

EXPLORING HEMATOLOGY/ONCOLOGY NURSES' RECOGNITION OF
PATIENTS AT RISK OF SEPSIS

A DISSERTATION

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

IN THE GRADUATE SCHOOL OF THE

TEXAS WOMAN'S UNIVERSITY

COLLEGE OF NURSING

BY

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DENTON, TEXAS

MAY 2021

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DEDICATION

To my parents, Fernando and Ana, who emphasized the importance of respect, education, and hard work.

To my mother, Ana, and to my sister, Soledad, who set an example of optimism and hope, you both are my rock.

To my other siblings, who are a thousand miles away, you are my inspiration.

To my husband, Garry, who gave me confidence and strength when I felt so inept, thanks for being my constant friend, critic, and mentor.

To my fur babies (Colby, Chelsea, Toby, Adele, and Kelsey), thanks for coming to my life.

To my wonderful dissertation chair, Dr. McFarlane, and to my thoughtful mentor, Dr. Brassil, you gave me wisdom, enthusiasm, and inspiration to assist me on my dissertation journey.

ACKNOWLEDGMENTS

I could not have completed my dreams without the support of my family and friends. To my sister, Soledad, a special heartfelt thanks to you for the countless times that I called to check on you before and after your cancer diagnosis and treatment. You remained positive, serene, and kind as you thought of me, your baby sister. Amidst fear and the unknown, you continued to care for our wonderful mother, Ana. You and mother are my role models. To my husband, Garry, who pushed me to keep going regardless of any roadblocks and redirected my thoughts to meaningful goals, thanks for your grit, love, and support.

A special thanks to my department chair, Dr. Kristen Price, who wholeheartedly supported my research without hesitation. Thank you so much for completing those random audits. I would like to thank my dissertation chair, Dr. Judith McFarlane, and my committee members, Dr. Sandra Cesario and Dr. Ann Malecha, for sharing their knowledge and providing guidance throughout this process.

Also, I would like to thank the hematology/oncology nurses for their significant contribution to this research. Throughout the process, they willingly shared their meaningful experiences of caring for patients at risk of sepsis, all while continuing to provide their patients the best care possible. My deepest gratitude to the nursing director, Corey Russel, for support and the opportunity to reach out to these dedicated nurses.

ABSTRACT

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MAY 2021

This descriptive exploratory study, guided by Carper's (1978) patterns of knowing, explored hematology/oncology nurses' recognition of patients at risk of sepsis. Semi-structured open-ended interview questions (with additional prompts as necessary) were used during individual face-to-face interviews of 14 clinical nurses to understand their experience when caring for hematologic/oncologic patients at risk of sepsis and how they differentiate between sepsis and other treatment-related complications such as those related to chemotherapy. Interviews were digitally recorded and subsequently were carefully analyzed using Colaizzi's (1978) method of analysis. The primary finding of this analysis was the overarching theme of *Act Quickly and Decisively*. This study, regarding the recognition and differentiation of sepsis, may enhance understanding of the experiences and tools used by clinical nurses in hematologic/oncologic settings. Recommendations for further research include the development of an evidence-based educational training module focused on early assessment and intervention, including differentiation alert tools. Improved understanding resulting from the development of such a training module would subsequently improve patient outcomes.

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CHAPTER I

INTRODUCTION

Focus of Inquiry

Sepsis is a major cause of morbidity and mortality worldwide (Dantes & Epstein, 2018; Fleischmann et al., 2016; Nucera, et al., 2018; Singer et al., 2016). In the United States, sepsis affects approximately 1.7 million adults and possibly contributes to more than 250,000 deaths annually (Rhee et al., 2019). Several studies estimate that 30–50% of overall hospital deaths are associated with sepsis, and incidence rates of sepsis are increasing (Cohen et al., 2015; Fleischmann et al., 2016; Walkey, et al., 2015). Specific to persons with cancer, infection and sepsis are common problems and affect up to 45% of such patients, resulting in substantial morbidity, mortality, and healthcare cost (Thursky et al., 2018). Oncologic patients are at high risk of sepsis due to chemotherapy, radiotherapy, and complex surgical interventions (Abou Dagher et al., 2017; Thursky et al., 2018). Additionally, oncologic patients may also experience neutropenic fever (also known as febrile neutropenia)—a serious complication that is commonly associated with chemotherapy (Abou Dagher et al., 2017; Thursky et al., 2018). However, the causal impact of neutropenia as pertains to sepsis and septic shock remains debatable (Kochanek, et al., 2019).

Sepsis in cancer patients requires rapid recognition and urgent treatment to prevent mortality (Kochanek et al., 2019). Nurses must be aware of the initial presenting features of sepsis that may occur during chemotherapy-induced neutropenia. In 2017, the

World Health Assembly and World Health Organization adopted a resolution highlighting sepsis as a global health priority and urged the 194 United Nations Member States to enhance prevention, diagnosis, and management of sepsis (Kim & Park, 2018).

Statement of Purpose

The purpose of the study was to describe how clinical nurses within an inpatient hematology/oncology unit recognize patients at risk of developing sepsis. Specifically, how do clinical nurses differentiate between early signs of sepsis and non-sepsis complications resulting from chemotherapy treatment? Once a description of nursing skills necessary for sepsis identification, including the crucial differentiation between sepsis and non-sepsis, is available, then evidence-based training modules can be formulated and tested for best care practices.

Rationale for the Study

Oncologic patients are at an increased risk of sepsis due to cancer-related treatment complications (Thursky et al., 2018). Differentiation between oncologic patients with sepsis and those with non-sepsis neutropenic fever can be difficult (Kochanek et al., 2019; Thursky et al., 2018). Developing nursing systems for early recognition and management of sepsis and non-sepsis are essential for ensuring the best patient trajectory. How the clinical nurse identifies and differentiates early signs of sepsis from non-sepsis complications of chemotherapy treatment within hematologic/oncologic patients is not described in the literature. Before evidence-based protocols of early assessment and management for sepsis can be formulated, tested, and followed, a

descriptive analysis to elucidate nursing recognition of sepsis must be conducted. This research seeks to fill this gap.

Theoretical Framework

Carper's (1978) patterns of knowing is the theoretical framework utilized in this exploratory qualitative study to describe the experiences of nurses who are working in hematology/oncology units and caring for patients at risk of sepsis. The theoretical framework of Carper comprises of four fundamental patterns of knowing: empirics, aesthetics, ethics, and personal knowing (Carper, 1978). Because of the integration of the patterns, a description of the meaning and processes of knowing the patient will be attained (Mantzorou & Mastrogiannis, 2011). The framework for Carper's patterns of knowing is consistent with the purpose of the study as it seeks to understand the phenomena from clinical nurses' experiences caring for hematologic/oncologic patients at risk of sepsis. Further, Carper's framework guided the researcher to develop a new method of knowing the patient and improve understanding of how nurses obtain information in order to enhance their knowledge and to support their delivery of patient care (Kelley et al., 2013).

Through empirical knowledge, phenomena will be described and explained by different observers using their senses, subjective impressions, and objective facts. While aesthetics is defined as the art of nursing, it encompasses a direct feeling of experience and creates new understanding of a phenomenon (Carper, 1978). Ethical knowing is guided by ethical principles and expressed through descriptions of ethical decision-making. Finally, personal knowing is a deep understanding of a human being or a

knowledge we have of ourselves based on what we observe and experience. In a therapeutic use of self, personal knowing is achieved (Carper, 1978). The value of this theoretical framework gains two dimensions, such as understanding the experiences of clinical nurses in hematology/oncology units, and their important role when caring for patients at risk of sepsis.

Assumptions

According to Carper (1978), the body of knowledge guiding nursing practice has patterns and structures that characterize the ways of thinking about phenomenon. Carper identified four fundamental patterns of knowing that were presented as a foundation to nursing practice. The four fundamental patterns of knowing are termed: (1) empiric, the science of nursing; (2) esthetics, the art of nursing; (3) the components of a personal knowledge in nursing; and (4) ethics, the component of moral knowledge in nursing. Understanding these patterns involves critical attention to the question of what it means to know and what kinds of knowledge are most valuable in the nursing discipline.

Using Carper's patterns of knowing, the following assumptions were applied to this study:

1. Clinical nurses caring for hematologic/oncologic patients at risk of sepsis are able to describe the sequence of recognizing sepsis while assessing other cancer-management complications, such as complications of chemotherapy.
2. Clinical nurses caring for hematologic/oncologic patients at risk of sepsis utilize assessment tools to recognize sepsis, leading to timely communication with health care providers and early sepsis intervention.

3. Clinical nurses caring for hematologic/oncologic patients at risk of sepsis describe methods and tools utilized when differentiating between signs of sepsis and other treatment complications such as chemotherapy.
4. Clinical nurses caring for hematologic/oncologic patients at risk of sepsis can verbalize barriers to sepsis recognition, including differentiating it from other cancer-treatment related complications.

Research Questions

The aim of this study was to describe how nurses on an inpatient hematology/oncology unit recognize patients at risk for sepsis. Specifically, how do clinical nurses differentiate between early signs of sepsis and non-sepsis complications of chemotherapy treatment? The two research questions to be explored in this study are:

Research Question 1:

How do clinical nurses caring for hematologic/oncologic patients identify patients at risk of sepsis?

Research Question 2:

How do clinical nurses caring for hematologic/oncologic patients differentiate between signs of sepsis and other non-sepsis complications?

Definition of Terms

The following conceptual and operational terms were used in this study:

1. *Sepsis* is conceptually defined as a syndrome of physiologic, pathologic, and biochemical abnormalities induced by infection (Singer et al., 2016). For this study, I used the latest and the third definition, Sepsis-3 (Poutsiaka et al.,

2017; Singer et al., 2016). The operational definition of sepsis was obtained from a task force convened by the Society of Critical Care Medicine and European Society of Intensive Care Medicine, comprising experts in sepsis pathobiology, clinical trials, and epidemiology. The Sepsis-3 definition and clinical criteria were generated through task-force meetings, Delphi processes, an analysis of electronic health record databases, and voting, subsequently circulating emerging concepts to international professional societies to facilitate peer review and endorsement (see Table 1).

2. *Hematologic/oncologic patient* is conceptually defined as a patient with blood-related illnesses, cancer disorder, hemophilia, Hodgkin's disease, leukemia, lymphoma, myeloma, or sickle cell anemia; operationally, a hematologic/oncologic patient is defined as one who was admitted to one of three adult inpatient units (namely, leukemia, lymphoma/myeloma, and stem cell transplant) devoted to the treatment of cancer within a tertiary care hospital.

Table 1

The International Sepsis-3 Definitions

Key Features of Sepsis-3	Definitions
Sepsis	<p>Organ dysfunction that is life-threatening and caused by an abnormal host response to infection.</p> <p>Organ dysfunction related to infection that can be identified as an acute, consequential change (≥ 2 points) in the total sequential organ failure assessment score (SOFA).</p> <p>In a general hospital population with suspected infection, a SOFA score ≥ 2 reflects an overall risk of death of approximately 10%.</p>
Septic Shock	<p>A subset of sepsis that profoundly increases the risk of death; related to underlying circulatory, cellular, and metabolic abnormalities.</p>

Note. The key features of Sepsis-3 were defined including sepsis and septic shock.

Adapted from “The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3),” by M. Singer, C. S. Deutschman, C. W. Seymour, M. Shankar-Hari, D. Annane, M. Bauer, ... & R. S. Hotchkiss, 2016, *Journal of American Medical Association*, 315, p. 805 (<https://doi.org/10.1001/jama.2016.0287>). Copyright 2016 American Medical Association.

Summary

As rates of sepsis continue to increase and thereby affect greater numbers of hematologic/oncologic patients, understanding the experience of clinical nurses in these treatment units is critical. Using a qualitative method provides essential information on the clinical sequence of caring for hematologic/oncologic patients at risk of developing

sepsis during chemotherapy, including those patients experiencing chemotherapy-related complications. This research adds value to the body of nursing science by providing new themes and leading to improved understanding of clinical nurses' experience in caring for hematologic/oncologic patients at risk for sepsis. By exploring the role of clinical nurses in sepsis recognition, gathered information may lead to novel nursing interventions to better recognize signs of sepsis in hematologic/oncologic patients. The theoretical framework of Carper's pattern of knowing guided this research by integrating four patterns of knowing: empirics, aesthetics, ethics, and personal knowing (Carper, 1978).

It is the researcher's aim to find the meaning in clinical nurses' experience when identifying hematologic/oncologic patients at risk for sepsis and determining which assessment tools were used. Carper's framework was used to understand these nurses' descriptions of their sepsis management experiences, adding value to the body of research in nursing science. Further, by exploring the sources that clinical nurses utilize to develop knowledge and beliefs of their practice, it could inform other disciplines involved in the care of hematologic/oncologic patients at risk of sepsis.

There is an identified problem of hematologic/oncologic patients being at increased risk of sepsis; however, there is limited data on how the clinical nurse identifies such patients at risk of sepsis while receiving cancer treatment. Despite the identification of several available sepsis resources, including those highlighted by international sepsis guidelines to promote the value of multidisciplinary collaboration, there is a paucity of information that specifically discusses how clinical nurses identify sepsis and differentiate it from non-sepsis complications of cancer treatment. Understanding the

experiences and tools used by nurses in hematologic/oncologic settings may afford foundations and others to develop educational interventions for nursing staff and lead to improved outcomes for hematologic/oncologic patients with and without sepsis.

CHAPTER II

REVIEW OF LITERATURE

Overview

Sepsis is a major cause of mortality and morbidity affecting more than 30 million people worldwide (Saito et al., 2018; Singer et al., 2016). Sepsis and severe sepsis are leading causes of death in the United States, with an estimated \$23 billion in healthcare expenditures added to the overall healthcare infrastructure (Cecconi et al., 2018; Hajj et al., 2018). Consequently, sepsis remains a healthcare challenge as evidenced by increased hospital admissions, worsening mortality rates, extended length of stay, and increased treatment cost (Olenick et al., 2017). In addition, severe sepsis occurs in an estimated 14% of oncologic patients; mortality from severe sepsis or septic shock in patients with cancer is as much as 30–40%, which is higher than in other populations (Shelton et al., 2016). The time between the onset and identification of sepsis is often where significant delays in management occur and often results in an emergent admission to the intensive care unit (ICU) to facilitate crucial, close monitoring (Keeley et al., 2017).

As a time-sensitive syndrome, the treatment of sepsis necessitates early recognition and response by nurses (Harley et al., 2019). Although there are available screening tools (and other screening modalities), existing staff-training programs, and an emphasis on the value of multidisciplinary collaboration, there is no specific statement on the role of nurses within the current sepsis guidelines. The role of the nurse is critical in early sepsis recognition in order to ensure timely treatment, which in turn leads to

reduced morbidity and mortality, decreased ICU days, and cost reduction (Kleinpell & Schorr, 2014).

Literature Search Techniques

The databases of CINAHL, PubMed, and Web of Science were searched with the following use of Boolean operations and keywords: ['Sepsis' OR 'Systemic Inflammatory Response Syndrome'] AND ['recogni*' OR 'alert*' OR 'detect OR' OR 'identif*' OR 'noti*' OR 'aware*'] AND ['nurse*']. The search was limited to studies of adult ages 19 years and over, English language only, human subjects, full-text availability, and peer-reviewed journals between 2009 and 2019. A total of 163 articles were retrieved. The search was further refined to exclude 16 articles containing editorial commentary, concerning guideline or continuing education, providing literature review, describing adult nurses caring for neonatal or pediatric patients, or with a focus on diagnosis and tests. After a quick review of the abstracts and an exclusion of duplicate articles, 33 articles were reviewed and analyzed. However, there were only four articles that were identified to specifically relate to the primary research questions: All studies were focused on clinical nurses caring for hematologic/oncologic patients at risk of sepsis (Al Qadire, 2017; Mattison et al., 2016; Shelton et al., 2016; Thursky et al., 2018). Three of the four studies were conducted in a hospital setting, while the fourth study was conducted in an ambulatory/clinic cancer setting. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used during abstraction to ensure that all study articles met the inclusion criteria (see Appendix A); additionally, each study was classified as either qualitative or quantitative.

A total of 4 articles are presented in summary review table (see Table 2); all involve an adult patient population with a majority of hospitalized hematologic/oncologic patients undergoing treatment for cancer, but also including one study that was conducted within an adult ambulatory oncology clinic setting with patients undergoing chemotherapy and hematopoietic stem cell transplant (Shelton et al., 2016). All four articles contributed to developing further tools and resources (i.e., protocols) for sepsis recognition and care and will be reviewed.

Table 2

Summary of Four Articles Meeting PRISMA Criteria for Inclusion

Review Features	Elements from the Four Studies Meeting PRISMA Criteria
Type of Study	Quantitative (Al Qadire, 2017; Mattison et al., 2016; Shelton et al., 2016)
	Quantitative and Qualitative (Thursky et al., 2018)
Study Design	Cross-sectional survey using 10 multiple-choice questions in a convenience sample (Al Qadire, 2017).
	Retrospective Analysis (Mattison et al., 2016).
	Quality improvement study with intervention (Shelton et al., 2016).
	Quantitative: comparison of pre- and post-implementation data following the development of a hospital-wide sepsis pathway for management; Qualitative: direct observation and focus group interviews using purposive sampling of junior and senior medical and nursing staff (Thursky et al., 2018).

Table 2 (continued)

Summary of Four Articles Meeting PRISMA Criteria for Inclusion

Aim	To assess knowledge of guidelines for preventing central venous catheter infections (Al Qadire, 2017).
	To determine if nurse-led protocols are effective in treating oncologic patients with presumed sepsis or febrile neutropenia; timing to presentation of antibiotics was studied (Mattison et al., 2016).
	To implement sepsis screening and initial bundled six-hour interventions in an ambulatory clinic for patients on a specialized care undergoing intensive chemotherapy or hematopoietic stem cell transplantation for hematologic disease or malignancy (Shelton et al., 2016).
	Multiple: (1) to develop and implement a whole hospital clinical pathway for sepsis management; (2) to determine the impact on patient outcomes and healthcare utilization; (3) to identify issues with the (a) identification of sepsis, (b) clinical review of patients with sepsis, and (c) administration of the first dose of antibiotics (Thursky et al., 2018).
Sample (Size)	Oncology nurses ($n = 170$); subgroup of those that completed questionnaire ($n = 137$); pilot study ($n = 20$; Al Qadire, 2017). Oncology nurses treating patients ($n = 697$) presenting with suspected sepsis after chemotherapy (Mattison et al., 2016). Hematologic patient ($n = 119$) undergoing intensive chemotherapy and HSCT; subgroups include a baseline group ($n = 40$) and an intervention group ($n = 79$; Shelton et al., 2016). Patients with cancer ($n = 323$); subgroups include pre-implementation cohort ($n = 111$) and post-implementation cohort ($n = 212$; Thursky et al., 2018).

Table 2 (continued)*Summary of Four Articles Meeting PRISMA Criteria for Inclusion*

Setting	Oncology units within two large hospitals (Al Qadire, 2017).
	Oncology hospital (Mattison et al., 2016).
	Adult ambulatory oncology clinic (Shelton et al., 2016).
	Oncology hospital (Thursky et al., 2018).
Resources for Early Sepsis Recognition	The questionnaire was based on the Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011. There were no specific resources provided to study participants (Al Qadire, 2017).
	Not specified other than routine training (Mattison et al., 2016).
	Evidence-based protocol for management of early sepsis (Shelton et al., 2016).
	Pathway was adapted from the Clinical Excellence Commission Adult Sepsis Kills pathway for emergency departments and modified for inpatient use; introduction of early sepsis warning criteria using SIRS criteria (Thursky et al., 2018).
Training	None provided (Al Qadire, 2017).
	The study did not include any new training specific to sepsis, but all nurses underwent routine training on a yearly basis (Mattison et al., 2016).
	Face-to-face educational sessions (30–45 minutes) and reference materials were provided to staff prior to implementation (Shelton et al., 2016).
	Pilot training followed by comprehensive training program in the form of presentations, weekly emails, and content quizzes (Thursky et al., 2018).

Table 2 (continued)

Summary of Four Articles Meeting PRISMA Criteria for Inclusion

Implementation Issues (Barriers & Facilitators)	The study was originally intended to be conducted at three large hospitals in order to obtain a larger sample of nurses; however, this study was only approved at two hospitals (Al Qadire, 2017).
	Not identified (Mattison et al., 2016).
	More than 75% of staff perceived they were adequately prepared to care for patients with sepsis, but they were unfamiliar with the recommendations from the Surviving Sepsis Campaign (Shelton et al., 2016).
	Identification of sepsis was difficult because of inexperienced junior staff and doctors inclined to view fever as unrelated to sepsis; knowledge gaps; the lack of a formal handover procedure; unclear escalation process; the lack of advanced care directives; skill and equipment issues; the lack of available antibiotics (Thursky et al., 2018).
Findings or Other Outcomes	There was an overall lack of knowledge in preventing central venous catheter infections. There is a need for greater and continued on-the-job training in order to improve knowledge of best-care practices (Al Qadire, 2017).
	Nurse-led protocols were effective, safe, sustainable, and facilitated early antibiotic administration (Mattison et al., 2016).
	A significantly higher incidence of severe mucositis, hyperthermia, hypotension, leukopenia, positive infection source, bacteremia, hospitalizations, number of SIRS criteria, and severe sepsis at 24 hours were found for the baseline group compared with the intervention group. Patients in the intervention group were found to have a lower incidence of sepsis-related complications and were not admitted to the hospital (Shelton et al., 2016).
	The amount of time to the first dose of antibiotic was significantly reduced by 50%; death related to sepsis was reduced more than 50% (11% versus 5%; Thursky et al., 2018).

Note. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

Tools and Resources for Sepsis Recognition

Sepsis screening protocol

Identifying sepsis at an early onset is a critical trigger point for early sepsis intervention. One of the four selected articles for review, developed a hospital-wide sepsis pathway after involving multidisciplinary teams and gleaning responses from oncology nurses participating in focus groups and qualitative interviews (Thursky et al., 2018). Systemic inflammatory response syndrome (SIRS) criteria and identifying sources as risks for infection were considered by using modified sepsis screening criteria (Shelton et al., 2016). The modified sepsis screening criteria were used for neutropenic cancer patients as well as for patients undergoing intensive chemotherapy or hematopoietic stem cell transplantation for hematologic malignancy.

Sepsis care protocol

A nurse-driven sepsis screening protocol with order sets lead to expedited care delivery to septic patients in a cancer hospital; the vast majority of patients received the first administration of antibiotics within 60 minutes of suspecting sepsis (Mattison et al., 2016). One study showed that using Sepsis Six Care Bundle led to mortality reduction, timely treatment (including antibiotic administration), improved knowledge and skills, staff empowerment, and improved patient outcomes (Shelton et al., 2016). The treatment bundle includes measuring lactate levels and urine output, administering antibiotics, oxygen and fast intravenous fluids, and taking blood cultures (Thursky et al., 2018).

Clinical alert criteria for sepsis recognition

Several alert criteria were identified by Thursky et al. (2018), such as SIRS, medical emergency team (MET) call, and quick sepsis related organ failure (qSOFA). These alert tools are commonly utilized to diagnose sepsis. SIRS criteria include measurements such as patients having a peripheral capillary oxygen saturation (SpO₂) of 90%-95%, a heart rate of 120-130 beats per minute, a respiratory rate of 25-30 breaths per minute, a systolic blood pressure of 90-100 mmHg, and having a temperature >38°C or <35.4°C (Thursky et al., 2018). Although MET call criteria are similar, they include slightly different thresholds and additional measures; these include patients having a SpO₂ <90%, a heart rate >130 beats per minute, a respiratory rate >30 or <6 breaths per minute, systolic blood pressure <90 mmHg as well as having an altered mental status or decreased urine output of < 0.5 ml/hour for > 2 hours.

Regarding qSOFA alert criteria, it consists of fewer criterion: patients having systolic blood pressure ≤100 mmHg and a respiratory rate ≥22 breaths per minute; the qSOFA alert criteria do not require the presence of fever. Notably, thirty percent of patients with severe sepsis do not present with fever, and neutropenic patients may have sepsis without fever (Thursky et al., 2018). Therefore, the use of qSOFA alone is troubling in that it has the potential to result in delays in administration of antimicrobial therapy. In contrast, incorporating SIRS criteria with MET call criteria may aid in sepsis recognition, which could result in reduced hospitalization costs and improved patient outcomes.

Training for Sepsis Recognition

Sepsis training program

The questionnaire developed by Al Qadire, another one of the four identified studies, found an overall lack of awareness of oncology nurses for current guidelines focused on catheter-related infections; thus, a need for ongoing sepsis training programs was established (Al Qadire, 2017). Within another oncology hospital, a highly effective training pathway was developed, which was adapted from a pathway initially established for emergency room staff—Clinical Excellence Commission Adult Sepsis Kills (Thursky et al., 2018). The pathway included presentations, teamwork and communication, and qualitative interviews. After an oncology-nurse-specific pathway for sepsis management was developed, it was implemented throughout the hospital. There was a substantial reduction in the time to first dose of antibiotics, as well as a large reduction in sepsis-related deaths. Face-to-face educational sessions, with a multidisciplinary team, demonstrated a positive impact of sepsis recognition based on before and after studies (Shelton et al., 2016).

Barriers to Sepsis Recognition and Care

The barriers to sepsis recognition and care include nursing staff who are unfamiliar with published recommendations (Al Qadire, 2017; Shelton et al., 2016), a lack of physician training (who tended to think of fever solely as a complication of chemotherapy) (Thursky et al., 2018), delays in recognition, diagnosis and management (Shelton et al., 2016; Thursky et al., 2018), the inability to carry out and administer intravenous (IV) antibiotic (Thursky et al., 2018), which was largely related no IV access

or a lack of available antibiotics, the lack of a formal handover procedure (Thursky et al., 2018), and an unclear escalation process (Thursky et al., 2018). Educational barriers include training to use a sepsis-screening tool, which did not cover all employees, as well as a general unfamiliarity of the Surviving Sepsis Campaign's recommendations despite nursing staff expressions of being adequately prepared to care for septic patients (Shelton et al., 2016).

Facilitators to Sepsis Recognition and Care

A retrospective study of nearly 700 patients treated by oncology nurses found that nurse-led protocols were effective, safe, sustainable, and facilitated early antibiotic treatment (Mattison et al., 2016). Interest from a broad spectrum of team leaders aided the development of a sepsis-prevention pathway specifically built on the experiences and impressions of oncology nurses (Thursky et al., 2018).

Discussion

Despite several studies evaluating educational programs, collaborative sepsis identification and management, and the development and implementation of clinical tools to evaluate risk for sepsis, no studies were found that discussed how clinical nurses identified hematologic/oncologic patients at risk for sepsis or differentiated sepsis from non-sepsis complications of chemotherapy. Further, only four studies were conducted in settings dependent on hematology/oncology nurses. Due to the elevated risk for sepsis in immunocompromised hematologic/oncologic patients, this review documents the paucity of literature specifically related to the experience of clinical nurses that is both outside the

intensive care setting and with patients who remain at high risk for developing sepsis, namely hematologic/oncologic patients.

The review of literature identified several gaps and limitations. Out of 33 articles that were examined, only four articles on sepsis were conducted in adult oncologic settings. This included one study meeting criteria for inclusion that was related to adult oncology in an ambulatory clinic setting, it showed that implementing interprofessional protocols following Surviving Sepsis Campaign (SSC) guidelines facilitates sepsis recognition. In this review, there was limited evidence from sepsis-training programs because only two studies included sepsis content; however, the available data demonstrated training was highly effective in improving recognition of sepsis as well as related outcomes such as death or inappropriate treatment delay (Shelton et al., 2016; Thursky et al., 2018).

Summary

Although there are multiple novel biomarkers, screening tools and resources, and awareness campaigns for predicting the risk for sepsis, early recognition of sepsis remains a challenge (Al Qadire, 2017). However, the development of evidence-based training protocols and oncology-nurse-specific pathways to manage sepsis document better sepsis recognition and management (Shelton et al., 2016; Thursky et al., 2018). As sepsis remains a leading cause of mortality in critically ill patients globally, including patients with hematologic cancers, additional studies are needed to determine the most effective way to achieve sepsis bundle targets in conjunction with nurse-driven screening and treatment protocols. As our understanding of the clinical epidemiology and

management of sepsis continue, a new roadmap for future research in terms of exploring nurses' experience in sepsis recognition in adult oncology population are evolving (Shelton et al., 2016; Thursky et al., 2018). Therefore, further research needs to be conducted in various clinical settings, especially regarding the role of clinical nurses in the early recognition of patients at risk for sepsis in hematology/oncology settings.

CHAPTER III

PROCEDURE FOR COLLECTION AND TREATMENT OF DATA

Approach to Study

This qualitative study used a descriptive exploratory approach to uncover the sequence of recognizing sepsis and the use of clinical assessment tools to differentiate between hematologic/oncologic patients with sepsis and non-sepsis complications related to chemotherapy. The main focus of descriptive exploration was to discover a particular phenomenon from the perspective of those experiencing it (Vaismoradi et al., 2013). The aim of this study was to have clinical nurses describe what is significant in their experience when caring for hematologic/oncologic patients at risk of sepsis, including how they differentiate sepsis and non-sepsis complications by utilizing specific assessment tools. The data allowed this researcher to gain understanding of the phenomenon following qualitative analysis. The study methods consisted of collecting data through face-to-face interviews. Additionally, quantitative demographic data was collected to describe the sample characteristics. This researcher developed and pilot-tested an interview guide, an inclusion tool for potential study participants, and a protocol checklist to guide the study process. The objective of this research was consistent with the aforementioned definition of descriptive exploratory inquiry because this study aimed to understand the lived experience of clinical nurses who care for hematologic/oncologic patients at risk of sepsis.

Setting

The setting for this study was a large tertiary hospital with over 600 beds. Study participants were recruited from three inpatient medical units: these include leukemia, lymphoma/myeloma, and stem cell transplant units. The interviews were conducted by the principal researcher. Each participant chose the location of interview site, all of which were nearby to the nurses' station. A typical participant's choice included a closed room (such as the staff conference room), where they remained readily available to provide patient care. The interview time was chosen by each participant based on their individual break time or at a designated time at the end of their shift.

Participants

The population under study included clinical nurses working in hematology/oncology units at a tertiary care hospital, who received routine on-the-job training in the care of hematologic/oncologic patients, and who routinely encountered patients at risk of sepsis or patients suspected with sepsis due to other treatment-related complications. An educational requirement for employment at this tertiary care hospital devoted to the treatment of cancer necessitated that all clinical nurses must have a minimum of a Bachelor of Science in Nursing degree. For this study, a purposive homogenous sample of 30 nurses was targeted to facilitate a deliberate, focused inquiry to better understand the experience of clinical nurses caring for hematologic/oncologic patients. Inclusion and exclusion criteria are presented in Appendix C. Briefly, all participants were required to be 18 years of age or older, to speak English, to work as clinical nurses within specific adult inpatient units (namely, leukemia, lymphoma/-

myeloma, and stem cell transplant), and to agree to provide informed consent and participate in an interview. There was no requirement regarding the length of working experience. Participants were recruited until data saturation was reached. Data saturation is achieved when there is redundancy of information or when no new data emerges with further data collection efforts (Creswell & Poth, 2018; Polit & Beck, 2017). Data saturation was reached after 14 study participants. Participants from the pilot study ($n = 3$) were included in the final sample size ($n = 14$) for data analysis.

Protection of Human Subjects

Prior to beginning the study, Institutional Review Board approval was obtained from MD Anderson Cancer Center and from Texas Woman's University. Participation was voluntary, and participants were allowed to withdraw from the study at any time. This process provided additional protection of the study protocol's human participants in regards to their privacy, safety, and personal rights. Each participant was informed of possible risks including fatigue, loss of time, personal distress, and potential loss of confidentiality. Once the participant verbalized willingness to participate in the study, they were allowed time to read and sign the informed consent (see Appendix B) and given an opportunity to ask questions. Participants were instructed to immediately inform the researcher if there were any concerns during the interview; no issues or concerns were raised during pilot testing of the interview or during subsequent research interviews.

The major risk to the participants was disclosure of identity and loss of confidentiality. Measures were taken to minimize this risk and included the use of code numbers on all data forms. This code was linked to the participants' demographic

information. All attempts were made to prevent personal identifying information from being audiotaped during the interview. At the beginning of the recorded interview, the researcher stated the participant's accession code number. During audio recording, the researcher did not use participant names or identifiers. If a participant mentioned their name on the audio recording, it was deleted in the transcription. All interviews were conducted in the locked staff conference room or another locked room. Because a person's voice was considered an identifier under Health Insurance Portability and Accountability Act (HIPAA), audio recordings were kept in a confidential manner, with the recorders locked in the office of the primary researcher, and the audio files uploaded into the secure Box account to which only the researcher had password-protected access. A cloud-based storage, Box, approved by the hospital and meeting HIPAA criteria, was used to store data. Only the researcher had access to the data. At the end of the study, all tapes were destroyed. Furthermore, no personal identifying information will be included in any future publication.

Data Collection

Data was collected through face-to-face, semi-structured interviews to obtain the perspective of the participants. The interviews took approximately one hour to complete. To facilitate comfort and privacy, the interviews were conducted at times convenient to participants' availability and preference within the hospital's main campus. The interviews were audio recorded by using a digital recorder. The recorded interviews were transcribed by the researcher. Subsequently, the content of the transcribed interviews was analyzed. Additionally, field notes were taken by the researcher to supplement

transcribed interviews in order to improve accuracy and aid validation of data. Each interview was coded for confidentiality and identifiers were removed. The audio recordings and study documents (including informed consent, demographic data, and field notes) were assigned codes (e.g., acc001protocol#, acc002protocol#, etc.) to ensure participant's protection and anonymity. Each interview recording was transcribed verbatim by the researcher in a closed private office. The transcriptions were reviewed several times to ensure accuracy. If there were any questions related to data transcription, the researcher contacted the study participant by telephone and asked for their availability in order to clarify accuracy of the contents. The interview recordings were maintained in a double-locked office cabinet on site until data analysis was complete. Continued access to the interview recordings allowed the researcher to re-review and double check the accuracy of transcriptions. All interview data was included in analysis; no participants requested to stop their interview early or be withdrawn from the study.

The data collection for the study proceeded as follows. After obtaining approval from the director of the study location, the researcher conducted a preliminary screening of the staff, who were designated as study candidates by the director, to assess potential participants' availability. For each of the three units, the researcher called the charge nurse 48 hours in advance to determine if potential participants were available and to confirm that the unit was not too busy, thus avoiding any disruption in patient care. If the potential participants qualified for this study based on the preliminary inclusion criteria, the researcher met with the potential participant, explained the study, and determined their willingness to participate. When potential participants were available, the researcher

met them in person and determined their preferred interview location and time of interview. If the potential participants were on site, the researcher went to the unit and screened participants by following the inclusion/exclusion criteria (see Appendix C).

After providing informed consent and signing the consent document, interested study subjects participated in an individual, private interview that lasted approximately one hour. Once the study participant consented to participate in the study, a “do not disturb” sign was placed on the door of the chosen interview location. Prior to initiation of the interview, demographic data on age, race, ethnicity, years of experience, level of education, and gender was collected. The researcher verified the participant’s understanding of the study protocol and provided an opportunity to answer any questions prior to the start of the interview. When the formal interview began, the researcher turned on two digital tape recorders. At the beginning of each interview, the participant was reminded of the focus of the study and asked to describe their most recent experience of caring for patient at risk of sepsis. A semi-structured interview guide and probes were used (these questions are listed under the instruments section). During the interview, the researcher encouraged the participant to describe their experience by using questions from the interview guide and gained entry into the informant’s world view. Although a protocol was developed such that any participant reporting distress would be able to immediately stop participation in the study, no participant reported distress or stated they felt unable to complete the interview; this protocol included referral to the hospital’s Employee Assistance Program for follow-up as well as documentation through a note-to-file. At the completion of each interview, the researcher thanked the study participant.

Following each interview, the data was uploaded from the digital recorders and transcribed by the primary investigator. Shortly thereafter, the transcribed data was reviewed and analyzed by the investigator and faculty advisor. During the pilot phase, a follow-up interview was made to one participant to clarify information concerning the transcribed interview.

Instruments

Once the study participant met the inclusion criteria (see Appendix C) and provided informed consent, the interview began with a demographic questionnaire (see Appendix D) to determine the participant's age, race, ethnicity, years of experience, level of education, and gender. Subsequently, two questions (including related interview probes) from the interview guide (see Appendix E) were asked as follows:

- Interview Question 1: Tell me about your most recent experience in caring for hematologic/oncologic patients at risk for sepsis?
- Interview Questions 2: How do you differentiate between signs of sepsis and other treatment complications such as chemotherapy?

The researcher used silence and head nodding to allow the participant time to elaborate thoughts without verbal interruption. The study checklist (see Appendix F) was used to ensure that the same process was followed during each interview. The instruments were pilot-tested to assess the clarity of the questions and feasibility of the data collection method.

Data Analysis

Data analysis began as soon as the first interview was completed. The primary investigator independently reviewed all transcripts as they became available. Manual methods were utilized to organize, classify and analyze the qualitative data. Careful data collection and analysis was strictly observed to ensure trustworthiness, an indicator of consistency in qualitative research.

Data was analyzed using careful transcription and coding of themes using Colaizzi's method of analysis until data saturation was reached (Polit & Beck, 2017). Each transcript of the clinical nurse caring for hematologic/oncologic patients was analyzed using Colaizzi's (1978) seven-step model, which ensured credibility of the study:

1. Participants' descriptions are read in order to familiarize data and acquire a meaning to the event.
2. Significant statements are extracted from each description, phrase, and sentence that directly relates to the investigated event.
3. Meaning is formulated by spelling out the essence of each significant statement.
4. Clusters of themes are organized from the aggregate formulated meaning.
5. Exhaustive descriptions of the phenomenon are gleaned from the prior steps.
6. The description of the phenomenon serves as an unequivocal interpretation of the essential structure of the phenomenon, as possible.

7. The phenomenon will be analyzed and interpreted with final validation by returning to the participants to confirm if the formulated description represents a true picture of the original experience.

Colaizzi (1978) suggested initially reading all the data to gain a sense of the whole, then pulling out items of significance and attaching meaning to those items. Similar meanings are then combined into themes, which are compared back to the original data to determine if any components are missing, ensuring that the emerging themes are broader in conceptual scope than the original data. Finally, an exhaustive description of the fundamental structure of the phenomenon is constructed, and the findings validated with participants.

The verbatim transcripts served as the primary source of development of the preliminary emergent themes and thematic categories. Theme is considered as the primary product of data analysis that produces meaningful results in the field of study (Vaismoradi et al., 2016). In thematic analysis, this researcher considered both latent content as theme and manifest content as category in data analysis. Coding, collecting codes under potential subthemes or themes, and comparing the emerged coding's clusters together, and in relation to the entire data set, encompassed the main components of data analysis.

Upon receipt of the transcriptions, content was verified by comparing the original transcripts to the taped interview for accuracy and to add pertinent comments. Once the transcripts were checked for accuracy, they were read repeatedly to gain a sense of the whole prior to beginning any coding. Based on the participants' direct statements,

descriptive terms, words, phrases and concepts were used to formulate themes. Initial coding was done on the original transcript by assigning a highlight color specific to each initial code. Then, statements were cut and pasted into a Microsoft Word document table to provide clarity in developing thematic categories. These themes represented a personal view (from the study participants' perspectives) of the meaning of the experience of caring for hematologic/oncologic patients at risk of sepsis. Themes that emerged were then synthesized into a theme category. Theme categories represented the collective experiences of clinical nurses when caring for hematologic/oncologic patients at risk of sepsis. These thematic categories were conceptualized using the broadest terms possible that remain inclusive, but were structured so as to not diminish any one participant's experience.

This information was then analyzed by reapplying it to the original participants' statements and emergent themes to ensure the correctness of the thematic category. The themes were not mutually exclusive, and some theme categories saturated all experiences. All the theme categories, collectively, accounted for what the participants viewed as important points that occurred when caring for hematologic/oncologic patients with possible sepsis or at risk of sepsis after using particular assessment tools. The reviewer, who was a doctorally prepared faculty member with experience in qualitative research, assisted with coding.

Scientific Rigor/Trustworthiness of Qualitative Research Methods

Generalization of qualitative findings is not a goal of qualitative research; instead, qualitative researchers strive for transferability of the research findings (Polit & Beck,

2017). Lincoln and Guba (1985) discussed four factors relating to testing and rigor in conventional scientific research and “naturalistic” inquiry, which were useful as a framework for understanding the qualitative approach. Establishing trustworthiness for qualitative research required four criteria: credibility, dependability, confirmability, and transferability. These criteria were similar to those of the positivists’ internal validity, reliability, objectivity, and external validity (Creswell & Poth, 2018; Lincoln & Guba, 1985).

- *Credibility* refers to confidence in the truth of the data and interpretations of them. It involved self-awareness of the researcher. To help increase awareness, the interviewer kept a journal to record content and process interactions. The journal allowed the interviewer to record and later reflect on study materials.
- *Dependability* is established when a research study can be audited. Lincoln and Guba (1985) postulated that when dealing with consistency of data, auditability should be the criterion for rigor. To establish dependability, the interviewer kept accurate records to facilitate the authentication of study data by the reviewing advisor, who examined the data and arrived at conclusions similar to those of the interviewer.
- *Confirmability* refers to the congruence between two or more independent people regarding the data’s accuracy, relevance, or meaning (Lincoln & Guba, 1985). To establish confirmability, the interviewer used experts from the

dissertation research committee to review and validate data. All data was de-identified by using only code numbers rather than identifying information.

- *Transferability* refers to the extent to which findings from the research study can be transferred to or have applicability to other settings or groups. The rich, in-depth data provide detailed descriptions of participants and settings to allow the reader to make decisions about transferability (Lincoln & Guba, 1985). The interviewer provided enough contextual references and information such that similar conclusions were made by others.

In addition, within this research protocol, the following steps were developed to ensure the rigor of the study:

1. All of the taped interviews were conducted by the primary investigator who received training in qualitative research methodology, and who conducted a pilot study prior to the dissertation study. To ensure consistency in data collection, a study checklist (see Appendix F) was used.
2. The role of the researcher in the interviews was to gather information. During the process of data analysis, the researcher separately analyzed the data in terms of “meaning units” and themes. When the results resulted in thematic differences, the transcripts were read multiple times, and data were analyzed following thorough discussion with the faculty advisor until consensus was able to be achieved to enhance credibility.
3. The analysis results were reviewed and verified by two persons—the researcher and her advisor—to achieve consensus.

Pilot Study

A descriptive exploratory pilot study was conducted between August and October of 2019 to test the methodology of the proposed research project and to establish credibility for this study. The Institutional Review Boards of the hospital and Texas Woman's University approved the pilot study. Three participants, who were experienced in the care of patients at risk of sepsis in selected hematology/oncology units, were interviewed for the study. The study participants were between 30 and 45 years old, one worked as a nurse for five years, and two had 12–15 years of nursing experience. The man-to-woman ratio was 1:2.

Interview Questions

At the start of the pilot study, semi-structured interviews were conducted by the researcher using a dialogue guide of two open-ended questions with additional probes as needed. Three meaningful themes were captured for both interview question 1 and interview question 2. The following questions and probes were used to conduct the interview:

- Interview Question 1: Tell me about your most recent experience in caring for hematologic/oncologic patients at risk for sepsis?
- Interview Question 2: How do you differentiate between signs of sepsis and other treatment complications such as chemotherapy?

Importantly, the interview process examined the experience of clinical nurses as pertained to recognizing sepsis, the tools used when caring for hematologic/oncologic

patients at risk of sepsis, and the barriers identified regarding assessment of sepsis or sepsis recognition.

Theme Categories

Each transcript of the clinical nurses' experience was analyzed following Colaizzi's (1978) phenomenological data analysis model. Based on the participants' direct statements, descriptive terms, words, phrases, and concepts were used to formulate themes. These themes represented the clinical nurses' personalized views on the sequence of sepsis recognition and differentiating between sepsis and other cancer treatment complications such as chemotherapy. Themes that emerged were then developed into six theme categories: (1) always on the lookout, (2) using tools, (3) knowing the problem and overall plan, (4) looking at the big picture, (5) looking for a needle in a haystack, and (6) knowing what you give. According to Munhall (1994), reflecting on the findings of interviews facilitates discussion of the meaning and implications of the research, which aids understanding. This section presents the findings of the pilot study in relation to the current body of literature on sepsis recognition and new themes that emerged from participants.

Interview Question 1: Tell me about your most recent experience in caring for hematologic/oncologic patients at risk for sepsis?

There were two themes that emerged from the participants' interviews using Colaizzi's (1978) phenomenological data analysis model.

Theme 1: Always on the lookout. This theme described the participants' experience of their environment, including how they care for their hematologic/oncologic

patients at risk of developing sepsis. Detection of sepsis required a constant vigilance right from the beginning of a shift. “During initial assessment at the beginning of my shift. I noticed that patient’s blood pressure was slightly low, and their breathing pattern was elevated.” Hypotension was mentioned repeatedly as an indicator of sepsis. “Change of vital signs such as fever, high heart rate, or hypotension.” Frequently hypotension was mentioned as part of vital signs, and participants singled out “hypotension or change of vital signs.” The patient with sepsis needs immediate attention in order to provide an effective intervention (Vincent, 2017).

Theme 2: Using tools. The previous shift’s hand-off report was used by clinical nurses caring for hematologic/oncologic patients to begin assessment for sepsis. “Our hands-off report at the start of the shift in review of the patient’s history provides a number of clues for my suspicion for sepsis.” Following review of the shift report, personal experience and scored instruments were used to assess for sepsis. “I rely on my experience ... I lay eyes on my patient and assess the patients based on the [shift] report ... I use the quick SOFA [sepsis related organ failure] score for rapid assessment.” Finally, expert opinion was sought. “Our team, charge nurse, other nurses, availability of the advance practice registered nurse, and physicians all help in validating my suspicions.” Put into steps, “I lay eyes on my patients, assess them, look at their chart and monitor their vital signs; temperature, heart rate, respiration, and BP [blood pressure].” The assessment process for sepsis was iterative and cyclic with validation at each step.

Interview Question 2: How do you differentiate between sepsis and other treatment related complications such as chemotherapy?

There were three themes that emerged from the participants' interviews using Colaizzi's (1978) method of data analysis model.

Theme 1: Looking at the big picture. An overall assessment was needed to differentiate between sepsis and other complications. "Knowing the history of the patient and current status, vital signs changes, laboratory results and if they are receiving chemotherapy or other treatment including blood transfusion." The importance of traditional vital signs was stressed. "When there is a change of vital signs and patient is not receiving chemo, or I have suspicion."

Theme 2: Looking for a needle in a haystack. Along with a broad assessment, clinical nurses caring for hematologic/oncologic patients also reported fine attention to detail. "Oncology patients are very complicated. The chemotherapy can present signs of sepsis, the patient may be immune compromised, sometimes their condition mimics sepsis, they may have received a blood transfusion and are experiencing a reaction which is similar to the changes in early signs of sepsis." A process of elimination was used to differentiate. "If the patient is not receiving chemotherapy or a blood transfusion, then my index of suspicion for sepsis is very high, which prompts me to initiate the sepsis algorithm and order sets." Reported another way, "I can differentiate if patient is developing sepsis if they are not receiving chemotherapy or they are not responsive to neutropenic order set. If [the patient is] receiving chemotherapy, then I will consider the changes of vital signs and patient's status as chemo-related complications."

Theme 3: Knowing the “what” and “when.” Clinical nurses caring for hematologic/oncologic patients have developed an understanding of the chemotherapy regimen and for monitoring of any related complications, which assisted the differentiation between sepsis and other complications. “Knowing what you’re giving to your patient is very important, so you can differentiate if your patient is having sepsis or developing chemo-related complications, or [if your] patient may have allergic reaction from certain medications.” “I can differentiate if patient is developing chemo-related complications when the changes of signs and symptoms are acute, just like having anaphylactic shock or inflammation during 1–2 days of their chemo treatment.” “So, I look at the timeframe or days of receiving chemo. If patient is on chemo day 14, then started to show changes on vital signs and with complaints of feeling sick, then I can say my patient is developing sepsis.”

The aforementioned themes assisted in answering the primary research question “How do clinical nurses caring for hematologic/oncologic patients differentiate between early signs of sepsis and non-sepsis complications resulting from chemotherapy treatment?” and represented the perspective of these nurses and their understanding of accurately identifying sepsis, including their ability distinguishing symptoms of sepsis from symptoms related to chemotherapy and other treatments that mimicked symptoms of sepsis.

Summary

This chapter presented the study’s methodology of Colaizzi (1978). The use of Colaizzi’s method of data analysis allowed new knowledge to be uncovered and provided

understanding into the experience of nurses from selected various hematology/oncology units. Colaizzi outlined the method in seven specific steps, which were discussed in relation to this specific inquiry. The process of developing themes during the pilot study facilitated this researcher's ability to generate answers to the research question, which resulted in the researcher modifying the interview questions to focus on the experience of differentiating between sepsis and other complications of other cancer-treatment complications (such as chemotherapy) as well as any tools used to aid the differentiation process.

CHAPTER IV

ANALYSIS OF DATA

Description of the Sample

There is evidence that patients with cancer are at an increased risk of sepsis due to treatment-related complications (Thursky et al., 2018). Differentiation between oncologic patients with sepsis and those with non-sepsis neutropenic fever can be difficult (Kochanek et al., 2019; Thursky et al., 2018). In addition, severe sepsis occurs in an estimated 14% of oncologic patients; mortality from severe sepsis or septic shock in patients with cancer is as much as 30–40%, which is higher than in other populations (Shelton et al., 2016). However, there is limited data on how the clinical nurse identifies hematologic/oncologic patients at risk of sepsis while receiving cancer treatment. In order to understand the experiences and tools used by these nurses in hematologic/oncologic settings, a descriptive exploratory study was completed.

To better understand the experiences of clinical nurses caring for hematologic/oncologic patients as pertains to sepsis, a sample of nurses from three medical units were asked about their experiences caring for patients at risk of sepsis; this sample included nurses from inpatient leukemia, lymphoma/myeloma, and stem cell transplant units. Clinical nurses caring for hematologic/oncologic patients were also asked how they differentiate between sepsis and other treatment-related complications such as those stemming from chemotherapy. Knowledge developed from this study

expands our understanding of the experiences and tools used by clinical nurses when caring for hematologic/oncologic patients at risk of sepsis. In addition, results from this study have implications for the development of evidence-based educational modules for early assessment and management of sepsis and the potential for improved clinical outcomes for hematologic/oncologic patients with and without sepsis.

This chapter depicts the experiences of clinical nurses caring for hematologic/oncologic patients at risk of sepsis. Each participant chose the location of the interview site, and all selected sites were nearby to nursing stations. A typical participant's choice included a closed room (such as the staff conference room), where they remained readily available to provide patient care. The interview time was chosen by each participant based on their break time or at a designated time of their preference at the end of their shift. The semi-structured interview guide, described in the previous chapter, was used to elicit the data. The questions addressed the clinical nurses' most recent experience in caring for hematologic/oncologic patients at risk of sepsis and how they differentiate between signs of sepsis and signs of other treatment-related complications, such as those stemming from chemotherapy.

Purposive Sampling

The sample was obtained through purposive sampling. Participants were clinical nurses who worked in any of three adult inpatient units (specifically leukemia, lymphoma/myeloma, and stem cell transplant units), who were 18 years of age or older, who spoke English, who were able to provide informed consent, and who agreed to participate in an interview (see Appendix C). The nurses were current employees in a

large tertiary care hospital devoted to the treatment of cancer and located within the Texas Medical Center in Houston, Texas. A sample of 14 hematology/oncology nurses participated in the study. Their ages ranged from 23 to 48 years of age with a median age of 30.5 years (see Table 3). Men represented nearly a third ($n = 4$, 29%) of study participants. There was a balance between participating Asian and White clinical nurses (each with six [43%]), with fewer Latinx participants ($n = 2$, 14%). Participants in this study reported a total clinical nursing experience (including hematology/oncology nursing experience) ranging from 1 year to 20 years with a median of 4 years. Among the clinical nurses caring for hematologic/oncologic patients who participated in this research study, four nurses worked on the night shift.

Table 3

Demographic Results of 14 Hematology/Oncology Nurses who Participated in Study

Characteristics	Sample	Results
Age (years)	$N = 14$	Range: 23–48
		Mean = 33
		Median = 30.5
Sex	$N = 14$	Women ($n = 10$, 71%)
		Men ($n = 4$, 29%)
Race/Ethnicity	$N = 14$	Asian ($n = 6$, 43%)
		White ($n = 6$, 43%)
		Latinx ($n = 2$, 14%)

Table 3 (continued)

Demographic Results of 14 Hematology/Oncology Nurses who Participated in Study

Characteristics	Sample	Results
Nursing Experience (years)	<i>N</i> = 14	Range: 1–20
		Mean = 6
		Median = 4
Clinical Experience in Hematology/Oncology Unit (years)	<i>N</i> = 14	Range: 1–20
		Mean = 6
		Median = 4

Methods

All interviews were digitally recorded; interviews were then carefully transcribed and analyzed to ensure accuracy and comprehension of the participants' experience. During the interview, the researcher encouraged the participant to describe their most recent experience by using questions from the interview guide to gain entry into the informant's worldview.

After the participants shared their thoughts regarding their sepsis experience and saturation was reached, the use of Colaizzi's (1978) method led the analysis process, starting with a review of the verbatim transcription of each interview. Each transcript was meticulously read and reread to ensure the transcription's accuracy and to arrive at a comprehensive understanding of how each participant viewed their experience. When performing a comparative analysis across all interview transcripts, common words and

statements were highlighted to facilitate the extraction of significant statements and phrases, and identified commonalities were then grouped into emerging themes. Each of the two interview questions generated a set of themes.

Next, meanings were formulated for each significant statement. These meanings were then inserted into the interview transcriptions to ensure that meaning had not changed from its original intent. Following validation with the participants, themes were linked and described using the most representative phrases. The faculty advisor, who has substantial expertise in qualitative research methods, reviewed the themes and transcripts to ensure consistency with the study findings. Table 4 provides an example of the data analysis process used to arrive at themes. The formulated meanings of statements that support the themes are additionally presented.

Table 4

Overarching Theme and Four Subthemes of 14 Hematology/Oncology Nurses as They Nurse Through Recognition of Sepsis

Overarching Theme: Act Quickly and Decisively		
Subthemes	Significant Statements	Formulated Meanings
1. They Go Septic Fast	Oncology patients are very complicated. The chemotherapy can present signs of sepsis, the patient may be immune compromised, sometimes their condition mimics sepsis, they may have received a blood transfusion and are experiencing a reaction which is	The nurse must intervene quickly to interrupt sepsis and decrease mortality.

Table 4 (continued)

Overarching Theme and Four Subthemes of 14 Hematology/Oncology Nurses as They Nurse Through Recognition of Sepsis

Overarching Theme: Act Quickly and Decisively		
Subthemes	Significant Statements	Formulated Meanings
1. They Go Septic Fast (continued)	<p>similar to the changes in early signs of sepsis, need to be on top of it or monitor closely.</p> <p>They start to crash fast.</p> <p>As nurses, we intervene as quickly as possible to stop sepsis.</p> <p>We try to do it within one hour.</p>	
2. Changing Vital Signs	<p>When there is a change of vital signs, and patient is not receiving chemo, or I have suspicion.</p> <p>Get the vital signs, you look at the lab, and you look at the trend, and then, of course, when you had this kind of suspicious, or suspicion about the patient then you communicate with the team.</p> <p>If the vital signs are within the six hours post transfusion, and if patient showing hypertension, tachycardia, and then that I have complete a transfusion investigation form or If the reaction is not related to any medications, then I need to see other vital signs if sepsis is happening.</p>	<p>The nurse uses changes in vital signs to initiate actions to interrupt sepsis.</p>

Table 4 (continued)

Overarching Theme and Four Subthemes of 14 Hematology/Oncology Nurses as They Nurse Through Recognition of Sepsis

Overarching Theme: Act Quickly and Decisively		
Subthemes	Significant Statements	Formulated Meanings
3. Assessment to Differentiate (continued)	<p>Personal experience and scored instruments are used to assess for sepsis.</p> <p>I rely on my experience.</p> <p>I lay eyes on my patient and assess the patients based on the [shift] report.</p> <p>I use the quick SOFA [sepsis related organ failure] score for rapid assessment.</p> <p>I can differentiate if patient is developing sepsis if they are not receiving chemotherapy or they are not responsive to neutropenic order set.</p> <p>I can differentiate if patient is developing chemo-related complications when the changes of signs and symptoms are acute.</p>	<p>The nurse uses assessment to differentiate signs of sepsis from other treatment-related complications, such as non-septic complications stemming from chemotherapy.</p>
4. Teamwork	<p>Teamwork is needed, and so when we have had acute situation, it's almost you need all hands on deck. It takes a village.</p>	<p>The nurse relies on teamwork to act quickly and decisively to prevent sepsis.</p>

Table 4 (continued)

Overarching Theme and Four Subthemes of 14 Hematology/Oncology Nurses as They Nurse Through Recognition of Sepsis

Overarching Theme: Act Quickly and Decisively		
Subthemes	Significant Statements	Formulated Meanings
4. Teamwork	<p>The team, my colleagues, they were really, really helpful.</p> <p>They were just really amazing, like, a very good teamwork.</p> <p>Team is available to help especially we activate several orders when the patients become septic or if patient has fever or change in vital signs.</p>	<p>The nurse relies on teamwork to act quickly and decisively to prevent sepsis.</p>

Findings

In the current literature, sepsis and septic shock are major causes of mortality during chemotherapy-induced neutropenia commonly associated with malignancies; these conditions require rapid recognition and urgent treatment to prevent mortality (Kochanek et al., 2019). Additionally, oncologic patients may also experience neutropenic fever—a serious complication linked to chemotherapy (Abou Dagher et al., 2017; Thursky et al., 2018). Thus, there is an identified problem of the increased risk of sepsis in hematologic/oncologic patients. However, there is limited data on how the

clinical nurse identifies hematologic/oncologic patients at risk of sepsis while these patients receive cancer treatment.

Experiences of clinical nurses in recognizing hematologic/oncologic patients at risk of sepsis were categorized into themes, as depicted in Table 4. Four themes emerged from clinical nurses describing how they recognize hematologic/oncologic patients at risk of developing sepsis and how they differentiate between sepsis and other treatment-related complications. The themes developed as these clinical nurses described the acute change of their hematologic/oncologic patients with sepsis or developing sepsis, the critical use of vital signs, the use of steps and tools to assist in sepsis recognition in conjunction with their deductive thinking, and the importance of teamwork when caring for these particular patients.

Carper's work guided this research to understand clinical nurses' descriptions of their sepsis management experiences in hematologic/oncologic patients by integrating the fundamental four patterns of knowing: empirics, aesthetics, ethics, and personal knowing (1978). Carper's patterns of knowing demonstrated that clinical nurses are not limited to one kind of knowledge or one-way of knowing; this intuitively resonated with clinicians in their practice. Through empirical knowledge, clinical nurses caring for hematologic/oncologic patients described and explained their experiences using their senses, subjective impressions, and objective facts. While in aesthetic knowledge, clinical nurses encompassed a direct feeling of experiences and provided new understanding of phenomena (Carper, 1978).

Subthemes

They go septic fast

Clinical nurses caring for hematologic/-oncologic patients described how quickly sepsis can occur. One nurse said, “They start to crash really fast. With sepsis, things happen very quickly.” Another experienced nurse stated, “There are some patients who had been completely fine, you know, vital signs have been great, and then suddenly they just deteriorate very quickly, and they go septic really fast.”

Five clinical nurses caring for hematologic/oncologic patients shared that their patients’ status and vital signs changed quickly during their bedside assessment and these patients required immediate attention:

The time that the patient has an elevated temperature, and you identified it. I need to act quickly. Time is of essence or else, we ‘ll have to do CPR . . . A patient with having sepsis, or went to septic shock, you can see there’s a change in vital signs, the temperature, and change of level of consciousness. A change of a patient from like two hours later the patient becomes septic... so we need to be quick and notify everyone. I meant their status can change quickly so timing is critical.

Two clinical nurses described that their hematologic/oncologic patients showed subtle signs or no changes in vital signs for hours and days but can become ill very quickly. They described some challenges on recognition related to patients’ representation. A nurse who worked the day shift in stem cell transplant unit said,

I monitor vital signs and white count . . . and assess them from head to toe. These patients will have no issue, doing great for days then the next day, patient will say “I am not feeling well” then they crash quickly.

A nurse who worked night shift in lymphoma/myeloma floor stated, “A change of a patient from like two hours later the patient becomes septic . . . so we need to be quick and notify everyone. I meant their status can change quickly so timing is critical.”

Changing vital signs

The importance of vital signs was repeatedly stressed by clinical nurses caring for hematologic/oncologic patients. One nurse stated, “During initial assessment at the beginning of my shift, I noticed that patient’s blood pressure was slightly low, and their breathing pattern was elevated.” Hypotension was mentioned repeatedly as an indicator of sepsis. Another nurse described, “Change of vital signs such as fever, high heart rate, or hypotension.” And a third and fourth nurse stated:

Knowing the history of the patient and current status, vital signs changes, laboratory results and if they are receiving chemotherapy or other treatment including blood transfusion. When there is a change of vital signs and patient is not receiving chemo, or I have suspicion.

If the vital signs are within the 6 hours post transfusion, and if patient showing hypertension, tachycardia, and then that I have complete a transfusion investigation form or If the reaction is not related to any medications, then I need to see other vital signs if sepsis is happening.

Assessment to differentiate

An overall assessment is needed to differentiate between sepsis and other treatment complications. By using deductive thinking, nurses performed a broad assessment initially then they do focused assessment to ensure they gave attention to detail. Several tools were described to facilitate sepsis recognition such as hand-off shift report, patient's history and baseline, personal experience, scored measurement, algorithms, order sets and vital signs monitoring. Hand-off reporting was emphasized to get the big picture of patient status. Communication with a team involved with patient care appeared to be critical when patient status changed. This is demonstrated by three clinical nurses who worked in leukemia unit, one of whom stated, "Our hands-off report at the start of the shift in review of the patient's history provides a number of clues for my suspicion for sepsis." Following review of the shift report, personal experience, and scored instruments are used to assess for sepsis. Another nurse mentioned, "I rely on my experience ... I lay eyes on my patient and assess the patients based on the [shift] report ... I use the quick SOFA [sepsis related organ failure] score for rapid assessment."

Six nurses shared knowing a patient's baseline will help them recognize any change in the patient's status through hand-off reporting, along with their focused bedside assessment. A process of elimination is used to differentiate between sepsis and other treatment-related complications such as those stemming from chemotherapy. One nurse recalled, "Like knowing their baseline is, and what their status is now, why they were admitted, their diagnosis, any complaints or concerns." A second nurse said, "Have to do some extra digging after you get report, in my opinion, and then go and assess the

patient.” A third nurse stated, “We have algorithms ... since our patients are receiving different kinds of treatment.” A fourth nurse said, “Getting hand-off report, patient assessment, especially talking to patients and vitals help me recognize sepsis.” A fifth nurse described this process:

And that’s something that we have to ... when you look at a patient; you have to look at all aspects. Patient who had or is receiving chemotherapy, and I notice the trend coming down, I look at other aspects of what’s going on, like, whether the patient has had previous reactions or allergies to certain medications, what symptoms a person’s showing, so to rule out anything.

Teamwork

Clinical nurses highlighted teamwork when caring for hematologic/oncologic patients. Working together to provide the best possible patient care was commonly described by nurses. Nurses sought help from colleagues and reached out to different teams to not only provide safe patient care, but to also promote a positive and collegial environment. This teamwork was demonstrated by the statements of a nurse who worked the day shift in leukemia units, describing when two of her patients needed additional care and attention because of issues related to sepsis:

I feel like, coworkers that I work with, are, very good with helping, ... and teamwork is needed, and so when we have had acute situation, it’s almost you need all hands on deck. It takes a village. In the sense if I walked into the situation, and then I had two patients that I felt like they were going septic, I would definitely make it known to my fellow coworkers and even my charge

nurse to where we can get extra hands on the patients and make sure that everything's getting attended to.

Teamwork is important when you have other patients, and [it] will provide another set of hands when your patient is crashing or become unstable. They can notify and get the orders in and start the treatment sooner, while I stay at the bedside.

Clinical nurses verbalized the need to seek help when there is a lack of causal clues and described scenarios where the hematologic/oncologic patient became unstable. A night-shift nurse in the stem cell transplant unit, stated how comfortable they were to ask somebody for help, "It's not like I'm ever just alone and have no clue what to do. If, you know, if I don't know or if I'm unsure of what needs to be done next, I always ask somebody for help."

Eight clinical nurses validated that teamwork is necessary when caring for hematologic/- oncologic patients at risk of sepsis. Regardless of working different shifts and having varying years of nursing experience, clinical nurses caring for hematologic/oncologic patients voiced that teamwork facilitates sepsis recognition and timely intervention:

I'm so glad that my other colleagues are there to help because, to be honest, that, all that time until like 1:00am patient was transferred to ICU, I was literally there in the patient's room entire time and never left the room so my colleagues covered my patients while I'm stabilizing my patients... It is hard to do it alone.

The other thing also that helped me was my colleagues, they were really, really helpful. They were just really amazing, like, a very having a very good teamwork.

When caring for this patient, it helps with the teamwork, and you know, being familiar with the orders, and practicing, helping out – not just our own patients, but also other nurses' patients as well.... Especially at night.

Summary

This qualitative study aimed to describe the experiences of clinical nurses within an adult inpatient hematology/oncology unit and how they recognize hematologic/oncologic patients at risk of developing sepsis. Specifically, how do clinical nurses caring for hematologic/oncologic patients differentiate between early signs of sepsis and non-sepsis complications resulting from chemotherapy treatment? Through a series of 14 interviews to learn how clinical nurses caring for hematologic/oncologic patients experience the process of recognizing sepsis, the overall theme that clinical nurses are required to act quickly and decisively emerged. Four supporting subthemes emerged: the rapid evolution of sepsis, how quickly vital signs change, the use of assessment to differentiate sepsis from non-sepsis, and teamwork. Clearly, urgent critical thinking is required of clinical nurses caring for hematologic/oncologic patients to recognize, differentiate, and interrupt sepsis. The critical role that clinical nurses hold towards improving survival of hematologic/oncologic patients with and without sepsis cannot be understated.

CHAPTER V
SUMMARY OF THE STUDY

Summary

This qualitative study explored the experiences of clinical nurses who worked on an inpatient hematology/oncology, who were 18 years of age or older, who spoke English, and who worked on adult inpatient hematologic/oncologic units (namely leukemia, lymphoma/myeloma, and stem cell transplant units). Specifically, this study focused on how these nurses recognized sepsis and differentiated between early signs of sepsis and non-sepsis complications of chemotherapy treatment; the aim of this study was to gain knowledge outside the currently available literature in order to develop new knowledge to facilitate improved recognition and treatment of sepsis in this complex care setting. Through this chapter, a summary of the current study will be presented, along with a discussion of the meanings uncovered, and their relation to previous research. Conclusions from this study have implications for clinical nurses caring for hematologic/oncologic patients, tertiary and other hospitals devoted to cancer treatment, and other professionals involved in the care of hematologic/oncologic patients; additionally, there are implications for improvements in future care as evidence-based training modules can be formulated from this research and tested for best care practices.

This researcher sought to explore and better understand sepsis as it affects hematologic/oncologic patients, using Carper's patterns of knowing (1978). Data was collected in semi-structured, in-depth, individual interviews with 14 clinical nurses caring

for hematologic/oncologic patients. Following Colazzi's (1978) method of analysis, which included careful transcription and coding of emerging themes, data saturation was reached with a relatively small sample size. One overarching theme and four subthemes were identified.

The overarching theme of *Act Quickly and Decisively* emerged as the participants in the study overwhelmingly described their experiences, and the tools they used when caring for hematologic/oncologic patients at risk of developing sepsis. Four supporting themes emerged from these clinical nurses' descriptions of their most recent experiences: they go septic fast, changing vital signs, assessment to differentiate, and teamwork. Clinical nurses caring for hematologic/oncologic patients used various methods of clinical assessment to differentiate sepsis from non-sepsis treatment-related complications. Notably, these nurses expressed the importance of teamwork in order to act quickly and decisively to prevent sepsis and to feel comfortable in reaching out for help from colleagues.

Discussion of Findings

The importance of teamwork in enhancing the ability of clinical nurses caring for hematologic/oncologic patients to identify, differentiate, and treat sepsis had not been explored in detail by previously published research articles. Other findings of this study were more fully supported by available academic research.

Act Quickly and Decisively

The current literature elucidates that sepsis development can occur with or without warning signs; thus, early detection is a cornerstone of care in these complex

hematologic/oncologic patients. The management of hematologic/oncologic patients is dominated by the need for early recognition of sepsis in order to rapidly begin appropriate treatment (Abou Dagher et al., 2017; Cohen et al., 2015; Kochanek et al., 2019). However, it is common to have substantial delay between the onset of symptoms and the identification of sepsis (Keeley et al., 2017). Inexperienced clinical staff were found to have difficulty identifying sepsis because they failed to recognize fever as a symptom of sepsis, believing that fever is related to other cancer-related causes (Thursky et al., 2018). Existing evidence-based strategies depend on initiating goal-directed therapy within the first 6 hours of confirming a diagnosis of sepsis in hematologic/oncologic patients (Shelton et al., 2016). Sepsis care that is initiated by nurses has been identified as decreasing delay in care and improving rapid treatment (Thursky et al., 2018). Further, a nurse-driven sepsis screening protocol with order sets was shown to expedite care delivery to septic patients in a cancer hospital; within 60 minutes of nurses' suspecting sepsis, the vast majority of patients received the first administration of antibiotics (Mattison et al., 2016).

In the current study, clinical nurses caring for hematologic/oncologic patients shared their experience that they must be aware of the initial presenting features of sepsis that may occur during chemotherapy-induced neutropenia. Not only did these nurses experience the need to act quickly and decisively when caring for hematologic/oncologic patients in particular, but there was also a need to utilize a deductive thinking process to act quickly and decisively.

They go septic fast

A generalized theme in pertinent literature is that hematologic/oncologic patients are at enhanced risk of sepsis may become septic very quickly (Abou Dagher et al., 2017; Al Qadire, 2017; Kim & Park, 2018; Mattison et al., 2016; Olenick et al., 2017; Shelton et al., 2016). Because of the urgency of treatment once sepsis is suspected in hematologic/oncologic patients (e.g., for example the first dose of an antimicrobial should be administered within 60 minutes), one can speculate that the septic process may occur within hours of symptom onset (Shelton et al., 2016). Reducing the time to the first dose of antibiotic was shown to decrease sepsis-related mortality rates by more than 50% in hematologic/oncologic patients (Thursky et al., 2018). This need for rapid treatment is additionally supported by the current study, as many of the study participants stressed how rapidly a hematologic/oncologic patient could develop sepsis.

Changing vital signs

In the available literature, several alert criteria dependent on changing vital signs were identified as useful in the diagnosis of sepsis; these included SIRS, MET call, and qSOFA, which are commonly utilized to diagnose sepsis (Kim et al., 2018; Shelton et al., 2016; Thursky et al., 2018). The importance of changing vital signs was also supported by the current study, and study participants emphasized developing hypotension as an indicator of sepsis in hematologic/oncologic patients.

Assessment to differentiate

Findings from the current literature indicate that many hematologic/oncologic patients do not have traditional signs of sepsis and need to be assessed with multiple

criteria, including modified SIRS criteria (Shelton et al., 2016; Thursky et al., 2018). Management of sepsis relies on early recognition of sepsis in the context of other competing diagnoses (Cohen et al., 2015). In particular, hematologic/oncologic patients commonly experience neutropenic fever, which must be differentiated from sepsis (Abou Dagher et al., 2017; Thursky et al., 2018). Notably, experienced nurses were more likely to identify sepsis with and without fever in hematologic/oncologic patients than were other staff (Thursky et al., 2018).

In the current study, modified sepsis screening criteria were used for neutropenic cancer patients as well as for patients undergoing intensive chemotherapy or hematopoietic stem cell transplantation for hematologic malignancy. Assessment to differentiate was described by clinical nurses caring for hematologic/oncologic patients after the hand-off report, with study participants reflecting on the importance of transferring crucial information about these patients during staff transitions. Also, these nurses further stated the need to look at other aspects of clinical health in order to better differentiate sepsis from non-sepsis. A process of elimination was commonly used in hematologic/oncologic patients to differentiate between sepsis and other related-treatment complications such as those specific to chemotherapy.

Teamwork

Although interdisciplinary teams were emphasized in the treatment of sepsis, the specific role of nurses in this process was unclear (Harley et al., 2019). Furthermore, the concept of nursing teamwork was not well described in available literature, despite recognition that a lack of a formal handover procedure between nurses was thought to

contribute to the inability to identify sepsis in hematologic/oncologic patients (Thursky et al., 2018). However, care initiated by nursing teams was demonstrated as key to success in the management of sepsis (Mattison et al., 2016; Thursky et al., 2018). Moreover, policies focused on interdisciplinary approaches while facilitating nursing staff empowerment and establishing a nursing culture were linked to improved care in hematologic/oncologic patients at risk of sepsis and acknowledged nurses were “key drivers of the [interdisciplinary] program across the hospital,” (Thursky et al., 2018).

In the current study, it was clear that clinical nurses care for hematologic/oncologic patients in a complex environment where all patients face a substantial risk of death; the nurses who participated in this study expressed the value they placed on coworkers and shared their experience that they must rely on teamwork to provide patient care. Furthermore, they described experiencing many acute patient-related events that require timely intervention by multiple staff, because assistance may be needed to activate multiple orders simultaneously. The value participating subjects placed on the hand-off report further exemplifies the crucial need for teamwork in caring for these patients at risk of sepsis.

Conclusions

1. Clinical nurses who care for hematologic/oncologic patients at risk of sepsis describe that they must act quickly and decisively to interrupt sepsis and decrease mortality.
2. Clinical nurses who care for hematologic/oncologic patients at risk of sepsis use change in vital signs to initiate actions to interrupt sepsis.

3. Clinical nurses who care for hematologic/oncologic patients at risk of sepsis use assessment to differentiate between sepsis and other treatment-related complications such as those specific to chemotherapy.

Implications

The following implications evolved from the findings of this study, which were culled from the experiences of clinical nurses caring for hematologic/oncologic patients as well as nurses within different settings caring for patients at risk of sepsis:

1. Clinical nurses who care for hematologic/oncologic patients need to improve their early assessment and interventions through an evidence-based, educational training module for patients with or without sepsis.
2. Specific criteria regarding vital signs are needed to develop nursing alerts, which are necessary to improve bedside assessment in order to differentiate between sepsis and other treatment-related complications.
3. Availability of team members is essential when caring for hematologic/oncologic patients at risk of sepsis.

Recommendations for Future Studies

Even though the findings of the current qualitative study enhance understanding of the lived experience of clinical nurses caring for hematologic/oncologic patients regarding sepsis recognition, gaps remain. The current study explored only a few of the specific aspects of providing nursing care to hematologic/oncologic patients at risk of sepsis. Recommendations for future studies include:

1. Replication of the current study on a larger scale in different clinical settings and countries to see if similar findings exist in other populations.
2. The development of evidence-based educational modules to aid early assessment and intervention for sepsis in order to improve outcomes for hematologic/oncologic patients with and without sepsis.
3. Quantitative research studies to assess the knowledge of clinical nurses caring for hematologic/oncologic patients regarding early sepsis assessment and evidence-based educational intervention by using pre- and post-test analyses.
4. Qualitative research studies to explore the implications of teamwork in sepsis recognition.

Summary

Clinical nurses who participated in this study described the importance of rapid recognition and intervention when caring for hematologic/oncologic patients at risk of sepsis. They described that a change of these patient's vital signs facilitated sepsis recognition and drove communication with healthcare providers involved in patient care. Clinical nurses caring for hematologic/oncologic patients expressed the need of overall assessment to differentiate between sepsis and other treatment-related complications such as those resulting from chemotherapy. These nurses' experiences also emphasized teamwork when caring for patients at risk of sepsis and for those with active sepsis. Teamwork is a new knowledge that is not well reflected in the current literature of sepsis recognition in oncologic settings. Recommendations for nursing practice include the development of evidence-based educational training modules for the early assessment

and intervention of sepsis in hematologic/oncologic patients, including the need for differentiation alert tools, timely communication with healthcare providers, and the evaluation of teamwork—all these factors will consequently improve patient outcomes.

REFERENCES

- Abou Dagher, G., El Khuri, C., Chehadeh, A. A., Chami, A., Bachir, R., Zebian, D., & Bou Chebl, R. (2017). Are patients with cancer with sepsis and bacteraemia at a higher risk of mortality? A retrospective chart review of patients presenting to a tertiary care centre in Lebanon. *British Medical Journal Open*, 7(3), e013502. <https://doi.org/10.1136/bmjopen-2016-013502>
- Al Qadire, M. (2017). Oncology nurses' knowledge of guidelines for preventing catheter-related bloodstream infections. *American Journal of Infection Control*, 45(9), e95–e97. <https://doi.org/10.1016/j.ajic.2017.03.034>
- Carper, B. (1978). Fundamental patterns of knowing in nursing. *ANS: Advances in Nursing Science*, 1(1), 13–23. <https://doi.org/10.1097/00012272-197810000-00004>
- Cecconi, M., Evans, L., Levy, M., & Rhodes, A. (2018). Sepsis and septic shock. *Lancet*, 392(10141), 75–87. [https://doi.org/10.1016/s0140-6736\(18\)30696-2](https://doi.org/10.1016/s0140-6736(18)30696-2)
- Cohen, J., Vincent, J.-L., Adhikari, N. K. J., Machado, F. R., Angus, D. C., Calandra, T., Jaton, K., Giulieri, S., Delaloye, J., Opal, S., Tracey, K., van der Poll, T., & Pelfrene, E. (2015). Sepsis: a roadmap for future research. *The Lancet Infectious Diseases*, 15(5), 581–614. [https://doi.org/10.1016/s1473-3099\(15\)70112-x](https://doi.org/10.1016/s1473-3099(15)70112-x)
- Colaizzi, P. F. (1978). Psychological research as the phenomenologist view it. In R. S. Valle & M. King (Eds.), *Existential phenomenological alternatives for psychology* (pp. 48–71). Oxford University Press.

- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches*. Sage.
- Dantes, R. B., & Epstein, L. (2018, Sep 28). Combatting sepsis: A public health perspective. *Clinical Infectious Diseases*, 67(8), 1300–1302.
<https://doi.org/10.1093/cid/ciy342>
- Fleischmann, C., Scherag, A., Adhikari, N. K., Hartog, C. S., Tsaganos, T., Schlattmann, P., Angus, D. C., Reinhart, K., & International Forum of Acute Care, T. (2016). Assessment of global incidence and mortality of hospital-treated sepsis. Current estimates and limitations. *American Journal of Respiratory and Critical Care Medicine*, 193(3), 259–272. <https://doi.org/10.1164/rccm.201504-0781OC>
- Hajj, J., Blaine, N., Salavaci, J., & Jacoby, D. (2018). The "Centrality of Sepsis": A review on incidence, mortality, and cost of care. *Healthcare (Basel)*, 6(3).
<https://doi.org/10.3390/healthcare6030090>
- Harley, A., Johnston, A. N. B., Denny, K. J., Keijzers, G., Crilly, J., & Massey, D. (2019). Emergency nurses' knowledge and understanding of their role in recognising and responding to patients with sepsis: A qualitative study. *International Emergency Nursing*, 43, 106–112.
<https://doi.org/10.1016/j.ienj.2019.01.005>
- Keeley, A., Hine, P., & Nsutebu, E. (2017). The recognition and management of sepsis and septic shock: a guide for non-intensivists. *Postgraduate Medical Journal*, 93(1104), 626–634. <https://doi.org/10.1136/postgradmedj-2016-134519>

Kelley, T., Docherty, S., & Brandon, D. (2013). Information needed to support knowing the patient. *ANS: Advances in Nursing Science*, 36(4), 351–363.

<https://doi.org/10.1097/ANS.0000000000000006>

Kim, H. I., & Park, S. (2018). Sepsis: Early recognition and optimized treatment. *Tuberculosis and Respiratory Disease (Seoul)*, 82(1), 6–14.

<https://doi.org/10.4046/trd.2018.0041>

Kleinpell, R., & Schorr, C. A. (2014). Targeting sepsis as a performance improvement metric: Role of the nurse. *AACN Advanced Critical Care*, 25(2), 179–186.

<https://doi.org/10.1097/NCI.0000000000000015>

Kochanek, M., Schalk, E., von Bergwelt-Baildon, M., Beutel, G., Buchheidt, D., Hentrich, M., Henze, L., Kiehl, M., Liebrechts, T., von Lilienfeld-Toal, M., Classen, A., Mellinshoff, S., Penack, O., Piepel, C., & Boll, B. (2019). Management of sepsis in neutropenic cancer patients: 2018 guidelines from the Infectious Diseases Working Party (AGIHO) and Intensive Care Working Party (iCHOP) of the German Society of Hematology and Medical Oncology (DGHO). *Annals of Hematology*, 98(5), 1051–1069. <https://doi.org/10.1007/s00277-019-03622-0>

Lincoln, A. J., & Guba, E. (1985). *Naturalistic inquiry*. Sage.

Mantzorou, M., & Mastrogiannis, D. (2011). The value and significance of knowing the patient for professional practice, according to Carper's patterns of knowing.

Health Science Journal, 5(1), 251–261 . <http://www.hsj.gr/medicine/the-value->

[and-significance-of-knowing-the-patient-for-professional-practice-according-to-the-carper-patterns-of-knowing.php?aid=3363](#)

Mattison, G., Bilney, M., Haji-Michael, P., & Cooksley, T. (2016). A nurse-led protocol improves the time to first dose intravenous antibiotics in septic patients post chemotherapy. *Support Care Cancer*, 24(12), 5001–5005.

<https://doi.org/10.1007/s00520-016-3362-4>

Munhall, P. (1994). *Revisioning phenomenology: Nursing and health science*. NLN Press.

Nucera, G., Esposito, A., Tagliani, N., Baticos, C. J., & Marino, P. (2018). Physicians' and nurses' knowledge and attitudes in management of sepsis: An Italian study. *Journal of Health and Social Sciences*, 3(1), 13–26.

<https://doi.org/10.19204/2018/phys2>

Olenick, E. M., Zimbro, K. S., D'Lima, G. M., Ver Schneider, P., & Jones, D. (2017). Predicting sepsis risk using the "Sniffer" algorithm in the electronic medical record. *Journal of Nursing Care Quality*, 32(1), 25–31.

<https://doi.org/10.1097/NCQ.000000000000198>

Polit, D., & Beck, C. (2017). *Nursing research: Principles and methods*. Lippincott.

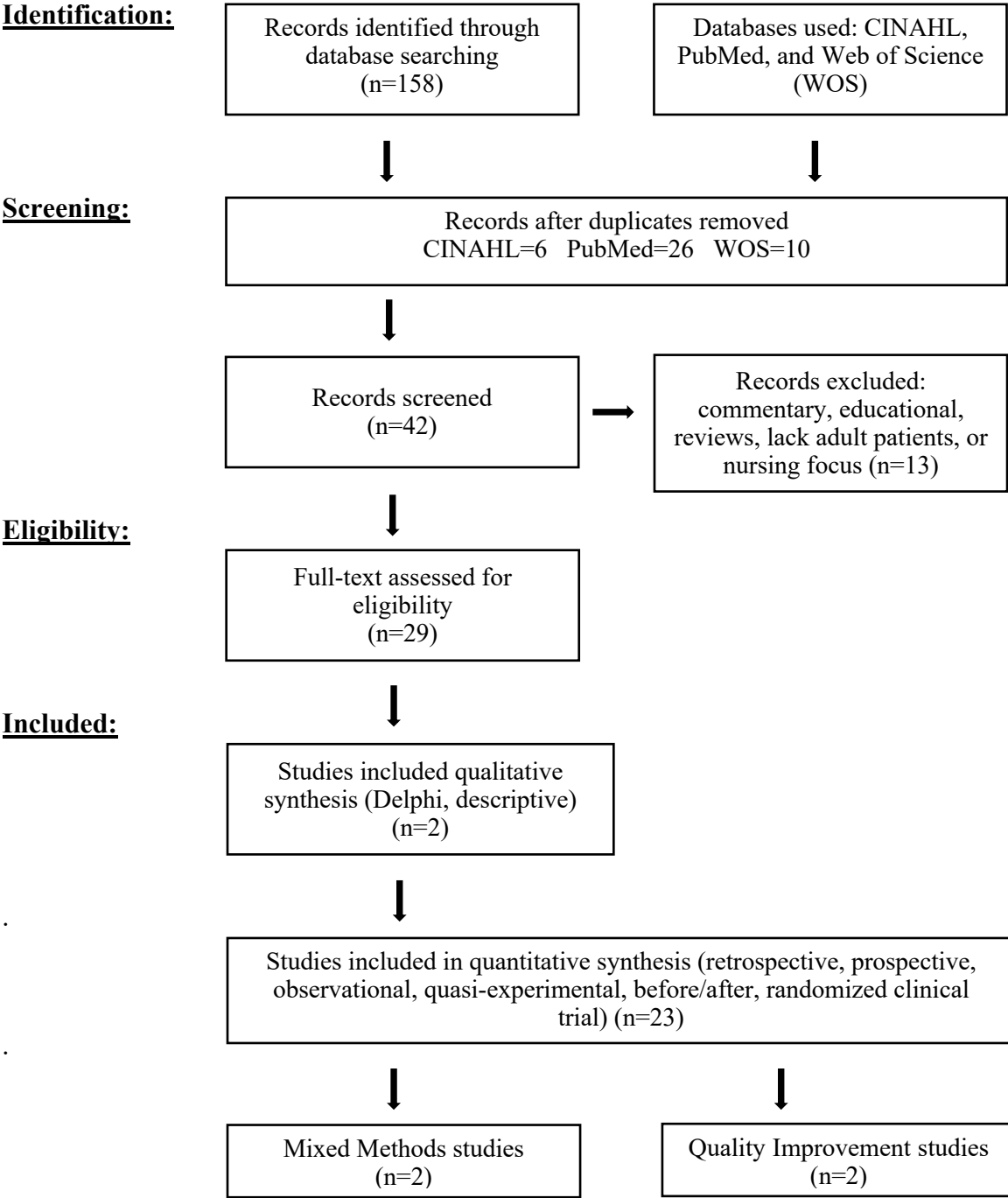
Poutsiaka, D. D., Porto, M., Perry, W., Hudcova, J., Tybor, D., Hadley, S., Doron, S., Reich, J. A., Snyderman, D., & Nasraway, S. (2017). Comparison of the Sepsis-2 and Sepsis-3 definitions of sepsis and their ability to predict mortality in a prospective intensive care unit cohort. *Open Forum Infectious Diseases*, 4(Suppl_1), S602–S602. <https://doi.org/doi:10.1093/ofid/ofx163.1579>

- Rhee, C., Jones, T. M., Hamad, Y., Pande, A., Varon, J., O'Brien, C., Anderson, D. J., Warren, D. K., Dantes, R. B., Epstein, L., Klompas, M., Centers for Disease Control and Prevention Prevention Epicenters Program. (2019). Prevalence, underlying causes, and preventability of sepsis-associated mortality in US acute care hospitals. *Journal of the American Medical Association Network Open*, 2(2), e187571. <https://doi.org/10.1001/jamanetworkopen.2018.7571>
- Saito, H., Kilpatrick, C., & Pittet, D. (2018). The 2018 World Health Organization SAVE LIVES: Clean Your Hands Campaign targets sepsis in health care. *Intensive Care Medicine*, 44(4), 499–501. <https://doi.org/10.1007/s00134-018-5097-9>
- Shelton, B. K., Stanik-Hutt, J., Kane, J., & Jones, R. J. (2016). Implementing the Surviving Sepsis Campaign in an ambulatory clinic for patients with hematologic malignancies. *Clinical Journal of Oncology Nursing*, 20(3), 281–288. <https://doi.org/10.1188/16.CJON.281-288>
- Singer, M., Deutschman, C. S., Seymour, C. W., Shankar-Hari, M., Annane, D., Bauer, M., Bellomo, R., Bernard, G. R., Chiche, J. D., Coopersmith, C. M., Hotchkiss, R. S., Levy, M. M., Marshall, J. C., Martin, G. S., Opal, S. M., Rubenfeld, G. D., van der Poll, T., Vincent, J. L., & Angus, D. C. (2016). The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *Journal of the American Medical Association*, 315(8), 801–810. <https://doi.org/10.1001/jama.2016.0287>
- Thursky, K., Lingaratnam, S., Jayarajan, J., Haeusler, G. M., Teh, B., Tew, M., Venn, G., Hiong, A., Brown, C., Leung, V., Worth, L. J., Dalziel, K., & Slavin, M. A.

- (2018). Implementation of a whole of hospital sepsis clinical pathway in a cancer hospital: impact on sepsis management, outcomes and costs. *British Medical Journal Open Quality*, 7(3). <https://doi.org/10.1136/bmjopen-2018-000355>
- Vaismoradi, M., Jones, J., Turunen, H., & Snelgrove, S. (2016). Theme development in qualitative content analysis and thematic analysis. *Journal of Nursing Education and Practice*, 6(5). <https://doi.org/10.5430/jnep.v6n5p100>
- Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing and Health Sciences*, 15(3), 398–405. <https://doi.org/10.1111/nhs.12048>
- Vincent, J. L. (2017). Update on surgical sepsis syndrome. *British Journal of Surgery*, 104(2), e34–e40. <https://doi.org/10.1002/bjs.10451>
- Walkey, A. J., Lagu, T., & Lindenauer, P. K. (2015). Trends in sepsis and infection sources in the United States. A population-based study. *Annals of the American Thoracic Society*, 12(2), 216–220. <https://doi.org/10.1513/AnnalsATS.201411-498BC>

APPENDIX A
PRISMA Flow Diagram

Literature Review Following PRISMA: Flow Diagram



APPENDIX B

Informed Consent

Informed Consent

Informed Consent/Authorization for Participation In Research

Sponsor Protocol # (if applicable):

Project Title: Exploring Hematology/Oncology Nurses' Recognition of Patients at Risk of Sepsis

IRB Protocol #: XXXXXXXX

Participant's Name: _____ **Subject ID Number:** _____

Study Chair: XXXXXXXXX

The goal of this research study is to learn about hematology nurses' experiences of recognizing patients at risk for sepsis. In this study, risk for sepsis is defined as the potential to develop a life-threatening infection due to a low blood cell count.

If you agree to take part in this study, you will have a one-on-one interview with the study staff about your experience as a nurse at MD Anderson recognizing patients at risk for sepsis. You will be asked questions about your experience assessing hematology patients for sepsis, recognizing risk, and what resources you have used for this purpose.

The interview will be recorded using audio digital recordings and should take about 1 hour. The interview will also be transcribed (typed up so a paper or digital copy of the interview is available).

Information such as your age, race, and years of experience will also be collected from you at the start of the interview.

Information learned as part of your participation in this study will not be used against you during your performance evaluation nor will it be reported to your supervisor.

However, you may be encouraged by a member of the study team to call the Institutional Compliance Office's anonymous hotline or report any patient safety issues in the Safety Intelligence system.

Your information, audio recordings, and typed audio recordings (collectively known as your study data) will be stored in an encrypted password protected electronic file on a secure institutional network/drive at MD Anderson that will only be accessed

by the study chair and the study staff. Your study data will be stored for five years or until the study ends, whichever comes last.

To protect your confidentiality, the researchers will use a code instead of your name when the interview is typed. However, your voice may identify you. Your study data will be used for study purposes only and may be used for future Institutional Review Board (IRB)-approved studies. The IRB is a committee of doctors, researchers, and community members. The IRB is responsible for protecting study participants and making sure all research is safe and ethical. If you withdraw from the study before completing the interview, the data you provided before withdrawal will still be used for analysis.

Your study participation will be over when the last interview is conducted with the last person.

Up to 30 participants will be enrolled in this study. All will take part at MD Anderson.

You should discuss the risks of interviews with the study chair. The known risks are listed in this form, but they will vary from person to person. Some questions may make you feel upset or uncomfortable. You may refuse to answer any question. If you have concerns after completing the interview, you are encouraged to contact the study chair, XXXX at 713-792-XXXX.

If you become distressed when participating in interviews and you feel unable to complete the interview, the interview will be stopped. You may be referred to the Employee Assistance Program.

You may also contact the Chair of MD Anderson's IRB at 713-745-6636 with questions about study-related injuries. By signing this consent form, you are not giving up any of your legal rights.

There will be no cost to you for taking part in this study.

There are no plans to compensate you for any patents or discoveries that may result from your participation in this research.

You will receive no compensation for taking part in this

study. **Authorization for Use and Disclosure of**

Information

- A. During the course of this study, MD Anderson may be collecting and using your information. For legal, ethical, research, and safety-related reasons, the research team may share your information with:
 - The OHRP
 - The IRB (IRB - a committee that reviews research studies) and officials of MD Anderson

- Texas Woman's University
- Study monitors and auditors who verify the accuracy of the information
- Individuals who put all the study information together in report form

B. Signing this consent is optional but you cannot take part in this study if you do not agree and sign.

C. MD Anderson will keep your information confidential when possible.

Participant Signature: _____

Date: _____

PRINTED NAME OF PARTICIPANT

APPENDIX C

Inclusion Criteria for Participants

Inclusion Criteria for Participants

Instructions: Participants will be screened according to the inclusion criteria in order to participate in the study. Please mark *yes or no* to the following questions. Each participant must score “YES” to all criteria questions. Those who do not meet the criteria will not be eligible to participate in the study.

Criteria	Yes	No
1. Is 18 years or older?		
2. Speaks English?		
3. Work in any of the Adult Inpatient Hematology/Oncology Inpatient Units (Leukemia, Lymphoma/Myeloma, and Stem Cell Transplant)		
4. Agree to provide informed consent and participate in an interview?		

“Yes” to all questions makes the participant eligible to participate in the study.

“No” to any question makes the participant ineligible to participate in the study.

APPENDIX D

Demographic Questionnaire

Demographic Information

Demographic information

Date: _____

Age: (In years, indicate date of birth)	
Gender:	
Race: (White/Black/Asian/Pacific Islander/Other)	
Ethnicity: (Hispanic/Non-Hispanic)	
Years of Nursing Service:	
Years of Experience at MD Anderson:	
Years of Experience in Hematology/Oncology:	

Signature of Participant and Date: _____

Signature of Researcher and Date: _____

Accession Code #: _____

APPENDIX E

Interview Guide

Interview Guide

You are being asked to participate in this interview because you are a full-time clinical nurse on a hematology/oncology unit. The purpose of this interview is to explore your experience caring for hematologic/oncologic patients at risk for sepsis and complications with similar symptom profiles. The interview will be audio recorded and will last approximately one hour. You may stop the interview at any time and refuse to answer any question with which you are uncomfortable. While not anticipated, if you experience distress during the course of the interview you will be referred to the Employee Assistance Program for follow-up. A professional transcriptionist will transcribe the audio recording and then the primary researcher will verify the transcriptions for accuracy. If you identify yourself or anyone else by name these will be removed during transcription. You will remain on study until all interviews have been completed. The audio recording file will be kept in a confidential manner since your voice is considered an identifier under HIPAA.

Interview Questions

- A. Tell me about your most recent experience in caring for hematologic/oncologic patients at risk for sepsis
- B. How do you differentiate between signs of sepsis and other treatment-related complications such as cytokine release syndrome, engraftment syndrome, or transfusion reaction?

APPENDIX F

Study Checklist

Study Checklist

2019-0118 ENROLLMENT CHECKLIST

3/1/20

CONSENT
<input type="checkbox"/> Confirm study eligibility
<input type="checkbox"/> Provide subject with copy of consent to read
<input type="checkbox"/> Paper consent (add your signature and date -- same day -- below the subjects' signature)
<input type="checkbox"/> Complete demographics (Appendix D) -- add ACC # and date to each demographics page
<input type="checkbox"/> Interview subject -- record and label with Date and Study Number
<input type="checkbox"/> Label all pages of consent if not barcoded (name, DOB, date)
<input type="checkbox"/> Print copy of signed consent for subject if they want one (offer a blank copy -- keep copies with you)
AFTER CONSENT VISIT
<input type="checkbox"/> Assign Subject Number: <i>see instructions SUBJECT REGISTRATION IN CORE</i>
<input type="checkbox"/> Register in CORE ***DO THIS SAME DAY*** ACC # _____ www.oncologyresearch.org
<input type="checkbox"/> Add patient to Accrual Log in Box
<input type="checkbox"/> Complete STUDY CONSENT note (use template) and print.
1) Sign and date note
2) Save original in study binder
3) Save copy in Box
<input type="checkbox"/> Store audio securely per protocol - Also save electronically in Box & label; add date and ACC number
<input type="checkbox"/> Notify Transcriptionist ready for transcription
<input type="checkbox"/> Paper Consents
1) Scan and save signed and dated consent in Box folder
2) Save original in a binder in a locked cabinet
<input type="checkbox"/> Transcribe per protocol
AFTER LAST INTERVIEW
<input type="checkbox"/> Take subject off study in CORE and on accrual log (use date the last interview was completed)
<input type="checkbox"/> Add off study date to list on Note to File