting of a Mixed Methods Study (GRAMMS) framework was used to guide this study at every stage of this study’s development and execution (19).

4.4. RESULTS

A total of 100 older adults participated (62% male). See Table 16 for participant characteristics. The median age was 76 years. The most common cancer sites included prostate (34%), breast (12%), and hematological (10%). A total of 168 falls were described by the
participants (see Table 17). The number of falls per participant ranged from one fall to >10 falls.

The majority (66%) fell more than once.

Table 16. Participant characteristics

<table>
<thead>
<tr>
<th>Participant characteristics</th>
<th>N=100 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age, years</td>
<td>76 (SD 7.5)</td>
</tr>
<tr>
<td>Women</td>
<td>38 (38%)</td>
</tr>
<tr>
<td>Living alone</td>
<td>18 (18%)</td>
</tr>
<tr>
<td>Years of education</td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>6 (6%)</td>
</tr>
<tr>
<td>5-8</td>
<td>8 (8%)</td>
</tr>
<tr>
<td>9-12</td>
<td>29 (29%)</td>
</tr>
<tr>
<td>13 or more</td>
<td>57 (57%)</td>
</tr>
<tr>
<td>Fall frequency in past 12 months</td>
<td></td>
</tr>
<tr>
<td>1 fall</td>
<td>44 (44%)</td>
</tr>
<tr>
<td>&gt;=2 falls</td>
<td>56 (56%)</td>
</tr>
<tr>
<td>Injurious fall rate*</td>
<td>45%</td>
</tr>
<tr>
<td>Cancer diagnosis</td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>34 (34%)</td>
</tr>
<tr>
<td>Gynecological</td>
<td>14 (14%)</td>
</tr>
<tr>
<td>Breast</td>
<td>12 (12%)</td>
</tr>
<tr>
<td>Hematological</td>
<td>10 (10%)</td>
</tr>
<tr>
<td>Others</td>
<td>10 (10%)</td>
</tr>
<tr>
<td>Lung</td>
<td>7 (7%)</td>
</tr>
<tr>
<td>Head &amp; neck</td>
<td>5 (5%)</td>
</tr>
<tr>
<td>Pancreatic</td>
<td>5 (5%)</td>
</tr>
<tr>
<td>Skin Melanoma</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Colorectal</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Cancer stage</td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>19 (19%)</td>
</tr>
<tr>
<td>3-4</td>
<td>81 (81%)</td>
</tr>
<tr>
<td>Treatment at time of fall**</td>
<td></td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>38 (38%)</td>
</tr>
<tr>
<td>Hormone</td>
<td>31 (31%)</td>
</tr>
<tr>
<td>Targeted therapy</td>
<td>9 (9%)</td>
</tr>
<tr>
<td>Radiation</td>
<td>8 (8%)</td>
</tr>
<tr>
<td>Others</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>Chemoradiation</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>Radiation + hormone</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Chemotherapy + targeted therapy</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Pre-treatment</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Chemotherapy + hormone</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Hormone + targeted therapy</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Participant characteristics</td>
<td>N=100 (%)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Functional status</strong></td>
<td></td>
</tr>
<tr>
<td>Use of walking aid***</td>
<td>55 (55%)</td>
</tr>
<tr>
<td>IADL impairment</td>
<td>66 (66%)</td>
</tr>
<tr>
<td><strong>Comorbidities &amp; medications</strong></td>
<td></td>
</tr>
<tr>
<td>Median number of comorbidities</td>
<td>3 (SD 2.4)</td>
</tr>
<tr>
<td>Depression</td>
<td>12 (12%)</td>
</tr>
<tr>
<td>&gt;= 5 medications</td>
<td>65 (65%)</td>
</tr>
<tr>
<td>Anti-hypertensives</td>
<td>45 (45%)</td>
</tr>
<tr>
<td>Psychotropic medications</td>
<td>26 (26%)</td>
</tr>
<tr>
<td>Diuretics</td>
<td>25 (25%)</td>
</tr>
</tbody>
</table>

* Based on 76 injurious falls out of 168 total falls
** Based on 100 participants
*** At time of survey
Table 17. Number of falls sustained by participants within the past 12 months

<table>
<thead>
<tr>
<th>Number of falls</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>44 (44%)</td>
</tr>
<tr>
<td>2</td>
<td>34 (34%)</td>
</tr>
<tr>
<td>3</td>
<td>12 (12%)</td>
</tr>
<tr>
<td>4</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>&gt;=5</td>
<td>6 (6%)</td>
</tr>
</tbody>
</table>

4.4.1. RESEARCH QUESTION 1: WHAT ARE THE CIRCUMSTANCES OF FALLS IN COMMUNITY-DWELLING OLDER ADULTS WITH CANCER?

Sixty-one (36%) of the falls occurred at home (see Table 18). The majority of the falls (47%) occurred in the afternoon. The most common locations of falls were living room (14%), bathroom (13%), bedroom (10%), staircase (9%), and sidewalk curb (10%). Forty-five percent of the falls were not accompanied by any particular physical sensations before falling. Of those who reported unusual sensations prior to a fall (n=91), feeling weak (16%), dizzy (12%), unsteady/difficulty balancing (11%) were the most common sensations. Walking (31%), changing position (getting up from sitting or from standing to sitting) (8%), going up/down stairs (7%), negotiating curb/step (7%), and turning (4%) were the most common activities at the time of the fall. Of those who had a fall on the stairs (n=15), one-third was carrying large, bulky objects (e.g. suitcase, sewing machine). Among those for whom normally used a walking aid (n=52), 19 (37%) were not using their walking aids when their falls occurred. Among those with serious injurious (e.g. fractures and head injuries), 25% had used psychotropics and 25% had used diuretics at the time of the falls.
### Table 18. Overview of circumstances of falls

<table>
<thead>
<tr>
<th>Circumstances of falls</th>
<th>168 falls (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOCATION</strong></td>
<td></td>
</tr>
<tr>
<td>Indoor</td>
<td></td>
</tr>
<tr>
<td>At Home</td>
<td></td>
</tr>
<tr>
<td>Living room</td>
<td>24 (14%)</td>
</tr>
<tr>
<td>Bathroom/shower</td>
<td>21 (13%)</td>
</tr>
<tr>
<td>Bedroom</td>
<td>16 (10%)</td>
</tr>
<tr>
<td>Staircase</td>
<td>15 (9%)</td>
</tr>
<tr>
<td>Kitchen</td>
<td>13 (8%)</td>
</tr>
<tr>
<td>Hallway/corridor</td>
<td>5  (3%)</td>
</tr>
<tr>
<td>Other areas at home</td>
<td>3  (2%)</td>
</tr>
<tr>
<td><strong>Hospital locations</strong></td>
<td>7  (4%)</td>
</tr>
<tr>
<td><strong>Other public buildings</strong></td>
<td>8  (5%)</td>
</tr>
<tr>
<td><strong>Outdoor</strong></td>
<td></td>
</tr>
<tr>
<td>Sidewalk curb</td>
<td>17 (10%)</td>
</tr>
<tr>
<td>On sidewalk</td>
<td>9  (5%)</td>
</tr>
<tr>
<td>Backyard</td>
<td>8  (5%)</td>
</tr>
<tr>
<td>Park/Golf course</td>
<td>7  (5%)</td>
</tr>
<tr>
<td>Parking lot/driveway</td>
<td>6  (4%)</td>
</tr>
<tr>
<td>Other outdoor locations</td>
<td>6  (4%)</td>
</tr>
<tr>
<td>Front/back door (house)</td>
<td>3  (2%)</td>
</tr>
<tr>
<td><strong>TIME OF THE DAY</strong></td>
<td></td>
</tr>
<tr>
<td>Morning</td>
<td>61 (36%)</td>
</tr>
<tr>
<td>Afternoon</td>
<td>79 (47%)</td>
</tr>
<tr>
<td>Evening</td>
<td>11 (7%)</td>
</tr>
<tr>
<td>Night</td>
<td>10 (6%)</td>
</tr>
<tr>
<td>Can’t recall</td>
<td>7  (4%)</td>
</tr>
<tr>
<td><strong>ACTIVITY</strong></td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>52 (31%)</td>
</tr>
<tr>
<td>Can’t recall</td>
<td>24 (14%)</td>
</tr>
<tr>
<td>Changing position*</td>
<td>14 (8%)</td>
</tr>
<tr>
<td>Negotiating curb/step</td>
<td>11 (7%)</td>
</tr>
<tr>
<td>Standing</td>
<td>10 (6%)</td>
</tr>
<tr>
<td>Performing task</td>
<td>8  (5%)</td>
</tr>
<tr>
<td>Going up/down stairs/steps</td>
<td>8  (5%)</td>
</tr>
<tr>
<td>Turning</td>
<td>7  (4%)</td>
</tr>
<tr>
<td>Getting in/out of bed</td>
<td>6  (4%)</td>
</tr>
<tr>
<td>Other activities</td>
<td>6  (4%)</td>
</tr>
</tbody>
</table>
### Circumstances of falls

<table>
<thead>
<tr>
<th>Circumstances of falls</th>
<th>168 falls (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting in/out of vehicle</td>
<td>4 (2%)</td>
</tr>
<tr>
<td>Using stairs while carrying objects</td>
<td>4 (2%)</td>
</tr>
<tr>
<td>Gardening</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>Showering</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>Hiking</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Reaching for phone/blind</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Carrying stuff and walking</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Chasing runaway pet</td>
<td>1 (&lt;1%)</td>
</tr>
<tr>
<td>Dodging an active pet</td>
<td>1 (&lt;1%)</td>
</tr>
</tbody>
</table>

### PHYSICAL SENSATIONS

<table>
<thead>
<tr>
<th>Physical sensation</th>
<th>168 falls (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>77 (46%)</td>
</tr>
<tr>
<td>Weak</td>
<td>27 (16%)</td>
</tr>
<tr>
<td>Dizzy</td>
<td>20 (12%)</td>
</tr>
<tr>
<td>Difficulty balance/unsteady</td>
<td>18 (11%)</td>
</tr>
<tr>
<td>Tired</td>
<td>10 (6%)</td>
</tr>
<tr>
<td>Can’t recall</td>
<td>5 (3%)</td>
</tr>
<tr>
<td>Pain</td>
<td>4 (2%)</td>
</tr>
<tr>
<td>Numbness/tingling</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>Hallucinating</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Didn’t feel good in general</td>
<td>2 (1%)</td>
</tr>
</tbody>
</table>

### ENVIRONMENT

<table>
<thead>
<tr>
<th>Environment</th>
<th>168 falls (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None in particular</td>
<td>88 (52%)</td>
</tr>
<tr>
<td>Stairs/step</td>
<td>31 (18%)</td>
</tr>
<tr>
<td>Slippery surface (wet, icy etc.)</td>
<td>16 (10%)</td>
</tr>
<tr>
<td>Uneven surface</td>
<td>11 (7%)</td>
</tr>
<tr>
<td>Dark</td>
<td>9 (5%)</td>
</tr>
<tr>
<td>Can’t recall</td>
<td>6 (4%)</td>
</tr>
<tr>
<td>Clutter</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>Furniture in the way</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Slope</td>
<td>1 (&lt;1%)</td>
</tr>
<tr>
<td>Rug</td>
<td>1 (&lt;1%)</td>
</tr>
</tbody>
</table>

### USE OF WALKING AID AT TIME OF FALL**

<table>
<thead>
<tr>
<th>Use of walking aid</th>
<th>168 falls (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>31 (60%)</td>
</tr>
<tr>
<td>No</td>
<td>19 (37%)</td>
</tr>
<tr>
<td>Can’t recall</td>
<td>2 (4%)</td>
</tr>
</tbody>
</table>

* Changing from sitting to standing or from standing to sitting
** For those who had normally been using a walking aid prior to the time of the fall (n=52)
Themes from the open-ended interviews were: ‘cognitive appraisal of the fall’ (blaming self for bad choices and not talking about things regarding their physical capacity and power [n=9]; and willingness to take extra cautions to avoid further falls [n=39]); ‘mobility-related fall reasons’ (participants described tripping and/or not being good at turns [n=12]; and many participants did not use their walking aid [n=19]); and ‘opportunity for health-teaching’ (older patients may benefit from reminders regarding safety [n=6]). Table 19 provides an overview of themes and quotes.

Table 19. Themes, subthemes and quotes from interviews

<table>
<thead>
<tr>
<th>Themes and subthemes</th>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cognitive appraisal of fall</strong></td>
<td><strong>Self-blaming</strong></td>
</tr>
<tr>
<td>1. <strong>Self-blaming</strong> (blaming self for bad choices and not talking about things regarding their physical capacity and power)</td>
<td>“I was rushing to go over to my brother’s place, so dumb, dumb, dumb, dumb! Impatience, anyways.” (Female, 77, gynecological cancer)</td>
</tr>
<tr>
<td>2. <strong>Willingness to take extra caution</strong></td>
<td>“I thought it was a stupid thing on my part too.” (Female, 88, breast cancer)</td>
</tr>
<tr>
<td>(participants are willing to be extra careful to avoid further falls)</td>
<td>“I didn’t see the step! It was my fault.” (Female, 78, breast cancer)</td>
</tr>
<tr>
<td><strong>Willingness to take extra caution</strong></td>
<td><strong>Family:</strong> “It was the so-called ‘foot drop’ that he has, so he didn’t realize that he couldn’t lift up his foot”</td>
</tr>
<tr>
<td>(participants are willing to be extra careful to avoid further falls)</td>
<td></td>
</tr>
<tr>
<td><strong>Mobility-related fall reasons</strong> (participants described tripping, and not being good at turns; many participants did not use their walking aids)</td>
<td>“I didn’t lift my foot high enough when I was in the bathroom.” (Male, 71, head and neck cancer)</td>
</tr>
<tr>
<td></td>
<td>Family: “It was the so-called ‘foot drop’ that he has, so he didn’t realize that he couldn’t lift up his foot</td>
</tr>
<tr>
<td>Themes and subthemes</td>
<td>Quotes</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td>normally.” (Male, 79, liver cancer)</td>
</tr>
<tr>
<td></td>
<td>“I don’t do turns very well.” (Male, 78, prostate cancer)</td>
</tr>
<tr>
<td></td>
<td>“Well, one was in my garden, I was working outside, and just turned around...... I guess I was too fast.” (Female, 84, hematological cancer)</td>
</tr>
<tr>
<td></td>
<td>“I was doing pretty good with my walking at that time. So I didn’t really need it (the cane). And it just happened.” (Male, 83, prostate cancer)</td>
</tr>
<tr>
<td></td>
<td>“I don’t need nothing.” (Female, 90, gynecological cancer)</td>
</tr>
<tr>
<td></td>
<td>“I didn’t want to use it. I felt I could walk okay. But I could walk okay. But when the leg gives out, it gives out. You can do nothing about that.” (Male, 72, prostate cancer)</td>
</tr>
</tbody>
</table>

| Opportunity for health-teaching regarding safety | Family: “Yesterday, if he had stayed straight with me......I had him by the arm walking across the road, and all of a sudden he veered right and stepped up on the sidewalk.......but, he......he went a little bit off on his own, even though he knows I was standing right there to help them. So in other words he was.............he didn’t follow instructions. I mean, in a situation where it was dangerous circumstances, and I’m standing right there ready to holding him up, and, he decided to do something different.......” (Male, 70, prostate cancer) |
|                                                   | “And I think it was the chemo, because normally I’m fine. I wasn’t feeling right that day and I really should have just stayed home, but my wife wanted to go out for a bike ride......we go out all the time......and so I guess I just wanted to be a good husband and go out and spend time with her......” (Male, 73, prostate cancer) |
|                                                   | “....In my garden outside, and uh from step ladder I fall down......I slipped and I fall down.” (Male, 70, prostate cancer) |
### Themes and subthemes

<table>
<thead>
<tr>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: “…..five weeks ago, he wanted to go feed the birds, he wanted to walk out, and I told him, “look, it’s icy out there, but no he had to feed the birds. And that’s what I’m talking about the fixation on things. And honest to God sometimes I feel like the house can be burning down if he’s got to feed the bird he will still feed the birds. It’s these fixations. And so he fell on the ice. He took two steps from the door fell on the ice.” (Male, 71, pancreatic cancer)</td>
</tr>
</tbody>
</table>

### 4.4.2. RESEARCH QUESTION 2: WHAT IS THE LEVEL OF FOF IN THE POST FALL CONTEXT?

More than half of the participants (55%) reported a high level of FOF based on the FES-I cut-off (15) (mean score 26.41 ± 10.44). Under the theme “cognitive appraisal of fall”, the notion of taking extra caution (as mentioned above) to avoid further falls was pervasive across participants. Participants described being extra careful or taking up strategies (e.g. putting in new carpet, moving furniture out of the way) since the falls. However, while FOF was high, reducing activities in the post-fall context was rare. Some participants even reported that, rather than reducing activities, they had actually become more active, albeit being more careful (e.g. enlisting a ‘gym buddy’ to avoid work out together).
4.5. DISCUSSION

This study found that falls in community-dwelling older adults with cancer occurred most often indoors, during the day and when conducting non-hazardous activities, such as walking. Falls on staircases and at sidewalk curbs were also common. The most commonly reported physical sensations preceding fall were weakness, dizziness, and difficulty balancing. Participants also alluded to tripping/not lifting foot high enough, and bad turns. Self-blaming for the falls were common. Many participants did not use their walking aids at the time of the fall. Cancer-related symptoms such as cancer-related pain and peripheral neuropathy were not commonly reported as sensations preceding falls. Circumstances of falls as alluded to by participants such as dizziness, balance difficulties, falling while walking, falling at home, falling in the bathroom etc. all align with findings in the general geriatric population (9,20,21).

Falling while walking was also a theme in a previous qualitative study exploring circumstances of falls in community-dwelling older adults with cancer (22). The majority of the falls occurred during the day, which is not surprising since that is the time period during which most activities normally occur for older adults (23). Furthermore, in our study, 16% of injuries occurred in the bathroom at home. In fact, evidence shows that the likelihood of sustaining an injury from falling in the bathroom was nearly 2.5 times higher than the living room (9). Over half (60%) of our participants who had a fall in the bathroom sustained injuries. This indicates that improvements in the bathroom to promote safety (e.g. occupational therapist assessment) could be beneficial to reduce future injurious falls. Active, healthy older adults are more likely to fall outdoors (24). The fact that many had a fall indoor highlights the vulnerability of this group (25). Over half of our participants had >1 falls, which made them a person who had
recurrent falls (20); the proportion recurrent fallers in our study is somewhat higher than previously reported in the general geriatric population (26,27). This suggests that fall assessment may be important to identify this vulnerable sub-group so that timely interventions could be carried out to mitigate falls and associated injuries. Falls prevention programs and other targeted interventions have been found to be most effective in recurrent fallers (28).

Many of our participants blamed not being good at turning for the fall. This may be related to reduction of resources to adapt to changes due to aging. About one-third of falls in the general older population are related to tripping or slipping (9). Older individuals have increased vulnerability to trips due to aging and the associated decreased clearance height of the recovery foot of the swing phase during walking (29), which might be exacerbated by effects of treatment-related neuropathy and diminished sensation. Falls on stairs and sidewalk curbs was disproportionately high considering the time one normally spends in these places over the course of a day. Evidence shows that older individuals do not prefer to present as being ‘the type who falls’, but instead tend to blame themselves for not taking care and attribute the fall to their own behavior (30). Being at risk for falls is viewed as synonymous with lack of control, which may sound unpalatable to older adults (30). This may in part explain why participants chastised themselves for being ‘stupid’/‘dumb’/‘foolish’, and attributed their falls to carelessness or bad choice.

Reluctance to use their walking aid was a common phenomenon in this study. Although assistive devices are among the methods found to reduce the rate of falling (31), research in the general geriatric population shows that many older individuals are reluctant to use them due to social stigma associated with the use of such devices (32). Drugs that were used by participants appear to be similar to those in other studies (33,34).
Our mean FOF score was similar to previous findings in the general older population (mean score 27.1 ± 10.7) (35), and both were above the cut-off for high FOF. Interestingly, while the literature shows that FOF among older adults lead to restriction of activities (7), our findings seem to differ as activity restriction was not common among participants. Of note, while healthcare professionals describe FOF as activity restriction; for older adults, on the other hand, FOF may mean finding a balance in everyday life (i.e. to discipline one’s daily life, and to adapt to living with the challenge such as being vulnerable to fall and losing control) (36). This is evident in our study, as the majority of participants did not limit/reduce activities; but rather, continued their usual activities, albeit acknowledging that they were more careful nowadays and had taken steps to help mitigate falls (e.g. enlisting work-out buddy, changing rug, taking time etc.). However, these participants might have already adopted a significantly lower activity pattern due to treatment-related health teaching (e.g. avoid crowds, public transit etc.)

4.6. CLINICAL IMPLICATIONS

This study suggests that effective interventions to prevent falls in the general geriatric population can also be applied to help mitigate falls in older adults with cancer since most risk factors, circumstances and location appear to be similar in the two groups. Teaching during clinic appointments regarding fall safety when conducting daily activities is essential; in particular on use of walking aid, carrying bulking objects while using stairs, negotiating steps and sidewalk curbs, and being cognizant about falls in both normal and potentially riskier activities. It is also important to routinely remind patients who are on active treatment that
common side effects of cancer treatment such as weakness and fatigue could place them at higher risk for falls and fall injuries. With regard to tripping, among promising interventions are teaching techniques in laboratory settings on how to regain balance (37,38). Referral for laboratory-based training that simulate slipping and induce backwards falls by way of surface perturbations, which has been shown to improve both proactive (i.e. pre-slip) and reactive (i.e. post-slip) balance and reduce backward falls (37). Early recognition and management of cancer-and its treatment-related late effects as well as referral to relevant specialists/disciplines (39) to address amenable issues and to provide appropriate supportive care are needed. Patients receiving psychotropic medications should be asked about falls; and medication reviews should be performed for possible stopping of such medications. Referral to rehab/physiotherapist for assessment and strength-training may be beneficial. For those who fall at home, referral for occupational therapist for in-home safety evaluation could help reduce falls (40).

4.7. RESEARCH IMPLICATIONS

Further prospective studies to examine how older adults with cancer receiving cancer treatments estimate their risk of falls and the activities during falls are needed. Moreover, further research with a larger sample size and multi-site recruitment to capture patients of more diverse health state, education, race, and socioeconomic level are needed. Future studies should also incorporate information on multifocal/bifocal lenses and footwear in understanding circumstances of falls (41,42). Prospective studies to more adequately capture circumstances of falls and physical sensations prior to falls are also warranted. Additionally, exploring risk factors unique to cancer, such as peripheral neuropathy pain, are also needed.
4.8. LIMITATIONS

This study recruited patients from a single urban comprehensive cancer centre; therefore, generalizability may be of issue. In particular, this cancer centre tends to attract patients who want cancer treatment and who are more highly educated, as evidenced in our participant characteristics. Second, referral bias in which less frail patients are referred to major cancer centres to some extent may explain our findings (43). Patients who were more frail and who might have experienced more falls and more serious injuries might not have been captured. Third, the retrospective recall of falls could have been subject to recall bias, which is not uncommon in studies utilizing retrospective approach (44), particularly more remote falls (i.e. up to a year ago). Moreover, the cross-sectional study design meant we could only assess their FOF at one time-point, as opposed to its evolution over time in the pre-fall and post-fall context. Nonetheless, the current FOF levels may still offer some insights into their attitude toward perceived fall risk. Lastly, the small sample size in this hypothesis-generating study also limits its representativeness of the population. Information regarding wearing multifocal/bifocal lenses and footwear was not collected. Additionally, the majority of the participants were Caucasians; other races were not well-represented; importantly, Spoelstra et al. found race to be a significant fall risk factor in the older cancer population (45).
4.9. CONCLUSION

Circumstances of falls do not seem to diverge from findings in the general geriatric population. Strategies for fall prevention and management used in the general geriatric population can potentially benefit this population as well. Attention may be warranted specifically regarding medication review, health-teaching on fall safety, home safety evaluation, and referral for balance-training.
References


Chapter 5
Discussion

The purpose of this research was to examine the circumstances of falls, how falls are assessed, reported, and managed in the outpatient oncology setting, as well as how falls can impact cancer treatment in older patients with cancer. The discussion of study findings is presented in this chapter, including study limitations, implications for clinical practice and recommendations for future research.

5.1. MAIN FINDINGS

5.1.1. LITERATURE REVIEW

The systematic review presented in Chapter 2 specifically focused on the following research questions: 1) How often do older adults (OA) with cancer fall? 2) What are the predictors of falls in OA with cancer? 3) What is the rate of injurious falls and predictors of injurious falls in OA with cancer? 4) What are the circumstances and outcomes of falls in this population? 5) How do falls in cancer patients affect subsequent cancer treatment?

This systematic review included 27 studies on falls in older adults with cancer and showed great heterogeneity in study designs and falls ascertainment. As a result, for Research Question 1 (fall rates), fall rates ranged widely. Since these fall rates were reported by studies using different designs and types of denominators, they were not appropriate to be compared to one another. Therefore, no meta-analyses of fall rates were performed.
The fall rates were organized according to setting, namely, inpatient and outpatient, mixed in- and out-patient, and administrative data base/clinical data. For the inpatient setting, fall rates ranged from 3% over one year (1) to 23% over two months (2). In the outpatient setting, it ranged from 15% over one year (3) to 79% over three months (4). For the mixed in- and outpatient setting, it ranged from 31% over one year (5) to 50% over six months (6). From administrative/clinical data, it ranged from 24% over two years (7) to 24% over six months (8).

For Research Question 2 (predictors of falls), only predictors that had been found significant in at least 2 prospective studies were considered. Cognitive impairment was found to be a significant predictor of falls in the inpatient setting (1,2), while prior falls was a significant predictor (3,9) in the outpatient setting. Among administrative databases/clinical data, having cancer was a significant fall predictor. Notably, the few predictors yielded had more to do with the paucity of research with prospective study designs in identifying fall predictors, than the lack of importance of other common fall predictors among older adults.

For Research Question 3 (injurious fall rates and predictors), injurious fall rates ranged between 29% - 74% of all falls in the past year (5,9). Age, gender, comorbidity, chemotherapy, cancer stage, and osteoporosis were identified as predictors for fall-related injuries in only one study (10).

For Research Question 4 (circumstances of falls), two inpatient studies found that falls often occurred from bed (while getting out of bed), and while standing or walking, and while transferring. One qualitative, outpatient study found that falling at home, and falling while walking were common themes (11). Concerning Research Question 5 (impact on cancer treatment due to falls), no literature was found.
In summary, results from the literature review made it apparent that research on falls in the geriatric oncology setting was scant, and that research was needed regarding perspective of impact of falls on cancer treatment, the circumstances of falls in older patients with cancer (in particular for older adults treated in the outpatient setting), and also fall rates and predictors. Main gaps in research informed by this systematic review were:

- No data on impact of falls on subsequent cancer treatment in community-dwelling older adults with cancer
- Few data on circumstances of falls in this population

Therefore, the research questions for this thesis informed by this systematic review were:

1) How do falls impact cancer treatment in community-dwelling older adults with cancer?
2) How are falls assessed and managed in oncology clinics?
3) What are the circumstances surrounding falls in this population?
4) What is the level of fear of falling (FOF) in the post-fall context in this population?
5) How do older patients report their falls?
6) How forthcoming are older patients in reporting falls from oncologists’ perspective?

This cross-sectional study utilized a convergent parallel mixed-methods study design. Quantitative data and qualitative data were collected to answer the research questions to help corroborate and/or augment data in order to gain better understanding of the research questions. The participants were community-dwelling older adults aged >=65 who had been referred to the Princess Margaret Cancer Centre in Toronto, Canada.
5.1.2. HOW DO FALLS IMPACT CANCER TREATMENT IN COMMUNITY-DWELLING OLDER ADULTS WITH CANCER?

This research question was answered in Chapter 3. The impact of treatment was evident in this study, albeit uncommon. Of the 100 older participants, 5% (n=5) experienced a change in their treatment due to falls which included an interruption, a dose reduction and a stoppage of treatment.

There was discrepancy between patient self-report and chart review. While two older participants recalled/reported impact of their falls on cancer treatment, a total of five participants had in fact experienced impact on treatment based on oncologist documentation in charts.

Of the four oncologists who were responsible for the care of these five participants, two did not participate in the study. Therefore, only the input of two oncologists was available. The two oncologists who participated confirmed the impact on cancer treatment.

5.1.3. HOW DO ONCOLOGISTS ASSESS AND MANAGE FALLS IN OLDER PATIENTS?

This research question was also answered in Chapter 3. Of the 72 falls that participants had reported to oncologists (based on patients’ self-reported surveys), only 64% of which were documented in the chart. Participants’ primary treating oncologists were invited for their input. The majority of the oncologists did not routinely assess falls because it was not feasible and was
not a priority. However, when a fall was reported, actions in response included ascertaining circumstances of falls and determining the cause of the falls, physical examination, gait/balance assessment, ordering tests, and referrals (e.g. occupational therapist, fall clinic). This was substantiated by data from patient survey (in which oncologists’ actions in response to a fall commonly included performing physical examination, making referrals, and asking circumstances of falls) and data collected from chart review (which showed that referrals, ordering tests, and asking circumstances are among the most common actions performed by oncologists).

5.1.4. WHAT ARE THE CIRCUMSTANCES OF FALLS IN THIS POPULATION?

This research question was answered in Chapter 4. Falls in community-dwelling older adults with cancer occurred mostly indoor, during the day and during normal, non-hazardous activities. Walking was the most common activity at the time of a fall, followed by changing position, going up/down stairs, negotiating curb/steps, and turning. Slightly riskier activities were evident but they accounted for a small proportion of the falls. Some participants had a fall when not using their walking aid. Some participants believed that their falls were caused by bad turns, tripping, or effects of cancer treatment, whereas some chastised themselves for their bad decisions or carelessness.
5.1.5. WHAT IS THE LEVEL OF FOF IN THE POST-FALL CONTEXT IN THIS POPULATION?

Research Question 4 (What is the level of FOF in the post-fall context in this population?) was also addressed in Chapter 4. Fifty-five percent of our participants were identified as having high FOF. Many participants voiced being extra careful to avoid further falls. However, activity restriction was rarely reported.

5.1.6. HOW DO OLDER PATIENTS REPORT THEIR FALLS?

Research Question 5 was also addressed in Chapter 3: How do older patients report falls? The Patients’ survey data showed that falls were often not reported to health care providers. About 43% of the falls were not reported to oncologists, while 53% and 49% of falls were not reported to clinic nurses and family physicians, respectively.

“Perception of falls” and “Communication” were key themes emerged from patient interviews. Many participants believed that their falls were not worth mentioning as they saw their falls as somewhat trivial matters that were not worth mentioning or ‘making a big deal of’.
5.1.7. HOW FORTHCOMING ARE OLDER PATIENTS IN REPORTING FALLS FROM ONCOLOGISTS' PERSPECTIVE?

Finally, research question 6 was answered in Chapter 3. All oncologists indicated that older patients often do not report their falls unless directly asked. Whenever the subject comes up, older patients tend to minimize or downplay it. These findings corroborate findings from patient surveys, in which half the falls were not reported to oncologists.

5.2. SYNTHESIS AND DISCUSSIONS

This was the first known study that examined impact of falls on cancer treatment in older patients in the outpatient oncology setting. The seemingly small percentage of impact on cancer treatment by falls should not be mistaken as an indication of irrelevance in the discussion of a fall in the oncology setting. It is important to take into account the high injurious fall rates, the pervasiveness of underreporting of falls as found in this study, as well as the proven vulnerability of this population to falls and injuries (10,12,13). Moreover, given that 60% of all cancer diagnoses are in persons aged 65 or above (14), one in twenty with impact of treatment is not a number to be overlooked. Research shows older adults who have fallen in the past year are 2.5 times more likely to fall again (15). This is in part because functional impairment from a fall often does not resolve and return to its pre-fall level (15–19). Therefore, for those participants who had a fracture and healed and had no impact on treatment, they could have repeated falls and potentially jeopardize subsequent treatments as well as the
quality of life of their cancer-survivorship.

Research in the general geriatric population shows that some of the most prominent circumstances in which falls occur are walking, physical chores, carrying/bending activities and environmental obstacles (20–22); which are similar to our findings. Home hazards have been shown to increase the risk of falling (23), which is supported by the findings in our study. In older adults, falls occur when age-related physical, perceptual, and cognitive changes intersect with an environment that is not conducive to safety (24). More than half of those who had a fall in the bathroom sustained an injury, this appears to align with current research findings in the general older population as well, in which bathroom falls are highly likely to result in injuries (25). Moreover, the high proportion of falls indoors underlines the vulnerability of these participants as indoor falls have been found to be associated with poorer health and physical difficulties (26). Once again, this could indicate that this group are prone to falls and will have recurrent falls (27). Special attention may be needed to identify those at risk for falls and those who had a fall. Research also shows that recurrent indoor fallers performed poorly in mobility tests (28). Therefore, mobility tests could be a starting point in identifying these vulnerable older patients, so that appropriate interventions to mitigate falls and potential injuries could be carried out timely. Evidence shows that a prior fall is an independent risk factor for subsequent falls in both older cancer and non-cancer populations (27). Therefore, although there are more recurrent fallers in this study than single fallers, fall assessment and preventive strategies should not exclusively target those who fall recurrently (21) because of the increased likelihood of those who had a fall to fall again.

Not being good at turns was a theme commonly voiced by participants and may have been related to the age-related reduction of resources to adapt to changes, and turning has
been found to be linked to falls in the general geriatric population as well (29). In older adults, falls occur when environmental demands or hazards outweigh the person’s ability to maintain his/her postural stability (30). The fact that close to one-fifth of the falls took place on stairs or on a sidewalk curb highlights the environmental risk for older patients. Tripping was also common. This may have been due to the increased vulnerability of tripping related to the decreased clearance height of the recovery foot of the swing phase during walking (31). This might also have been exacerbated by effects of cancer treatment and associated diminished sensation (32).

Additionally, it is also important to note that older adults tend to have stiffer and less coordinated gait; with aging, older adults’ body-orienting reflexes, and step length and height decrease. These, combined with reduced muscle strength and tone, reduce their ability to avoid falling when an unexpected trip or slip occurs (33). Older adults’ gait patterns tend to be less coordinated. Older adults are also less able to shift weight or execute rapid response steps to keep themselves from falling when their balance is unexpectedly disturbed. Research shows that stair descent in combination with a secondary motor task is more difficult for older adults than stair descent without a secondary task (34). This may explain the falls that occurred in the staircases while carrying large, bulky objects. Findings from this study also seems to confirm that falls are multifaceted and are the culmination of intrinsic factors (such as pre-existing conditions, polypharmacy, functional limitations, muscle weakness) and extrinsic risk factors (e.g. environmental hazards) among the older population (35). This also speaks to the value of assessing for falls/fall risks during patient encounters and to understand circumstances of falls in order to address any amenable risk factors. In fact, it has long been established that falls should be assessed and managed in a multifactorial manner (35).
A recent Cochrane systematic review also confirmed that multifactorial risk assessment and management can help reduce rates of falls (24). Also, group-based and home-based exercise programs, as well as home safety interventions, can help reduce fall rates and risk of falling (24). Moreover, a recent network meta-analysis by Tricco et al. (36) found that various combinations of interventions are more effective in preventing injurious falls. For example, combined exercise, vision assessment and treatment, environmental assessment and treatment, multifactorial assessment and treatment, calcium supplementation, and vitamin D supplementation are significantly linked to reductions in injurious falls (36).

According to research in the general geriatric population, risk factors of falls include history of falls, gait/balance problems, visual impairment, use of >4 medications, use of psychoactive drugs, depression, functional limitations, arthritis, use of walking aids, vertigo, and pain (27,37). Additionally, a recent study by Wildes et al. in the oncology setting also found risk factors such as IADL dependence, polypharmacy (≥ 4 medications), depressed mood, and benzodiazepine use to be associated with prior falls (38). Although this study did not examine association of risk factors and falls, many of these risk factors were present in our participants. Our findings also seem to suggest that fall risk factors of oncology setting may be in essence quite similar to those in the general older population (e.g. environment hazards, dizziness, weakness, balancing and unsteadiness issues are all known to be risk factors for falls among older adults in general) (27).

As mentioned, prior falls have been known to portend further falls in the general geriatric population. It has also been found to be a fall predictor among older adults in the oncology setting (39). In fact, the rate of recurrent falls in this study appears to be twice as high compared to that of the general geriatric population (40).
Interestingly, in this study, cancer-specific fall risk factors such as peripheral neuropathy (41,42) did not seem to be common among participants. However, the literature shows that peripheral neuropathy may be underreported by cancer patients due to fear of potential dose reduction or break in treatment (43). Similarly, pain is a common risk factor for falls in the general geriatric population, but was not a commonly voiced antecedent of a fall in our study. Fatigue was also not commonly reported as a symptom preceding the fall. However, a number of participants had documented depression. According to Wildes et al., self-reported fatigue and depression are associated with greater risk for falls in older patients with cancer (44). This may have been due to the small sample size of this mixed-methods study. Interestingly, cancer-related pain was not commonly reported as a sensation that occurred preceding a fall. This may have been due to the large proportion of prostate cancer patients in the sample, as some prostate cancer tumors may be indolent and could exist for a long period of time without causing any symptoms (45).

Use of psychotropics and antihypertensive medications (e.g. diuretics) were also common among participants and are known to be medications that increase the risk of falls (46–51), and in particular, benzodiazepines are linked to falls in a dose-dependent manner (52). Therefore, it is important to specifically assess older patients who are using these medications.

Injurious fall rate in the general older population is about 29% (10). Between 2 to 6% sustain fractures, and hip, femur, and pelvis fracture account for between 0.2 to 1.9% (20,53,54). Our findings (injurious rate 45%; fracture rate 25% of all injuries) appeared to be higher compared to these rates, and it demonstrates that older cancer patients may have added vulnerability to fall injuries due to cancer and effects from its treatment. Further research is required to examine risk factors for injurious falls in this population. Another
interesting observation is that existing literature shows that women tend to have more injuries in indoor falls, while injurious outdoor fall rates are equivalent between men and women (55). The rate of outdoor fall injuries in this study is also equivalent between men and women. This could potentially mean that gender difference in terms of vulnerability related to an injurious fall does not become more pronounced with cancer and its treatment. However, men in this study had a disproportionately high indoor injurious fall rate compared to women. This could have been due to the high proportion of men in this study, and these men may have been more frail. In fact, sarcopenia and androgen deprivation therapy have been shown to be associated with falls among older prostate cancer patients (3,56,57).

Our findings align with existing evidence and show that falls in community-dwelling older adults with cancer often go unnoticed in oncology clinics unless the persons are asked about it directly and, thus, are underreported (58). Findings of this study reinforce the importance of extra diligence in fall assessment in this setting, especially since older patients in general tend to ‘put on a good face’ during doctor’s appointments (59). Oncologists often serve as the interim primary care providers for older patients with cancer, and, as such, can potentially play a vital role in assessing the problem by asking about falls, documenting them into patients’ medical record, and may be even initiate interventions (8). Historically, oncology training has not incorporated geriatric principles into management of cancer, and often geriatric consultations are not always available for patients in a timely manner (59). Oncologists often function as the primary care provider for many of their older patients during active treatment (60). In this study, older patients often viewed their treating oncologist as their primary health provider. However, while oncologists should not be expected to assume the role of geriatricians, they are under increasing pressure to take geriatric principles into
consideration during cancer care (60). Assessing for falls could also add to oncologists’ understanding of individual patient’s vulnerability when considering treatment (60). Therefore, falls as a health issue warrants more attention with the aging of the population and the anticipated increase of older patients in this setting. Fall assessment may help unearth an opportunity for an intervention (e.g. impaired gait and balance, weakness in lower extremity, dizziness, inappropriate medications, depressed mood etc.) (60). Therefore, it is logical to ask patients about falls and benefit from this knowledge from the perspective of vulnerability to help individualized management (59). Additionally, diligent fall assessment should also be focused on older patients with prostate cancer, as it appears that older prostate cancer patients take up a disproportionate number in our sample. This is of particular importance given the increased fall risk for older prostate cancer patients receiving androgen ablation treatments (3,56), which are widely used in older adults with prostate cancer (61).

Fall evaluation is important in older cancer patients because it provides a gauge to evaluate patients’ functional status (8). It is also important to consider that, in the oncology setting, the standard Eastern Cooperative Oncology Group (ECOG) assessment, used in most practices, often misses subtle impairment in IADL (62), which has been shown to be a significant fall predictor in older patients >=70 (63). Timely interventions such as referrals could help address amenable issues. More importantly, fall assessment must be followed by intervention strategies; if not, the assessment would be useless (59).

Nevertheless, findings from this study show that, once informed, oncologists do take appropriate steps in response to falls, which are in line with recommendations for fall management from guidelines/recommendations such as the American Geriatrics Society/British Geriatrics Society (AGS/BGS) (64) and the Registered Nurses Association of Ontario (RNAO) (65).
Given the compressed time schedules in most clinical settings, oncology nurses could perform the fall assessment. Nurses can also remind patients to report if a recent fall has occurred so that timely assessments and appropriate interventions could be used. Additionally, the lack of and/or inadequacy of resources (i.e. lack of outpatient OT for referral, long wait time for Falls Clinics, etc.) as mentioned by some oncologists elucidate the need for improvement from the organizational perspective.

Overall, the circumstances reported by participants are similar to those found in the general geriatric populations (25). This suggests that effective interventions to prevent falls in the general geriatric population may be potentially applicable in helping mitigate falls in older adults with cancer.

Reluctance to use a walking aid was a common phenomenon found in this study. Although assistive devices are among the methods found to reduce the recurrence of a fall (24). Research in the general geriatric population shows reluctance to use walking aids may be related to social stigma (66) that is often reinforced by media depiction of assistive devices (67).

Participants’ self-blaming for the falls may indicate their reluctance to accept the notion of being vulnerable to falls (68). Therefore, oncology teams, when approaching patients regarding fall assessments or interventions, should be mindful of the language used, and focus on strength and balance, independence, as well as discuss how even a single fall may have potential implications for cancer treatment.

Another important finding was that, within the context of high FOF, exercising extra caution to avoid further falls was a common ground among participants. Participants also voiced the determination to continue to stay active or even increase activity to keep up strength. Contrary to existing literature, which shows that up to 55% of those with high FOF
tend to restrict their activities (69,70), findings from this study suggests that FOF does not necessarily translate into activity restriction and social isolation. In fact, our findings seem to echo that of a recent study in which older adults took up strategies to ‘stay on their feet’ and ‘keep going’ (71). This is an encouraging finding as promotion of physical activities would be less difficult if older patients do not harbour fear of activities or make conscious efforts to restrict activities. This is of particular importance since exercise and physical activity are important for older patients with cancer, as they help reduce cancer-related fatigue (72) and also have been found to be effective in fall prevention (24,73).

5.3. IMPLICATIONS FOR CLINICAL PRACTICE

Given the time constraints in oncology clinics, assessment at every clinic visit if a fall has occurred in the recent past or since the last clinic visit could be a simple and important place to start. Simple gait and balance tools such as Gait Speed (74) can be administered while patients are being escorted to the examination room (58). This quick and feasible method of identifying those who may be at risk for falls can be administered by clinic nurses or ancillary staff to help identify potentially patients who might be at risk for falls and require further assessments and follow-up (58). The gait speed requires minimal expertise/training and equipment to carry out. However, a caveat is that, currently there are no tools reliable enough to be a stand-alone fall risk assessment tool for older adults (75,76). Nonetheless, for practical reasons, these tests should be feasible within the contraints of busy clinical settings. Additionally, it is important to
take into account safety consideration during tests (e.g. to stay within arm’s reach of the older adult in case he/she loses balance).

Oncology team may need to be aware that older patients tend to view their treating oncologists as their primary care providers. Oncology nurse are well-positioned to ask about falls, to assess and identify older patients who are at risk for falls and to provide education, support, and management. Nurses should also closely monitor patients receiving cancer treatment as patients may need specific advice concerning environmental or activity modifications (77). Health teachings/reminders to help older patients become more vigilant and to exercise extra cautions while negotiating curbs/steps and while turning would be beneficial. Additionally, it is important to encourage older patients to report falls, so that timely, targeted assessment, and individualized management (e.g. medication review, referrals etc.) and education could be carried out. However, while fall prevention is an important goal, it is important to be cognizant that older adults are often more concerned about the risk of losing their personal and social independence (78) and (as evidenced in this study) value maintaining strength and independence. Therefore, health promotion and exercise promotion should focus on the positive aspects such as ‘health’, ‘strength’, and ‘maintain independence’ to make it more palatable. Furthermore, so far evidence shows that education alone is not effective in preventing falls (79). Therefore, interventions should be multifactorial to help reduce rate of falls (24).

A recent systematic review and meta-analysis by Tricco et al. (36) found that exercise alone and various combinations of interventions (e.g. visual assessment and treatment, environmental assessment and modification, comprehensiveness geriatric assessment etc.) were associated with a lower risk of injurious falls when compared with usual care. However,
the authors noted that the choice of fall-prevention intervention may also depend on the values and preferences of the patient and caregiver. Therefore, consideration should be given to older patient and caregiver preferences while discussing options for appropriate intervention. Exercise promotion may also benefit this population; in particular, Tai chi, which has been shown to lead to a 51% reduction of falls in a meta-analysis (24,80) in older adults. Furthermore, moderate physical activity or exercise can help decrease risk of falls and fall-related injuries in older adult by way of weight control and maintaining healthy muscle, bone, and joints (81), as well as improve mobility, balance, and reaction time (82). However, it should be noted that participation in vigorous physical activities (e.g. intensive running) may contribute to increased falls in older adults (83). Activities such as outdoor walking or mall walking are among the most feasible and accessible way of exercises to recommend as they can help improves strength, balance and flexibility and to help reduce the risk of falling (83). However, while staying active is encouraged, it is also important to advise patients receiving chemotherapy to avoid large crowds due to the increased risks for infection related to myelosuppression (84).

Additionally, those with relatively sound cardiorespiratory fitness should be encouraged to undertake more than their current physical activity minimums (85). To ensure patient safety, intensity of physical activity should be determined by clinical evaluation (e.g. assessment by physician/sports medicine professional by way of graded exercise testing [which includes 6-min walking test, exercise/stress test with electrocardiography], and, if necessary, echocardiography) (85). Anatomic limitations should also be considered (e.g. cycling may not be suitable for prostate cancer patients, while resistance training can be carried out safely for breast cancer patients etc. (85,86). Currently, heart rate is the preferred means to establish levels of intensity of physical activity, while research also shows that CR10 or Borg rating of perceived exertion
Exercise also carries additional benefits for patients, given the importance of oxygen cascade as well as the link between cardiorespiratory fitness and cancer-related death, physical activity can potentially deter decline in aerobic fitness during cancer treatment and restore patients’ aerobic fitness to pre-diagnosis levels (85). Moreover, according to the American College of Sports Medicine, avoiding inactivity is an advice that would be helpful even for cancer patients with existing disease or those receiving difficult treatments (86). However, when promoting physical activity, another gender-specific consideration that the care team should be mindful of, is that, research shows 80% of older men perceive exercise programs as feminine, and is thus, a barrier to participation (90).

Moreover, encouraging older patients to keep up their routine visits with their FP and to bring up issues related to gait/balance as well as falls during FP and oncology clinic appointments are essential for fall prevention and timely management.

Furthermore, it has been recommended by the AGS/BGS (64) to assess positional blood pressure as part of assessment and management for those at risk for falls. Positional blood pressure (i.e. supine and standing) can be checked to detect orthostatic hypotension, which is defined as a drop in systolic pressure of 20 mmHg or in diastolic pressure of 10 mmHg 1 – 3 minutes after repositioning from supine to standing position (91). Orthostatic hypotension can predict falls when the pulse rate increase is <6 bpm (measured 30 seconds after standing up) (15). This can be done once patients are in the examination room, and can be initiated with a primary evaluation of fall risks (79). Lastly, health teaching should incorporate strategies on how to fall safely once a fall is already underway (92) would also be beneficial.
5.4. RECOMMENDATIONS FOR FUTURE RESEARCH

Research is needed to continue to address gaps in research that may not have been adequately addressed thus far. For instance, further examining the impact of falls on treatment in this population is needed. Ideally, using multi-site recruitment, moving beyond comprehensive cancer centres to encompass patients being treated in the community to increase generalizability. Moreover, future research on the topic should include older patients of more diverse education levels, socio-economic status, and ethnic background to enhance representativeness of the findings. Future studies investigating the impact of a fall on cancer treatment in older patients should involve larger sample sizes.

In terms of study design, fall assessment using prospective study design to help minimize the possibility of recall bias and more accurately capture fall rate, injuries, various aspects related to details of circumstances of falls, as well as fall-reporting should be undertaken. Prospective fall reporting has been recommended as the gold standard of fall recording, such as using fall calendars (93), diaries (94,95), or postcards (96). Starks et al. (97) found that prospective fall ascertainment using a systematic approach (including tailoring, anchor dates, telephone coaching, monthly reminder with self-addressed stamped envelope, and month incentives) is an effective method to obtain reports of falls from healthy, cognitively intact older adults living in the community. Additionally, older adults are engaged in reporting a fall and are compliant (97).

Moreover, footwear worn and multi-focal lens worn at the time of the fall should be explored in future studies exploring circumstances and risk factors of falls in older adults with cancer as they have been found to be linked to falls in older adults (98,99). What is more,
further studies to explore older patients’ perception about their walking aids and their understanding of the consequence of falls and injury within the context of heightened risks for falls and injuries due to cancer and its treatments is essential. Such research may inform formulation and tailoring of education interventions by providing oncology teams insights into older patients’ perspectives. As well, the discrepancy noted in data obtained from patient self-report survey and chart review regarding impact on treatment suggests that future research in this population may benefit from obtaining data from more than one source to help triangulate/corroborate data for accuracy.

Other salient gaps in research that need to be addressed include fall rates, injurious fall rates, and strong fall and fall injury predictors. This is particular important since the two recent systematic reviews (39,100) on older cancer patients were not able to produce precise fall rates nor identify consistently strong fall predictors in this population owing to reasons including a paucity of studies examining falls in this population, heterogeneity of study designs, and fall ascertainment methods. Future research utilizing prospective longitudinal study design and more consistent fall measurement methods and fall definitions are warranted.

Additionally, a pilot intervention study to examine the effectiveness of strength-training classes (with collaborators in physiotherapy and/or rehab sciences) that incorporate tips on how to ‘fall safely’ on falls and injury prevention can also help inform fall prevention programs. Further, a qualitative study to assess and explore access and use of exercise and other health and wellness programs among minority older adults (e.g. immigrants, non-English speakers, LGBT population) may help provide insight into any potential barriers to access that these populations may be facing.
In addition, the use of patient engagement methods to design a study to help gain insight into the ways to improve functional outcome and prevent falls (e.g. exercise interventions) and the ideal ways of promoting fall prevention in this population are also needed. This will be of value as engaging patients in the planning and execution of research can help improve its translation into clinical practice (101). Further, given that falls and fall injuries are added concerns in this population, randomized controlled trials of fall and fall injury preventions are needed to identify potentially effective ways of mitigating falls and fall injuries in this population. A number of recent randomized controlled trials related to exercise benefits in older cancer populations have demonstrated some benefits of exercises. However, so far, most are focused on outcomes such as cancer outcomes, quality of life, functional outcome, depression, symptom management, and chemotherapy completions etc. rather than on fall prevention (102–106). Moreover, a recent systematic review and meta-analysis of 26 studies (107) reported that older cancer survivors who exercised the most had a 37% lower risk of dying from cancer compared to those who exercised the least. Exercise is a low-cost, low-toxicity intervention that has been shown to improve health-related fitness and quality of life in cancer survivors (108). If exercise can be demonstrated to reduce fall risk and fall-related injuries in this population, it will aid implementation of exercise programs in the geriatric oncology setting. Therefore, randomized controlled trials focusing on fall and/or fall injury prevention are needed in order to demonstrate utility in this population and to identify the most effective interventions for falls in this population.
5.5. LIMITATIONS / METHODOLOGICAL CONSIDERATIONS

In this section, several methodological considerations are discussed concerning the study design and methodology of this thesis. A merit of this study was the high response rate, which aligns with existing evidence that shows that older patients with cancer are happy to participate in research studies if they believe that their participation could help other cancer patients (109). Another strength of this study was the mixed-methods design in which the difference sources allowed comparison and/or augmentation of data, thus providing a better understanding of the research questions. Additionally, the use of the FES-I scale was also a merit as this scale stands out from other tools because it uses the word ‘concern’ rather than ‘fear’, which is more socially acceptable (110).

However, as with many research studies, this study was not without limitations. In terms of selection of participants, as this study relied on clinic staff asking older patients whether a fall has occurred within the past 12 months, we cannot safely exclude underreporting of falls, fall injuries, and treatment interruptions. Therefore, it was possible that impact on treatment as underestimated. Secondly, this study may have been subject to recall bias as participants were asked to recall about falls and injuries in the past 12 months. However, it is important to note that, in a review of cohort study by Ganz et al. (111), fall recall in the past year is highly specific (91 - 95%), although less sensitive (80 - 89%) compared to prospective data collection using diaries or postcards.

Moreover, referral bias could have been at play in this study, which rendered the sample consisting of older patients who were less frail and with better functional status. Therefore, the falls, injurious falls, and impact of treatment among those who are sicker, frailer,
and more functionally impaired may have been left uncaptured. In turn, the impact of treatment may also have been underestimated in this way also.

Additionally, recruitment from one comprehensive cancer centre in one urban city may not have adequately included older patients of diverse socio-economic profiles, race and ethnic groups, and those who are non-English-speaking to ensure representation of the diverse Canadian population. Moreover, a lack of reference of sample size informed by prior research limited our ability to perform a precise sample size calculation.

In this study, FOF was assessed cross-sectionally. Although this method helped provided a glimpse of the participants’ level of concern about falls in the post-fall context, it was assessment of only one time-point, and, therefore, there is no way to know the participants’ FOF level in the pre-fall context and to observe any evolution that might have occurred over time.

Research suggests that greater neighbourhood disadvantage is linked to increased fall risks (112). We did not explore neighbourhood level social economic characteristics. However we did collect information in terms of education and, this is also one of the limitations of the study because the sample largely consisted of those are well educated and are presumably within the better socio-economic level. Therefore, those in the lower socio-economic bracket as well as those experiencing neighbourhood disadvantage (usually associated with low income) may have not been well represented. This may also have in part contributed to our low injurious fall rate, as research shows that there is an independent association between neighbourhood disadvantage and incident falls, and those with limited mobility may be even more vulnerable (112). Type of footwear or whether footwear was worn at the time of fall was not examined in this study as this study only explored the most prominent risk factors as
outlined by the Tinetti et al. systematic review on falls in older adults (27). Future study should include this in their fall assessment. Research shows that while canvas/athletic shoes are associated with the lowest risk of a falls, going barefoot or in stockinged feet are linked to high fall risk (even after controlling for health status) (98). Moreover, the use of bi-focal/multi-focal lens, which are fall risk factors, were not explored either (99). Lastly, this study was unable to adequately examine the difference between single versus recurrent fallers in terms of impact of treatment, fall-reporting, as well as circumstances of falls. Future studies should examine these areas.

5.6. CONCLUSION

This study examined the circumstances of falls, the assessment, reporting and management of falls, as well as the impact of falls on cancer treatment in community-dwelling older adults with cancer. This research lays a foundation for understanding the potential impact of falls in this population and some of the potential opportunities in clinical practice in oncology. Findings from this study may help increase awareness of importance of fall assessment in daily outpatient practices, as well as inform support-oriented strategies to mitigate falls in this vulnerable population. However, much is yet to be done regarding prevention and management.
References


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65. rnao 2017 preventing falls and reducing injuries form falls - Google Search [Internet]. [cited 2018 Apr 7]. Available from: https://www.google.ca/search?q=rnao+2017+preventing+falls+and+reducing+injuries+form+falls&rlz=1C1GGRV_enCA786CA786&oq=rnao+2017+preventing+falls+and+reducing+injuries+form+falls&aqs=chrome..69i57.70359j0j8&sourceid=chrome&ie=UTF-8


Appendix A: Patient Consent form

CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY

Study Title: “How do falls impact cancer treatment in older cancer patients?”

Investigator/Study Doctor: Dr. Shabbir Alibhai (Site Principal Investigator)
Schroder Sattar (RN, MN, PhD Candidate)

Contact Information: Dr. Shabbir Alibhai [Contact Information]

Introduction:

You are being asked to take part in a research study. Please read the information about the study presented in this form. The form includes details on study’s risks and benefits that you should know before you decide if you would like to take part. You should take as much time as you need to make your decision. You should ask the study doctor or study staff to explain anything that you do not understand and make sure that all of your questions have been answered before signing this consent form. Before you make your decision, feel free to talk about this study with anyone you wish including your friends, family, and family doctor. Participation in this study is voluntary.

Background/Purpose:

The purpose of this study is to explore the impact of falls on cancer treatment in older adults living in the community, what circumstances led to the falls, and the concern about falls in this population in order to gain a deeper understanding of falls in this aspect. Accidental falls are common among older adults that can have serious consequences. Falls among older cancer patients may be of added concern due to the cancer disease processes and side effects from various types of cancer treatments. This study will develop knowledge on the impact of falls on cancer treatment as well as on circumstances surrounding falls with the goal to inform development of fall safety guidelines and support services. Results from this study
may be used to inform care planning and interventions which will improve the outcomes for older cancer patients living in the community. About 120 older adults with cancer will participate in this study at the University Health Network and it will take up to one year to complete. You are being asked to consider participating in this study because you have cancer and have experienced at least one fall within the past 12 months.

**Study Design:**

This study involves completing a questionnaire in which you will be asked to provide some sociodemographic information such as age, gender, living arrangement, and years of education. You will also be asked about your cancer treatment history, questions related to your fall(s) and subsequent treatment, your concerns about falling, as well as the medications that you have been taking, your activities of daily living, and any chronic conditions that you might have. The oncologist who is in charge of your care will also be invited to participate in the study and to provide information regarding your fall and cancer treatment history, as well as his/her fall assessment routine. Additionally, information regarding your medical history, cancer and treatment history, and the oncologist’s documentation of his/her fall assessment and intervention done will also be collected from your electronic medical record.

**Study Visits and Procedures:**

Participation in this study involves completion of a survey (one time only). It is estimated that it takes 30-40 minutes to complete the whole questionnaire. The questionnaire also includes a few open-ended questions that will be asked verbally in the form of a short interview. With your permission, the interview will be audio-recorded to enhance accuracy of information recorded as well as to minimize the time you will have to spend answering those questions. The audio recording will be deleted immediately after transcription and verification.

**Risks**

We are not aware of any risks associated with participation in this study.

**Benefits:**
You may not receive direct benefit from being in this study. Information learned from this study will be used by the study investigators to inform development of fall safety strategies and guideline as well as inform oncologists to improve care-planning for future older adults with cancer.

**Confidentiality:**

Personal Health Information: If you agree to join this study, the study team will look at your personal health information and collect only the information they need for the study.

Personal health information is any information that could identify you and includes your:

- Name,
- Address,
- Date of birth,
- New or existing medical records, including types, dates and results of medical tests, procedures, and cancer treatment.

The following people may come to the hospital to look at the study records and at your personal health information to check that the information collected for the study is correct and to make sure the study is following proper laws and guidelines:

Representatives of the University Health Network (UHN) including the UHN Research Ethics Board

All information collected during this study, including your personal health information, will be kept confidential and will not be shared with anyone outside the study unless required by law. The study doctor will keep any personal health information about you in a secure and confidential location for 10 years. A list linking your study number with your name will be kept by the study doctor in a secure place, separate from your study file.

Your participation in this study will also be recorded in your medical record at this hospital. This is for clinical safety purposes.

You will not be named in any reports, publications, or presentations that may come for this study.

**Voluntary Participation:**

Your participation in this study is voluntary. You may decide not to be in this study, or to be in the study now and then change your mind later. You may leave the study at any
time without affecting the care you receive. You may refuse to answer any question you do not want to answer, or not answer an interview question by saying “pass”. We will give you any new information that is learned during the study that might affect your decision to stay in the study.

**Withdrawal from the Study:**

If you leave the study, the information that was collected before you left the study will still be used in order to help answer the research question. No new information will be collected without your permission.

The investigators can exclude participants from the study for reasons including the suspicion of memory difficulties that may make it difficult to complete the study. If this occurs, you will receive the reimbursement for participation in the study as described below. The data collected from you will not be included in the study and will be destroyed.

**Costs and Reimbursement:**

There is no cost to you to participate in this study. As a token of appreciation of your time, you will receive a $10 gift card to Tim Hortons or Walmart (depending on your choice) upon completion of the survey.

**Rights as a Participant:**

If you are harmed as a direct result of taking part in this study, all necessary medical treatment will be made available to you at no cost.

By signing this form you do not give up any of your legal rights against the investigators, sponsor or involved institutions for compensation, nor does this form relieve the investigators, sponsor or involved institutions of their legal and professional responsibilities.

**Conflict of Interest:**

The researchers and the study sponsor have an interest in completing this study. Their interests should not influence your decision to participate in this study. You should not feel pressured to join this study.
Questions about the Study:

If you have any questions, concerns or would like to speak to the study team for any reason, please call us at 416-340-5125.

If you have any questions about your rights as a research participant or have concerns about this study, call the Chair of the University Health Network Research Ethics Board (UHN REB) or the Research Ethics office number at 416-581-7849. The REB is a group of people who oversee the ethical conduct of research studies. The UHN REB is not part of the study team. Everything that you discuss will be kept confidential.
You will be given a signed copy of this consent form.

**Consent:**
This study has been explained to me and any questions I had have been answered.

I know that I may leave the study at any time. I agree to the use of my information as described in this form. I agree to take part in this study.

_________________________  ______________________  ___________
Print Study Participant’s Name  Signature  Date

My signature means that I have explained the study to the participant named above. I have answered all questions.

_________________________  ______________________  ___________
Print Name of Person Obtaining Consent  Signature  Date
Appendix B: Patient survey

SOCIO-DEMOGRAPHIC INFORMATION

1. Where do you currently live?
   □ At home
   □ Residence
   □ Other: ________________________________

2. Does anyone live with you? (Select all that apply)
   □ No one
   □ Spouse/common-law partner
   □ Child(ren)
   □ Pet animal such as cat and/or dog(s)
   □ Other:
   ________________________________

3. Level of education
   □ 0 to 4 years
   □ 5 to 8 years
   □ 9 to 12 years
   □ 13 years or more

4. Do you use any assistive devices (e.g. walker, cane etc) to help with walking?
   □ Yes  →  □ Indoor only  □ Outdoor only  □ Both in- and outdoor
   Please specify what type (for example, cane, walker, etc): ________________
   □ No
INSTRUMENTAL ACTIVITIES OF DAILY LIVING (IADL)

We would like to ask you about some of the activities of daily living, things that we all need to do as part of our daily lives. We would like to know if you can do these activities without any help at all, or if you need some help to do them, or if you can't do them at all. Please circle the answer that best applies to you.

1. Can you use the telephone ...
   - 2 without help, including looking up numbers and dialing;
   - 1 with some help (can answer phone or dial operator in an emergency, but need a special phone or help in getting the number or dialing); or
   - 0 completely unable to use the telephone

2. Can you get to places out of walking distance ...
   - 2 without help (drive your own car, or travel alone on buses, or taxis);
   - 1 with some help (need someone to help you or go with you when traveling); or
   - 0 unable to travel unless emergency arrangements are made for a specialized vehicle like an ambulance

3. Can you go shopping for groceries or clothes
   - 2 without help (taking care of all shopping needs yourself, assuming you had transportation);
   - 1 with some help (need someone to go with you on all shopping trips); or
   - 0 completely unable to do any shopping
   - 3 not applicable (do not usually perform grocery/clothes shopping)

4. Can you prepare your own meals
2 without help (plan and cook full meals yourself);
1 with some help (can prepare some things but unable to cook full meals yourself); or
0 completely unable to prepare any meals
3 not applicable (live in a care home or have never prepared meals)

5. Can you do your housework

2 without help (can clean floors, etc.);
1 with some help (can do light housework but need help with heavy work); or
0 completely unable to do any housework
3 not applicable (do not usually do housework)

6. Can you take your own medicine

2 without help (in the right doses at the right time);
1 with some help (able to take medicine if someone prepares it for you and/or reminds you to take it); or
0 completely unable to take your medicines

7. Can you handle your own money ...

2 without help (write checks, pay bills, etc.);
1 with some help (manage day-to-day buying but need help with managing your checkbook and paying your bills); or
0 completely unable to handle money
3 not applicable (do not usually handle money)
MEDICATIONS:

Please name all the medications that you are current taking:

Example: ___aspirin__________________ Dose:__81mg  _ Schedule:__once a day__

1._______________________________ Dose:______  Schedule:____________
2._______________________________ Dose:______  Schedule:____________
3._______________________________ Dose:______  Schedule:____________
4._______________________________ Dose:______  Schedule:____________
5._______________________________ Dose:______  Schedule:____________
6._______________________________ Dose:______  Schedule:____________
7._______________________________ Dose:______  Schedule:____________
8._______________________________ Dose:______  Schedule:____________
9._______________________________ Dose:______  Schedule:____________
10._______________________________ Dose:______  Schedule:____________
11._______________________________ Dose:______  Schedule:____________
FALLS

1. How many times did you fall within the past 12 months? _______________
   Approximate dates___________________________________________________

2. How many times did you fall since the start of cancer treatment? ________
   Approximate dates___________________________________________________

3. For each fall: (Please check all that apply in below)

   Fall #1
   Where were you when the fall occurred?
   □ At home  ➔ Which room? ____________________________
   □ Outdoor ➔ (Please specify what place it was)_______________________
   □ At a public place (e.g. shopping mall, grocery store)
   □ Other (please describe)_______________________________
   □ Can’t remember

   What time was the day when the fall occurred?
   □ Morning  (Around what hour?)___________
   □ Afternoon (Around what hour?)___________
   □ Evening  (Around what hour?)___________
   □ At night  (Around what hour?)___________

   What were you doing when the fall occurred?
   ____________________________________________________________________
Before you fell, were you feeling……

- Dizzy
- Weak
- Difficulty balancing Unsteady on your feet?
- Pain → please specify the locations of the pain ______________________
- Tingling/numbness in feet? Or anywhere?
- Tired
- Nauseous

Was the physical environment in which the fall occurred……

- Dark
- Slippery
- Cluttered
- Uneven surface
- Slope
- Stairs/steps
- Other
- None of the above
- Can’t remember

If you normally use an assistive device, were you using the device at the time of the fall?

- Yes
- No → Why not? ________________________________
- Not applicable

Do you think you tripped over something?

- Yes → What was it? ________________________________
- No
- Not sure
Did you sustain any injuries from the fall?

☐ Yes, I was injured (If your answer is yes, please continue on to Table A)

☐ No, I was not injured. (If your answer is no, please continue on to Table B)

<table>
<thead>
<tr>
<th>Table A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What type of injuries did you sustain? (for example, bruise, fracture, etc.)</strong></td>
</tr>
<tr>
<td>__________________________________________________________</td>
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<td>__________________________________________________________</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Did you seek care for these injuries?</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Yes</td>
</tr>
<tr>
<td>☐ No → Please explain why not</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>If you sought care for the injuries, from whom/where?</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Emergency department</td>
</tr>
<tr>
<td>☐ Urgent care clinic</td>
</tr>
<tr>
<td>☐ Family doctor</td>
</tr>
<tr>
<td>☐ Other ____________________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What type of treatment/care did you receive for your injuries?</th>
</tr>
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<tr>
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<td></td>
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</tbody>
</table>
Did you report the fall to your oncologist?

☐ Yes  →  What actions did your oncologist take to address the fall(s), if any?  (please check all that apply)

  □ Asked you to describe the circumstances of falls
  □ Assessed your feet
  □ Assessed your footwear
  □ Referred you to see another healthcare provider
  □ Performed a physical examination

☐ No  →  Please explain why you did not report the fall to your oncologist

________________________________________________________________________________________

________________________________________________________________________________________

Did you report the falls to your oncology nurse?

☐ Yes  →  What actions did your nurse take to address the fall(s), if any?  (please check all that apply)

  □ Asked you to describe the circumstances of falls
  □ Assessed your feet
  □ Assessed your footwear
  □ Performed a physical assessment

☐ No  →  Please explain why you did not report it to the oncology nurse

________________________________________________________________________________________

________________________________________________________________________________________
**Did you report the falls to your family physician?**

- **Yes →** What actions did your family physician take to address the fall(s), if any? (please check all that apply)
  - [ ] Asked you to describe the circumstances of falls
  - [ ] Assessed your feet
  - [ ] Assessed your footwear
  - [ ] Performed a physical assessment

- **No →** Please explain why you did not report it to the family physician

____________________________________________

____________________________________________

**Was your cancer treatment interrupted because of the fall?**

- [ ] Yes
- [ ] No
- [ ] Don’t know

**If your treatment was interrupted, how?**

- [ ] Put on hold temporarily → For how long? _____________________________

- [ ] Stopped altogether

- [ ] Changed to a different type of treatment → What kind? __________________

- [ ] Treatment continued but modified (e.g. dose reduction or frequency altered)
  
  Please specify________________________
<table>
<thead>
<tr>
<th>Table B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Do you report all of your falls to your oncologist?</strong></td>
</tr>
<tr>
<td>□ Yes → Please describe the actions that your oncologist took to address the fall(s) (if any)</td>
</tr>
<tr>
<td>________________________________________________________________</td>
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<tr>
<td>________________________________________________________________</td>
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<tr>
<td>________________________________________________________________</td>
</tr>
<tr>
<td>□ No → Can you explain why?</td>
</tr>
<tr>
<td>________________________________________________________________</td>
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<td>________________________________________________________________</td>
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</tbody>
</table>
Fall #2

Where were you when the fall occurred?

☐ At home  → Which room? ____________________________

☐ Outdoor  → (Please specify what place it was)__________________________

☐ At a public place (e.g. shopping mall, grocery store)

☐ Other (please describe)__________________________

☐ Can’t remember

What time was the day when the fall occurred?

☐ Morning  (Around what hour?)________________

☐ Afternoon (Around what hour?)___________

☐ Evening  (Around what hour?)___________

☐ At night  (Around what hour?)___________

What were you doing when the fall occurred?

__________________________________________

Before you fell, were you feeling......

☐ Dizzy

☐ Weak

☐ Difficulty balancing Unsteady on your feet?

☐ Pain  → please specify the locations of the pain ________________________

☐ Tingling/numbness in feet? Or anywhere?

☐ Tired

☐ Nauseous
Was the physical environment in which the fall occurred……

☐ Dark
☐ Slippery
☐ Cluttered
☐ Uneven surface
☐ Slope
☐ Stairs/steps
☐ Other
☐ None of the above
☐ Can’t remember

If you normally use an assistive device, were you using the device at the time of the fall?

☐ Yes
☐ No → Why not? ____________________________
☐ Not applicable

Do you think you tripped over something?

☐ Yes → What was it? ____________________________
☐ No
☐ Not sure

Did you sustain any injuries from the fall?

☐ Yes, I was injured (If your answer is yes, please continue on to column A)

☐ No, I was not injured. (If your answer is no, please continue on to column B)
<table>
<thead>
<tr>
<th><strong>Table A</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What type of injuries did you sustain? (for example, bruise, fracture, etc)</strong></td>
</tr>
<tr>
<td>________________________________________________</td>
</tr>
<tr>
<td>________________________________________________</td>
</tr>
<tr>
<td><strong>Did you seek care for these injuries?</strong></td>
</tr>
<tr>
<td>☐ Yes ☐ No  → Please explain reason</td>
</tr>
<tr>
<td>________________________________________________</td>
</tr>
<tr>
<td><strong>If you sought care for the injuries, from whom/where?</strong></td>
</tr>
<tr>
<td>☐ Emergency department</td>
</tr>
<tr>
<td>☐ Urgent care clinic</td>
</tr>
<tr>
<td>☐ Family doctor</td>
</tr>
<tr>
<td>☐ other __________________</td>
</tr>
<tr>
<td><strong>What type of treatment/care did you receive for your injuries?</strong></td>
</tr>
<tr>
<td>________________________________________________</td>
</tr>
</tbody>
</table>
**Did you report the fall to your oncologist?**

- **□ Yes** → What actions did your oncologist take to address the fall(s), if any? (please check all that apply)
  - □ Asked you to describe the circumstances of falls
  - □ Assessed your feet
  - □ Assessed your footwear
  - □ Referred you to see another healthcare provider
  - □ Performed a physical examination

- **□ No** → Please explain why you did not report the fall to your oncologist

**Did you report the fall to your oncology nurse?**

- **□ Yes** → What actions did your nurse take to address the fall(s), if any? (please check all that apply)
  - □ Asked you to describe the circumstances of falls
  - □ Assessed your feet
  - □ Assessed your footwear
  - □ Performed a physical assessment

- **□ No** → Please explain why you did not report it to the oncology nurse
Did you report the falls to your family physician?

□ Yes  →  What actions did your family physician take to address the fall(s), if any? (please check all that apply)
   □ Asked you to describe the circumstances of falls
   □ Assessed your feet
   □ Assessed your footwear
   □ Referred you to see another healthcare provider
   □ Performed a physical assessment

□ No  →  Please explain why you did not report it to the family physician

____________________________________________
____________________________________________

Was your cancer treatment interrupted because of the fall?

□ Yes
□ No
□ Don’t know

If your treatment was interrupted, how?

□ Put on hold temporarily  →  For how long? _____________________________

□ Stopped altogether

□ Changed to a different type of treatment  →  What kind? ___________________

□ Treatment continued but modified (e.g. dose reduction or frequency altered)
   Please specify___________________
<table>
<thead>
<tr>
<th>Do you report all of your falls to your oncologist?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Yes → Please describe the actions that your oncologist took to address the fall(s) (if any)</td>
</tr>
<tr>
<td>________________________________________________</td>
</tr>
<tr>
<td>________________________________________________</td>
</tr>
<tr>
<td>________________________________________________</td>
</tr>
<tr>
<td>□ No → Can you explain why?</td>
</tr>
<tr>
<td>________________________________________________</td>
</tr>
<tr>
<td>________________________________________________</td>
</tr>
</tbody>
</table>
Fall #3

Where were you when the fall occurred?

□ At home  →  Which room? _______________________

□ Outdoor  →  (Please specify what place it was)________________________

□ At a public place (e.g. shopping mall, grocery store)

□ Other (please describe)__________________________

□ Can’t remember

What time was the day when the fall occurred?

□ Morning  (Around what hour?)____________

□ Afternoon (Around what hour?)___________

□ Evening  (Around what hour?)___________

□ At night  (Around what hour?)___________

What were you doing when the fall occurred?

________________________________________

Before you fell, were you feeling......

□ Dizzy

□ Weak

□ Difficulty balancing Unsteady on your feet?

□ Pain  →  please specify the locations of the pain _________________

□ Tingling/numbness in feet? Or anywhere?

□ Tired

□ Nauseous
Was the physical environment in which the fall occurred……

☐ Dark
☐ Slippery
☐ Cluttered
☐ Uneven surface
☐ Slope
☐ Stairs/steps
☐ Other
☐ None of the above
☐ Can’t remember

If you normally use an assistive device, were you using the device at the time of the fall?

☐ Yes
☐ No → Why not? ________________________________
☐ Not applicable

Do you think you tripped over something?

☐ Yes → What was it? ______________________________
☐ No
☐ Not sure

Did you sustain any injuries from the fall?

☐ Yes, I was injured (If your answer is yes, please continue on to column A)

☐ No, I was not injured. (If your answer is no, please continue on to column B)
<table>
<thead>
<tr>
<th>Table A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What type of injuries did you sustain? (for example, bruise, fracture, etc)</strong></td>
</tr>
<tr>
<td>__________________________________________________________</td>
</tr>
<tr>
<td>__________________________________________________________</td>
</tr>
<tr>
<td><strong>Did you seek care for these injuries?</strong></td>
</tr>
<tr>
<td>□ Yes</td>
</tr>
<tr>
<td>____________________________________________</td>
</tr>
<tr>
<td>____________________________________________</td>
</tr>
<tr>
<td><strong>If you sought care for the injuries, from whom/where?</strong></td>
</tr>
<tr>
<td>□ Emergency department</td>
</tr>
<tr>
<td>□ Urgent care clinic</td>
</tr>
<tr>
<td>□ Family doctor</td>
</tr>
<tr>
<td>□ other ________________</td>
</tr>
<tr>
<td><strong>What type of treatment/care did you receive for your injuries?</strong></td>
</tr>
<tr>
<td>____________________________________________</td>
</tr>
<tr>
<td>____________________________________________</td>
</tr>
</tbody>
</table>
Did you report the fall to your oncologist?

□ Yes  →  What actions did your oncologist take to address the fall(s), if any? (please check all that apply)

□ Asked you to describe the circumstances of falls
□ Assessed your feet
□ Assessed your footwear
□ Referred you to see another healthcare provider
□ Performed a physical examination

□ No  →  Please explain why you did not report the fall to your oncologist

________________________________________________________________________________________

________________________________________________________________________________________

Did you report the fall to your oncology nurse?

□ Yes  →  What actions did your nurse take to address the fall(s), if any? (please check all that apply)

□ Asked you to describe the circumstances of falls
□ Assessed your feet
□ Assessed your footwear
□ Performed a physical assessment

□ No  →  Please explain why you did not report it to the oncology nurse

________________________________________________________________________________________

________________________________________________________________________________________
<table>
<thead>
<tr>
<th><strong>Did you report the falls to your family physician?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Yes → What actions did your family physician take to address the fall(s), if any? (please check all that apply)</td>
</tr>
<tr>
<td>□ Asked you to describe the circumstances of falls</td>
</tr>
<tr>
<td>□ Assessed your feet</td>
</tr>
<tr>
<td>□ Assessed your footwear</td>
</tr>
<tr>
<td>□ Referred you to see another healthcare provider</td>
</tr>
<tr>
<td>□ Performed a physical assessment</td>
</tr>
<tr>
<td>□ No → Please explain why you did not report it to the family physician</td>
</tr>
<tr>
<td>____________________________________________</td>
</tr>
<tr>
<td>____________________________________________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Was your cancer treatment interrupted because of the fall?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Yes</td>
</tr>
<tr>
<td>□ No</td>
</tr>
<tr>
<td>□ Don’t know</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>If your treatment was interrupted, how?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Put on hold temporarily → For how long? ____________________________</td>
</tr>
<tr>
<td>□ Stopped altogether</td>
</tr>
<tr>
<td>□ Changed to a different type of treatment → What kind? _______________</td>
</tr>
<tr>
<td>□ Treatment continued but modified (e.g. dose reduction or frequency altered)</td>
</tr>
<tr>
<td>Please specify_________________________</td>
</tr>
</tbody>
</table>
Table B

**Do you report all of your falls to your oncologist?**
- Yes → Please describe the actions that your oncologist took to address the fall(s) (if any)

______________________________________________________________
______________________________________________________________
______________________________________________________________

- No → Can you explain why?

______________________________________________________________
______________________________________________________________
Fall #4

Where were you when the fall occurred?

☐ At home → Which room? _________________________

☐ Outdoor → (Please specify what place it was)_________________________

☐ At a public place (e.g. shopping mall, grocery store)

☐ Other (please describe)________________________

☐ Can’t remember

What time was the day when the fall occurred?

☐ Morning (Around what hour?)___________

☐ Afternoon (Around what hour?)___________

☐ Evening (Around what hour?)___________

☐ At night (Around what hour?)___________

What were you doing when the fall occurred?

________________________________________

Before you fell, were you feeling……

☐ Dizzy

☐ Weak

☐ Difficulty balancing Unsteady on your feet?

☐ Pain → please specify the locations of the pain _________________________

☐ Tingling/numbness in feet? Or anywhere?

☐ Tired

☐ Nauseous
Was the physical environment in which the fall occurred……

- Dark
- Slippery
- Cluttered
- Uneven surface
- Slope
- Stairs/steps
- Other
- None of the above
- Can’t remember

If you normally use an assistive device, were you using the device at the time of the fall?

- Yes
- No → Why not? ________________________________
- Not applicable

Do you think you tripped over something?

- Yes → What was it? ________________________________
- No
- Not sure

Did you sustain any injuries from the fall?

- Yes, I was injured (If your answer is yes, please continue on to column A)
- No, I was not injured. (If your answer is no, please continue on to column B)
**Table A**

**What type of injuries did you sustain? (for example, bruise, fracture, etc)**

__________________________________________________________

__________________________________________________________

**Did you seek care for these injuries?**

☐ Yes

☐ No  ➔ Please explain reason

__________________________________________________________

__________________________________________________________

**If you sought care for the injuries, from whom/where?**

☐ Emergency department

☐ Urgent care clinic

☐ Family doctor

☐ other ________________

**What type of treatment/care did you receive for your injuries?**

__________________________________________________________
Did you report the fall to your oncologist?

☐ Yes → What actions did your oncologist take to address the fall(s), if any? (please check all that apply)
  □ Asked you to describe the circumstances of falls
  □ Assessed your feet
  □ Assessed your footwear
  □ Referred you to see another healthcare provider
  □ Performed a physical examination

☐ No → Please explain why you did not report the fall to your oncologist

________________________________________________________________________
________________________________________________________________________

Did you report the fall to your oncology nurse?

☐ Yes → What actions did your nurse take to address the fall(s), if any? (please check all that apply)
  □ Asked you to describe the circumstances of falls
  □ Assessed your feet
  □ Assessed your footwear
  □ Performed a physical assessment

☐ No → Please explain why you did not report it to the oncology nurse

________________________________________________________________________
________________________________________________________________________
Did you report the falls to your family physician?

□ Yes → What actions did your family physician take to address the fall(s), if any? (please check all that apply)

□ Asked you to describe the circumstances of falls
□ Assessed your feet
□ Assessed your footwear
□ Referred you to see another healthcare provider
□ Performed a physical assessment

□ No → Please explain why you did not report it to the family physician

____________________________________________

____________________________________________

Was your cancer treatment interrupted because of the fall?

□ Yes
□ No
□ Don’t know

If your treatment was interrupted, how?

□ Put on hold temporarily → For how long?
____________________________________________

□ Stopped altogether

□ Changed to a different type of treatment → What kind?
____________________________________________

□ Treatment continued but modified (e.g. dose reduction or frequency altered)

Please specify________________________________
Table B

**Do you report all of your falls to your oncologist?**

- **Yes** → Please describe the actions that your oncologist took to address the fall(s) (if any)

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

- **No** → Can you explain why?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
# FALLS EFFICACY SCALE-INTERNATIONAL

We would like to ask some questions about how concerned you are about the possibility of falling. For each of the following activities, please circle the opinion closest to your own to show how concerned you are that you might fall if you did this activity. Please reply thinking about how you usually do the activity. If you currently don’t do the activity (example: if someone does your shopping for you), please answer to show whether you think you would be concerned about falling IF you did the activity.

<table>
<thead>
<tr>
<th></th>
<th>Not at all concerned 1</th>
<th>Somewhat concerned 2</th>
<th>Fairly concerned 3</th>
<th>Very concerned 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cleaning the house (e.g. sweep. Vacuum, dust)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Getting dressed or undressed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Preparing simple meals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Taking a bath or shower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Going to the shop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Getting in or out of the chair</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Going up or down stairs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Walking around in the neighbourhood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Reaching for something above our head or on the ground</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Going to answer the telephone before it stops ringing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Walking on a slippery surface (e.g. wet or dry)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Visiting a friend or relative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Walking in a place with crowds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Walking on an uneven surface (e.g. rocky ground, poorly maintained pavement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not at all concerned 1</td>
<td>Somewhat concerned 2</td>
<td>Fairly concerned 3</td>
<td>Very concerned 4</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------</td>
<td>----------------------</td>
<td>---------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>15</td>
<td>Walking up or down a slope</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Going out to a social event (e.g. religious service, family gathering, or club meeting)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thank you for completing the questionnaire.
Appendix C: Oncologist Consent form

CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY

**Study Title:** “How do falls impact cancer treatment in older cancer patients?”

**Investigator/Study Doctor:** Dr. Shabbir Alibhai (Site Principal Investigator)
Schroder Sattar (RN, MN, PhD Candidate)

**Contact Information:** Dr. Shabbir Alibhai

**Introduction:**

You are being asked to take part in a research study. Please read the information about the study presented in this form. The form includes details on the study's risks and benefits that you should know before you decide if you would like to take part. You should take as much time as you need to make your decision. You should ask the investigators or study staff to explain anything that you do not understand and make sure that all of your questions have been answered before signing this consent form. Before you make your decision, feel free to talk about this study with anyone you wish. Participation in this study is voluntary.

**Background/Purpose:**

The purpose of this study is to explore the impact of falls on cancer treatment in older adults living in the community, what circumstances led to the falls, and the concern about falls in this population in order to gain a deeper understanding of falls in this aspect. Accidental falls are common among older adults that can have serious consequences. Falls among older cancer patients may be of added concern due to the cancer disease processes and side effects from various types of cancer treatments. This study will develop knowledge on the impact of falls on cancer treatment as well as on circumstances surrounding falls with the goal to inform development of fall safety guidelines and support services. Results from this study will be used to inform care planning and interventions which will hopefully improve the outcomes for older cancer
patients living in the community. About 120 older adults with cancer will participate in this study at the University Health Network and it will take up to one year to complete.

and who is participating in our study, has identified you as a cancer specialist involved in his/her care and has consented for us to contact you for further information You are being asked to consider participating in this study because a patient you treat, regarding to his/her falls, treatment history, and impact of falls on cancer treatment.

**Study Design:**

This study involves completing an open-ended interview in which you will be asked about the patient’s cancer treatment history, the patient’s reporting of the fall(s), how you responded when you learnt about the fall(s), the impact of the fall(s) on his/her subsequent cancer treatment and care plan, and your opinion of the impact on their prognosis and disease trajectory.

**Study Visits and Procedures:**

Participation in this study involves completion of an open-ended interview (one time only). It is estimated that it takes 5 minutes to complete the interview. To minimize the time burden on you, this interview will be audio-recorded with your permission. The audio recording will be deleted immediately after transcription and verification.

**Risks:**

We are not aware of any risks associated with participation in this study.

**Benefits:**

You may not receive direct benefit from being in this study. Information learned from this study will be used by the study investigators to inform development of fall safety strategies and guideline as well as inform oncologists to improve care-planning for future older adults with cancer.

**Confidentiality:**

The study team will keep any personal health and treatment information that you provided about the patient in a secure and confidential location for a minimum of 10 years. A list linking your study number with your name will be kept by the study team in a secure place, separate from your study file. Only the study team or the people listed below will be allowed to look at your file. Your participation in this study also may be
recorded in the patient’s medical record at this hospital. This is for clinical safety purposes.

The following people may come to the hospital to look at the study records and at your file to check that the information collected for the study is correct and to make sure the study is following proper laws and guidelines:

Representatives of the University Health Network (UHN) including the UHN Research Ethics Board.

All information collected during this study, including the information that you provided, will be kept confidential and will not be shared with anyone outside the study unless required by law.

You will not be named in any reports, publications, or presentations that may come for this study.

**Voluntary Participation:**

Your participation in this study is voluntary. You may decide not to be in this study, or to be in the study now, and then change your mind later. Your decision to participate in the study or not will not affect your employment or academic status. You may refuse to answer any question you do not want to answer. You may leave the study at any time without affecting your employment or academic status. We will give you new information that is learned during the study that might affect your decision to stay in the study.

**Withdrawal from the Study:**

If you leave the study, the information that was collected before you left the study will still be used in order to help answer the research question. No new information will be collected without your permission.

**Costs and Reimbursement:**

There is no cost to you to participate in this study. As a token of appreciation of your time, you will receive a $10 gift card to Tim Hortons upon completion of the interview.

**Conflict of Interest:**

The researchers and the study sponsor have an interest in completing this study. Their interests should not influence your decision to participate in this study. You should not feel pressured to join this study.

**Questions about the Study:**
If you have any questions, concerns or would like to speak to the study team for any reason, please call: ********

If you have any questions about your rights as a research participant or have concerns about this study, call the Chair of the University Health Network Research Ethics Board (UHN REB) or the Research Ethics office number at ********. The REB is a group of people who oversee the ethical conduct of research studies. The UHN REB is not part of the study team. Everything that you discuss will be kept confidential.
You will be given a signed copy of this consent form.

**Consent:**
This study has been explained to me and any questions I had have been answered.

I know that I may leave the study at any time. I agree to the use of my information as described in this form. I agree to take part in this study.

__________________________  __________________________  _____________
Print Study Participant’s Name  Signature  Date

My signature means that I have explained the study to the participant named above. I have answered all questions.

__________________________  __________________________  _____________
Print Name of Person Obtaining Consent  Signature  Date
Appendix D: Oncologist Interview Guide

Did the fall(s) and/or injuries affect the planned or current cancer treatment regimen of this patient?

If yes, how was the cancer treatment regimen affected?

How long did the treatment interruption (if applicable) last?

Did the impact of falls on cancer treatment affect the patient’s cancer disease trajectory/treatment outcome/life expectancy? And if so, how?

Do you usually ask your patients about falls during clinic visits? (If yes, how often? If no, why?)

When a fall was reported, what do you do in terms of management?

Do you think older patients in general are forthcoming in reporting their falls?
### Appendix E: Chart Review Form

**Chart review form**

**Participant ID**

<table>
<thead>
<tr>
<th>Cancer Site(s)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer Stage</td>
<td></td>
</tr>
<tr>
<td>Treatment Type</td>
<td>(chemotherapy, radiation, hormonal, chemoradiation)</td>
</tr>
<tr>
<td>Treatment intent (curative, palliative)</td>
<td></td>
</tr>
<tr>
<td>Drug type and name</td>
<td></td>
</tr>
<tr>
<td>Documentation of treatment-related peripheral neuropathy (yes/no)</td>
<td></td>
</tr>
<tr>
<td>Description of neuropathy</td>
<td></td>
</tr>
<tr>
<td>Documentation of oncologist assessing for falls</td>
<td></td>
</tr>
<tr>
<td>Oncologist's documentation of falls</td>
<td></td>
</tr>
<tr>
<td>Documentation of oncologist's</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>action in response to the fall (yes/no)</td>
<td></td>
</tr>
<tr>
<td>Description of oncologist’s action in response to the fall</td>
<td></td>
</tr>
<tr>
<td>Comorbidities listed in patients’ EPR</td>
<td></td>
</tr>
<tr>
<td>Total number of comorbidities</td>
<td></td>
</tr>
<tr>
<td>Documentation of cognitive impairment (including documentation of ‘cognitively intact’ or no documentation)</td>
<td></td>
</tr>
<tr>
<td>Documentation of depression (including documentation of ‘no depressive symptoms’ or no documentation)</td>
<td></td>
</tr>
</tbody>
</table>
Appendix F: Older adult open-ended interview topic guide

- Within this past one year, how many times did you fall?

For each fall:

- When did this fall happened?
- Where were you when it happened?
- What was the surrounding like?
- What time of the day was it?
- What were you doing at the time?
- How did it happen?
- How were you feeling right before it happened?
- (For those using walking aid) What about your walking aid when it happened? (If applicable: Why was it not used?)
- Who did you mention the fall to when you go for appointments? (prompt, oncologist, nurse, family physician). What action did he/she take?
- (If not mentioned) Why was it not mentioned?
- What are you doing differently nowadays since the fall?
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