EMERGENCY NURSES' EXPERIENCES OF THE IMPLEMENTATION OF EARLY GOAL-DIRECTED FLUID RESUSCITATION THERAPY IN THE MANAGEMENT OF SEPSIS

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Statement of Authentication

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare I have not submitted this material, either in full or in part, for a degree at this or any other institution.

Signed: 

Date: 19/12/2019

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Glossary of Terms

The following terms have been used throughout this thesis.

Bolus: Rapid administration of medication. In this study, the term is used in relation to rapid administration of intravenous fluids, usually over 30 minutes.

Early goal-directed fluid resuscitation: This is a more specific form of fluid resuscitation used to treat severe sepsis. This approach involves timely aggressive management and monitoring of hemodynamics in patients.

Emergency nurse: A nurse who provides care to patients attending an emergency department in a hospital, who require prompt medical attention.

Fluid resuscitation: The practice of replenishing lost bodily fluids, generally through intravenous therapy, in emergency circumstances. Fluid resuscitation is primarily targeted at restoring intravascular blood volume.

Sepsis: An extreme reaction to an infection, where the body's immune reaction to an infection damages its own tissues and organs.

Transcription Glossary

Participants' narratives are quoted directly from the interview transcription records, which are presented in italics. Pseudonyms and are used throughout the thesis. Along with pseudonyms, years of experience of participants working as emergency nurses are indicated as (EDRN-0). Although many participants have several years of additional experience as registered nurses in other clinical areas, the number of years of experience in emergency nursing is used in Chapter 4: Findings, because it is particularly relevant to this study.

( ) Parentheses are used in the narratives to indicate words or phrases inserted into the narratives to clarify meaning.

[ ] Square brackets are used in the narratives to expand abbreviations used by participants or provide additional information

… An ellipsis in the narratives indicates where the text from the narrative has been omitted without altering the meaning or expression.

Abstract

Background: Severe sepsis is a life-threatening condition caused by the body's overwhelming immune response to an infection. It can lead to organ failure and death if immediate treatment, such as intravenous (IV) fluids and antibiotics, are not commenced within the first hour. While a large number of studies have analysed the administration of first-dose antibiotics, the time-critical initiation of IV fluids has not always been given its deserved priority. To date, studies have not explored factors that inhibit timely IV fluid administration and the experience of emergency nurses relating to initiating early goal-directed fluid resuscitation (EGDFR).

Purpose: To explore the experiences of emergency nurses related to initiating EGDFR in the care of patients with sepsis

Methods: A qualitative exploratory approach, encompassing face-to-face semi-structured interviews, was used for data collection. Ten registered nurses were interviewed, who were currently practicing in emergency settings across New South Wales (NSW). Braun and Clarke's (2006) thematic analysis framework guided the data analysis.

Findings: Three themes and associated subthemes were identified. The three themes are (i) Nurses' perceptions and experiences regarding IV fluid administration in sepsis, (ii) Challenges related to initiating IV fluid, and (iii) Strategies to improve compliance with EGDFR. Participants described various factors they found that inhibited timely initiation of IV fluids, including busyness of the department, delayed diagnosis of sepsis, complex patient presentations and limited scope of nurses' practice to initiate IV fluids.

Conclusion: It is anticipated that the outcomes of this research will provide an impetus for re-evaluating current protocol guidelines to provide a positive impact on the scope of emergency nurse practice for initiating EGDFR.

Chapter 1 – Introduction

This chapter provides an introduction into the initiation of Early Goal-Directed Fluid Resuscitation, defines sepsis, and discusses the current state of compliance and the gap in practice.

Sepsis is one of the leading causes of death in healthcare settings worldwide. Severe sepsis is defined as "life-threatening organ dysfunction", where the body mounts an abnormal and overwhelming immune response to infection. Septic shock is defined as "a subset of sepsis with profound organ dysfunction which substantially increases the risk of death" (Singer et al., 2016, p. 801). Sepsis is considered to be present if the patient has any risk factors, or signs and symptoms of infection, and if more than one of the following clinical findings is present:

a) A body temperature >38.5º Celsius or <35.5º Celsius
b) Heart rate >120 beats/minute or <50 beats/minute
c) Respiratory rate >25 breaths/minute or <10 breaths/minute
d) Systolic Blood pressure <100 mmHg
e) SpO2 <95%
f) Altered level of consciousness or new-onset confusion (Burrell, McLaws, Fullick, Sullivan, & Sindhusake, 2016).

1.1 Significance of the Problem

Globally, nearly 30 million people succumb to sepsis every year with an attributable mortality of 15%–50%. This equates to one death from sepsis every 3.5 seconds. Of those who survive sepsis, there is significant morbidity and related complications (Global Sepsis Alliance, 2019).

According to the Australian Sepsis Network (2019), more than 5000 Australians die of sepsis each year, three times the number of deaths due to road traffic accidents. Sepsis has a mortality rate that is greater than prostate, breast and colorectal cancer, and HIV/AIDS combined. Sepsis is a serious illness that progresses to septic shock when physiological compensation fails, which then leads to multiple organ dysfunction. In Australia, it has an attributable mortality rate of 38% in adult patients (Fullerton et al., 2017).

Sepsis is a medical emergency that requires both early recognition and prompt treatment. Despite the time-critical nature of sepsis treatment, awareness of sepsis and targeted management for sepsis is limited. The "Surviving Sepsis" campaign has been instrumental in the implementation of the "Sepsis Pathway" (see Appendix 7.1), which provides guidelines for sepsis management in emergency departments. These guidelines are referred to as "Early Goal-Directed Therapy" (EGDT). One of the critical elements of EGDT is Early Goal-Directed Fluid Resuscitation (EGDFR). The Sepsis Pathway recommends that a minimum of 30 ml/kg of IV fluid (known as EGDFR) should be commenced immediately upon recognising a patient with sepsis and/or hypotension to prevent septic shock. Compliance by clinicians, including emergency nurses and doctors, with the Sepsis Pathway is, however, poor (Levy, Evans, & Rhodes, 2018).

In response to the ongoing non-compliance issues, in the past decade, the NSW Ministry of Health (2012), has implemented new models of care in emergency departments across NSW to improve patient outcomes and to facilitate the timely management of patients. One of its successful innovation strategies has been the introduction of the role of a Clinical Initiatives Nurse (CIN).[1] Underpinning this current model of care are the core principles for an "ideal patient journey" in the emergency department, as illustrated in Figure 1.1.

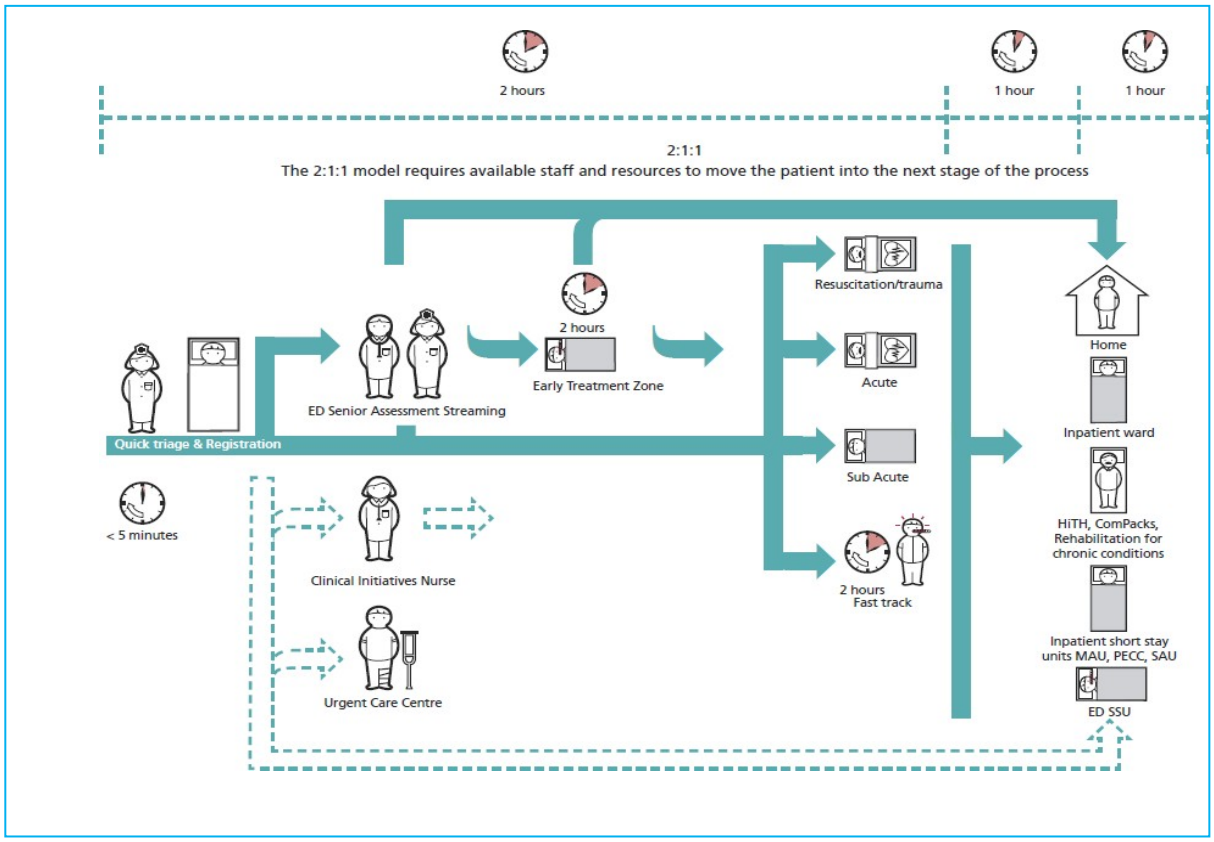

Figure 1.1 The Ideal Patient Journey, with streaming to models of care within Emergency Department (ED) and external to ED (NSW Ministry of Health, 2012)

[1] A Clinical Initiatives Nurse is a registered Nurse who has appropriate emergency nursing experience across a broad range of ED roles. In 2002, the aims for the CIN role included: "providing education and advice to patients and their carers whilst waiting to be seen; facilitating the reassessment/re-triage processes in the ED waiting room; assessing patients and constructing a plan of care for each patient they have seen in consultation/discussion with a senior emergency medical officer" (NSW Department of Health, 2010).

1.2 Background

The Surviving Sepsis Guidelines 2012, known as the Sepsis Pathway, is used in hospitals both within Australia and worldwide (Dhooria & Agarwal, 2015). Collectively, these evidence-based measures aim to reverse lactic acidosis from poorly perfused organs by optimising the haemodynamic status of patients. These interventions, referred to as EGDT, are proven to be effective in reducing morbidity and mortality. The protocol recommends the use of the "care bundle" – a group of treatments based on best available evidence which, when implemented together, have been proven to achieve greater benefit than when implemented as individual therapies (Gyawali, Ramakrishna, & Dhamoon, 2019). This set of evidence-based interventions, when implemented collectively, significantly improve patient outcomes with a reduction in mortality rate by 16% (Ward & Levy, 2017). This care bundle has two sets of interventions: a 3-hour and 6-hour bundle. The 3-hour bundle includes immediately (i) obtaining lactate level, (ii) obtaining peripheral blood cultures, (iii) administering empirical antibiotics within the first hour of presentation, and (iv) administering 30 ml/kg IV fluids to correct hypotension or lactate >4 mmol/L immediately. The 6-hour bundle includes administering vasopressors if hypotension is unresolved (Kleinpell, Aitken, & Schorr, 2013; Schell-Chaple, & Lee, 2014).

The Surviving Sepsis Guidelines were updated in June 2018, with the most important change being combining the 3-hour and 6-hour bundles into a single 1-hour bundle. This recommendation is targeted at initiating sepsis management immediately on presentation to the emergency department. According to the revised guidelines, obtaining blood for lactate and cultures, administering 30 ml/kg IV fluids bolus and empirical antibiotics, and commencing vasopressors in life-threatening situations should all be initiated immediately from the time of presentation. The guidelines acknowledge the urgent and crucial nature of EGDFR in

stabilising sepsis-induced tissue hypoperfusion. They recommend that initial fluid resuscitation with 30 ml/kg of crystalloid fluids should begin immediately on recognising a patient with sepsis and/or hypotension, and elevated lactate (Levy et al., 2018). The NSW Clinical Excellence Commission (CEC) has modified the Sepsis Pathway in accordance with this revision. However, the Sepsis Pathway recommends initiating with 20 ml/kg initial IV fluid bolus. If the patient does not respond to the initial IV fluid bolus, the pathway recommends repeating the 20 ml/kg IV fluid bolus (CEC, 2019). Despite the compelling evidence of its effectiveness, however, timely implementation of the Sepsis Pathway remains inadequate (Burney et al., 2012).

A retrospective chart review of IV fluid resuscitation of sepsis patients in two emergency departments in London, between 2014 and 2015, showed that patients with sepsis presenting with hypotension were treated with <30 ml/kg fluids; the average time to initiation of IV fluids was between 60 minutes and 77 minutes, well outside the 30-minute window recommended in the hospital's protocol (Leung, Aguanno, & Van Aarsen, 2017). An observational study on compliance with the sepsis bundle, conducted in 2012 in Scotland, found that IV-fluid administration and obtaining blood cultures had the poorest compliance rate, compared to other interventions such as IV antibiotic administration. Of the patients, 47% did not receive adequate IV fluids within the first three hours (Bentley, Henderson, Thakore, Donald, & Wang, 2016).

Despite evidence of the need for early management in sepsis, variations in the recommended time of intervention is evident in the literature, ranging from 30 minutes to six hours. This variation is likely due to the ambiguity in the time for initiating IV fluids in the sepsis guidelines (Bentley et al., 2016; Leung et al., 2017).

A recent survey of the knowledge level related to sepsis management of 123 emergency nurses in a tertiary-level hospital in the United States of America (USA) by Roberts et al. (2017) reported that nurses perceived IV-fluid administration was a factor inhibiting antibiotic administration. The sepsis guidelines recommend that both IV fluids and antibiotics should be administered concomitantly. The survey results, however, suggested that nurses were less aware of this recommendation. This lack of knowledge could be an inhibiting factor in initiating EGDFR because more emphasis is placed on antibiotic administration.

Several studies have analysed factors that inhibit implementing the sepsis protocol, with particular attention to administering first-dose antibiotics (Burney et al., 2012; Roberts et al., 2017; Tipler, Pamplin, Mysliwiec, Anderson, & Mount, 2013). However, there is limited data investigating, specifically, the individual element of fluid resuscitation. This study will contribute to identifying strategies that could improve compliance with timely IV fluid resuscitation and the Sepsis Pathway.

The researcher works as a registered nurse in an emergency department and has experienced several inconsistencies and delays in initiating EGDT, particularly initiating IV fluids. In addition, variable patient outcomes were identified based on the time of initiating treatment. On further exploring this area of concern through a preliminary literature review, the researcher identified several inconsistencies and controversies in IV-fluid management, despite several studies proving the effectiveness of EGDFR. This led to the conception of this study, which aimed to explore, in depth, the experiences of emergency nurses initiating EGDFR for patients presenting with sepsis and to identify the factors that inhibit this practice, using a qualitative approach. The purpose and objectives of this study have been designed to address the existing gap in the literature and to develop recommendations for practice change.

1.3 Purpose and Objectives

1.3.1 Purpose

The purpose of this study is to explore the experiences of emergency nurses related to initiating EGDFR for patients identified with sepsis.

1.3.2 Objectives

(i) To explore potential inhibiting factors perceived by emergency nurses, regarding timely initiation of EGDFR

(ii) To develop recommendations that support the timeliness of fluid resuscitation for patients with sepsis

1.4 Summary

This introductory chapter has defined sepsis, discussed the significance of its clinical management, and identified it as an important issue in both the global and Australian context. The guidelines for managing sepsis provided by the Sepsis Pathway 2012 were introduced and, despite the proven effectiveness of the Sepsis Pathway in reducing mortality, compliance with the pathway was found to be poor. Although much research has been conducted regarding compliance with the Sepsis Pathway, with a particular focus on the administration of IV antibiotics, there has been little research relating to lack of compliance with EGDFR. Therefore, this study's focus was to identify potential inhibiting factors that prevent the timely initiation of EGDFR and provide strategies to improve its timeliness. An integrative literature review was conducted to explore the existing body of knowledge related to EGDFR comprehensively, and to inform this study.

Chapter 2 – Literature Review

This chapter provides an integrative review of the literature related to Early Goal-Directed Therapy, specifically addressing the component of Early Goal-Directed Fluid Resuscitation in patients presenting with sepsis in the emergency department.

Early recognition and management of sepsis has become increasingly emphasised, because sepsis is identified as a time-critical illness. The name of the protocol used in managing sepsis – Early Goal-Directed Therapy (EGDT) – highlights the importance of the expected timing of interventions. By examining what is already known about current practice, an understanding of compliance with the timeliness of sepsis management can be established. The literature review was conducted using an integrative method to identify relevant literature pertaining to EGDFR; it explores various factors impacting the timely initiation of EGDFR. The studies retrieved and selected for further analysis are presented in the Synthesis Table (see Appendix 7.2). From this literature review, six key areas around the timely initiation of EGDT emerged.

2.1 Search Strategy

A systematic integrative literature review was conducted, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009) (Figure 2.1, p. 10). The researcher used the following electronic databases: CINAHL, Medline, Education Research Complete, EBSCO Host, Google Scholar, PubMed, Scopus and CiAP. The initial search was conducted in November 2017. The primary

outcome of interest was evidence relating to nurse-initiated fluid resuscitation. The secondary outcomes considered were mortality, length of hospital stay, multi-organ failure and use of vasopressors. The keywords searched in the titles and abstracts of journal articles included sepsis, septicaemia, septic shock, SIRS, Systemic Inflammatory Response, fluid therapy, intravenous fluid, fluid resuscitation, barriers and emergency. Reference lists of the identified studies were also searched for any further references. The search was limited to full-text primary articles published in English from 2001 to 2019, because EGDFR was first introduced in the Early Goal-Directed Therapy Collaborative Group's (2001) study conducted by Rivers et al. Studies reporting paediatric patients were excluded, due to differing sepsis management guidelines used for this population. At this stage, the scope of the study and time constraints limited the possibility of conducting a scoping literature review to extract all available literature, including grey literature at this stage.

2.2 Screening and Review

All retrieved articles were subject to individual review of the title and abstract. The articles that satisfied the inclusion criteria were then reviewed by one or more supervisors.

The inclusion criteria for the articles were as follows:

1. Both quantitative and qualitative articles, case studies, literature reviews, systematic analysis reports, chart reviews, guidelines and protocols, relating to fluid management in sepsis in the emergency department.
2. Articles published in the English language, from 2001 to 2019.

The exclusion criteria for the articles were as follows:

1. Studies involving paediatrics, due to differing sepsis management guidelines in this population.

2. Articles addressing fluid management in general, not referring to sepsis.
3. Articles analysing sepsis management in critical care areas other than the emergency department.

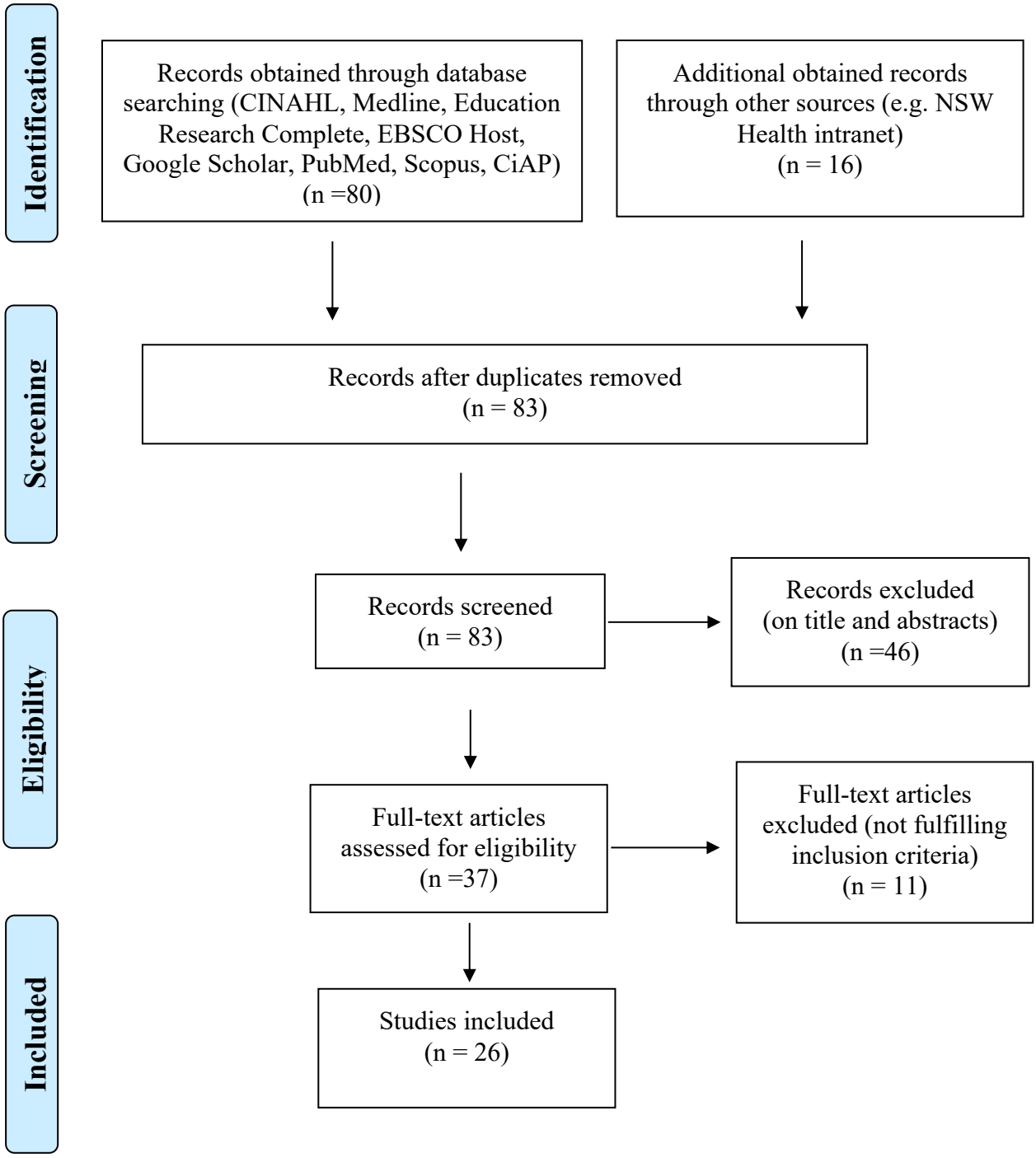

Figure 2.1 PRISMA-style flowchart of studies included (Moher et al., 2009)

2.3 Search Results

The search results revealed several articles discussing the overall management of sepsis using the Sepsis Pathway; however, there was limited literature discussing EGDFR as an individual element. While none of the articles comprehensively addressed inhibiting factors in initiating EGDFR, the 26 articles included broadly address the area initiating IV fluids in patients with sepsis. None of the studies identified used a qualitative approach in identifying potential inhibiting factors to initiating EGDFR. Data were analysed using a summative content analysis method. This approach enables the qualitative exploration of themes, providing basic insight into the phenomenon of interest (Hsieh & Shannon, 2005). The results are summarised and discussed below.

2.3.1 Evidence of effectiveness of EGDT

The landmark study by the Early Goal-Directed Therapy Collaborative Group (2001), a randomised controlled trial conducted in the USA that implemented a set of interventions, including early fluid resuscitation and administration of oxygen, antibiotics and vasopressors, demonstrated a significant improvement in mortality by 16% in patients receiving EGDT in sepsis. In response, the Surviving Sepsis Guidelines recommended aggressive fluid therapy during the initial six “golden hours” of a patient’s presentation with sepsis (Madhusudan, Tirupakuzhi Vijayaraghavan, & Cove, 2014).

A recent prospective observation study conducted in the USA showed that commencing fluid resuscitation in patients with severe sepsis or septic shock within 30 minutes of diagnosing sepsis is associated with a statistically significant improvement in hospital mortality (6.2% reduction), a 36.7% reduction in intensive care unit (ICU) admission and a 12% reduction in length of stay in ICU, compared to those receiving fluids in 180 minutes (Leisman et al., 2016).

2.3.2 Poor compliance with the sepsis care bundle

Despite evidence of the effectiveness of the interventions recommended in the sepsis care bundle, several studies have found that compliance with the EGDFR is poor. A retrospective analysis conducted in two French emergency departments showed that only 19% of patients were treated in accordance with the sepsis care bundle. The poor compliance rate was largely due to the low volume of IV-fluid loading, with an average of 11 ml/kg, compared to the recommended 30 ml/kg (Le Conte et al., 2017). An observational study on adherence to the sepsis bundle, in a tertiary emergency unit in Scotland, found that administering IV fluid and obtaining blood culture had the poorest compliance rate. In fact, 47% of patients did not receive adequate IV fluids within the first three hours (Bentley et al., 2016).

A large-scale observational cohort study in New York, USA, showed that the average time to initiating IV fluids in patients with severe sepsis was 105 minutes (Leisman et al., 2017). A retrospective chart review of fluid resuscitation of sepsis patients in two emergency departments in London, United Kingdom (UK), showed that patients presenting with sepsis and hypotension were treated with <30 ml/kg crystalloid fluid, with the average time to initiation of IV fluid therapy being 60.50 minutes, well outside the recommended time frame (Leung et al., 2017).

2.3.3 Controversies about fluid management in sepsis

Three large multicentred studies – the Protocolised Care for Early Septic Shock (ProCESS) in the USA, the Australasian Resuscitation in Sepsis Evaluation (ARISE) in Australasia, and the Protocolised Management in Sepsis (ProMISe) in the UK, conducted between 2014 and 2015, have all challenged the benefit of EGDT for sepsis, showing no difference in mortality.

However, a recent systematic review and meta-analysis, comparing normal interventions with EGDT, confirms the findings of the Early Goal-Directed Therapy Collaborative Group (2001). The analysis included randomised controlled trials conducted after the Early Goal-Directed Therapy Collaborative Group's (2001) study; this showed that EGDT reduces mortality by 14%, confirming the effectiveness of early intervention (Chelkeba, Ahmadi, Abdollahi, Najai, & Mojtahedzadeh, 2015).

This conflicting evidence has sparked several researchers to explore these major studies in detail. A review showed that, in all three studies (ARISE Investigators et al., 2014; ProCESS Investigators et al., 2014; ProMISE Trial Investigators et al., 2015), both the experimental and control arm cohorts received early antibiotics and aggressive fluid therapy, compared to patients in the Early Goal-Directed Therapy Collaborative Group's (2001) study, when early intervention was not common practice (Dhooria & Agarwal, 2015).

A systematic review and meta-analysis of 10 randomised controlled trials conducted in 2014 with approximately 3700 patients, comparing EGDT with usual care or other strategies, showed no difference in mortality between the EGDT and control groups. Sub-group analysis showed a lower mortality in the EGDT group compared to usual care, which varies largely between hospitals, and a higher mortality rate compared to the early lactate-clearance group (Zhang, Zhu, Han, & Fu, 2015). One of the prime interventions used in the early lactate-clearance study, however, was volume resuscitation using crystalloid or colloid fluids within six hours of presentation to the emergency department. This is consistent with the current emphasis on EGDFR for treating hypoperfusion (Nguyen et al., 2004).

Controversies exist among researchers, regarding the choice of fluid type for fluid resuscitation and the recommended volume and duration of IV-fluid therapy. Despite conflicting evidence, these studies (Finfer, 2014; Hariyanto, Yahya, Widiastuti, Wibowo, & Tampubolon, 2017) support the central role that IV fluids and antibiotics play in managing sepsis effectively. A systematic review, analysing the effect of different resuscitative fluids in patients with sepsis or septic shock, showed a reduction in acute kidney injury with balanced crystalloids, such as Hartmann's, or colloids, such as albumin, compared to solutions such as Gelofusine. The study reported no significant difference in kidney injury between balanced crystalloids and colloids, compared to 0.9% sodium chloride (Rochwerg et al., 2014). The common choice of initial resuscitation fluid is currently sodium chloride (0.9%) because it is comparatively isotonic and is a predominant interstitial fluid with a pH of 5. However, large volumes of rapid fluid resuscitation with sodium chloride could lead to dilutional hypochloremic metabolic acidosis. Therefore, some clinicians advocate using Hartmann's instead of 0.9% sodium chloride (Finfer, 2014). The Sepsis Pathway recommends using crystalloids such as 0.9% sodium chloride, not balanced crystalloids such as Hartmann's. These controversies could impact on the medical officer's clinical decision-making and be a potential inhibiting factor in implementing timely fluid resuscitation.

A large retrospective study conducted in 2013, using data from 500 hospitals in the USA, which analysed the association between the volume of fluid administered and patient outcome, showed that low-volume fluid resuscitation (1–5 litres of IV fluids administered on Day 1 of patient admission) had a small yet significant decrease in mortality, compared to the patients who received high-volume fluids, who had an increase in mortality rate of 2.3% for each additional litre above 5 litres. While this study recommended the judicious administration of IV fluids, it

does not contradict the early initiation of IV fluids (Marik, Linde-Zwirble, Bittner, Sahatjian, & Hansell, 2017).

2.3.4 Inconsistencies in recommendations for fluid initiation

There were several inconsistencies identified in the literature regarding the recommendations for time of initiating IV fluids, otherwise known as EGDFR. The Surviving Sepsis Guidelines of 2012 recommended initiating IV fluids within 15 minutes of patient presentation in the emergency department. The recent Surviving Sepsis guidelines, modified in June 2018, recommend initiating 30 ml/kg of crystalloid fluids immediately from "time zero" or "time of presentation". The guidelines, however, acknowledge the lack of control studies supporting ongoing fluid therapy and, therefore, recommend a careful reassessment of fluid status following initial resuscitation (Levy et al., 2018).

Despite the recommendations of the Surviving Sepsis Guidelines, some studies (Bentley et al., 2016; Leung et al., 2017) indicate varying recommendations for time of initiating IV fluids, ranging from 30 minutes to up to six hours. In addition, the volume of IV fluids to be administered ranges from 500 ml to 1000 ml, based on local hospital guidelines. For instance, the NSW Sepsis Pathway recommends an initial bolus of 20 ml/kg to be administered immediately and, if the patient does not respond, a repeat bolus of 20 ml/kg, despite the international Surviving Sepsis Guidelines recommending an initial fluid bolus of 30 ml/kg (Clinical Excellence Guidelines, 2019). The variations found in local policies may impact clinical practice, resulting in non-adherence to the Surviving Sepsis Guidelines 2018.

2.3.5 Factors impacting early goal-directed fluid resuscitation

Early recognition of sepsis has remained a challenge, due to the complexity of presentations causing delays in initiating EGDFR. A retrospective analysis undertaken in three emergency departments showed that only 17% of patients presenting to emergency departments were diagnosed with severe sepsis at triage (Cronshaw, Daniels, Bleetman, Joynes, & Sheils, 2010).

In their study, Bentley et al. (2016) analysed the overall compliance of the Sepsis 6 bundle in an emergency department in a major tertiary hospital in Scotland; this showed that, despite increasing evidence of the effectiveness of early intervention, compliance with EGDFR was poor. Time to first junior or senior doctor assessment, and presence of pyrexia, delayed the time to initiating EGDFR by 25 minutes. Other factors identified were needing better staff–patient ratios and establishing venous access.

A recent international study conducted by Alexandrou et al. (2018), assessing more than 40,000 peripheral IV cannulas in 51 countries, showed that, globally, the proportion of nurses inserting IV cannulas is much lower in Australia and New Zealand than in all other countries and regions. This issue could be further compounded by difficult IV access, particularly in acutely ill patients, where the implications can include a delay in diagnosis, initiation of treatment and escalation for insertion of central venous access (Sou et al., 2017).

A survey by Roberts et al. (2017), investigating the knowledge levels of emergency and critical care nurses in a tertiary level hospital in the USA, reported that nurses perceived IV-fluid administration as a factor inhibiting antibiotic administration. The Surviving Sepsis Guidelines recommend that both IV fluids and antibiotics be administered concomitantly. However, the

nurses were less aware of this recommendation. This lack of knowledge could be an inhibiting factor in initiating EGDFR, because much emphasis is placed on antibiotic administration.

A retrospective quasi-experimental study in a tertiary emergency department in the USA, between 2013 and 2014, analysed the association between implementing triage-initiated sepsis alert, triggering a number of care bundles, and time administering antibiotics and IV fluids. As a result of the triage-initiated sepsis alert system, the researchers found a significant improvement in both antibiotics and IV-fluid administration times. However, time to antibiotic administration was half that of time to IV-fluid administration (Hayden et al., 2016). Similar findings were found in a study analysing the effectiveness of Sepsis Kills Program across 97 emergency departments in NSW, Australia, from 2009 to 2011. About 52% of patients received the first dose of IV antibiotics within the first 60 minutes. Only about 27% of patients, however, received the second litre of IV fluids within 60 minutes. The time of initiating first IV fluids was not measured in this study (Burrell et al., 2016). This implies that much more emphasis is placed on antibiotic administration compared to IV fluids, despite both being part of critical recommendations.

A prospective multi-centre randomised trial, across 51 centres in Australia and New Zealand, compared EGDT for early septic shock patients with conventional therapy. The results show that patients receiving EGDT received more IV fluids during the first six hours of presentation compared to the patients in the conventional group (ARISE Investigators et al., 2014). A small prospective observational Brazilian study on 40 patients with septic shock, conducted by Lopes Cunha and Ajeje Lobo (2015) following the ARISE study, reported harmful effects of positive fluid balance due to injudicious use of IV fluids in patients post-septic shock, including death. The study, however, supports the therapeutic guidelines for early-phase fluid resuscitation.

Similar findings are reported by Pittard, Huang, McLean, and Orde (2017) in their retrospective analysis of an Australian cohort of patients from a Sydney-based hospital.

2.3.6 Possible strategies to improve compliance

The evidence suggests that there are possible strategies to improve compliance with the Sepsis Pathway. Two emergency departments in California, USA, trialled a nurse-initiated sepsis management protocol between 2011 and 2012, with some elements of the sepsis care bundle such as serum lactate measurement and blood culture prior to antibiotic administration, to be implemented independently by nurses. Results showed a nearly 100% compliance rate with those elements following the nurse-initiated protocol implementation. However, a suboptimal level of compliance continued with some elements of the protocol, such as IV antibiotic and fluid administration. These interventions require the collaboration of two or more healthcare professionals, such as doctors and nurses. A collaborative multi-disciplinary approach would, therefore, be the likely path to improving the timeliness of interventions (Bruce, Maiden, Fedullo, & Son Chae, 2015).

An Australian pre- and post-test study of implementing the Sepsis Pathway in 2016 showed a significant time reduction to receiving a second litre of IV fluids (758-minute reduction) as a result of implementing the Surviving Sepsis Guidelines. However, data relating to the initial initiation of IV fluids is unavailable from this study. This evidence suggests compliance with the sepsis guidelines may lead to an improvement in timely IV fluid administration (Romero, Fry, & Roche, 2017).

A study analysing the initiation of antibiotics and commencing the second litre of fluids within one-hour post-implementation of Sepsis Kills Program, in 97 emergency departments in NSW

hospitals between 2009 and 2011, found that the number of patients receiving a second litre of IV fluids within one hour increased from 10.6% to 27.5%. These results indicate the success of a protocolled approach in managing sepsis patients (Burrell et al., 2016).

Lactate measurements have been part of the sepsis care bundle's recommendations. Lactate levels are used as an indication of tissue hypoperfusion, in particular, and facilitates early clinical intervention. A pre- and post-test comparative study in the USA in 2014, regarding the impact of introducing point-of-care lactate testing, showed that IV-fluid administration occurred 16 minutes faster after the introduction of bedside lactate testing. An additional factor identified in the study was the easy availability of IV fluids by the patients' bedside, which could have further contributed to the time improvement (Singer, Taylor, LeBlanc, Williams, & Thode Jr, 2014).

2.4 Gaps in the Literature

A systematic integrative approach was used to identify quantitative and qualitative studies relating to EGDFR. The search results, however, have shown that only limited literature has focused specifically on factors inhibiting the time of initiating EGDFR. While the researcher has used an integrative approach, involving University librarians and a health librarian, in determining a comprehensive search strategy, no qualitative research was identified in the literature review.

Studies have shown the existing gap in practice with evidence of delays in initiating EGDFR. Many of the studies have been conducted retrospectively accounting for cumulative fluid administered. Limited evidence was identified that focused specifically on EGDFR initiated within the first few hours of sepsis patients presenting. In addition, studies exploring emergency

nurses' perceptions and experiences with EGDFR have also not been identified. Knowledge is, therefore, lacking about why delays occur in initiating EGDFR. This study aims to address these gaps in the existing literature, using a qualitative approach to provide an in-depth understanding of any inhibiting factors. The following research questions were informed by the literature review; they are designed to focus on addressing this gap in the literature and current clinical practice.

2.5 Research Questions

1. What are the experiences of emergency nurses related to initiating EGDFR in the care of patients with sepsis?
2. What are the potential inhibiting factors perceived by emergency nurses, regarding timely initiation of intravenous fluid therapy?
3. What recommendations can emergency nurses provide to support the timely initiation of fluid resuscitation for patients with sepsis?

2.6 Summary

This literature review has explored the existing evidence related to EGDFR. Studies have shown the effectiveness of EGDFR; however, they have confirmed that compliance with the timely initiation of EGDFR is poor. Despite the lack of experiential aspects of emergency nurses related to initiating EGDFR, some studies have demonstrated strategies that have proved effective in improving compliance. This literature review has also discussed some controversies that exist in the literature about EGDFR. Consistent with the poor compliance rate, there is a paucity of literature that specifically analyses inhibiting factors for initiating EGDFR. Overall, the published literature regarding EGDFR is largely quantitative. It is also notable that, although the studies have used valid and reliable instruments to collect data, they have small sample sizes

(see Appendix 7.2) and have an overreliance on survey data and retrospective chart reviews. The literature review has shown that there is a knowledge gap regarding the inhibiting factors related to EGDFR.

Chapter 3 – Methodology

This chapter describes the methodological approach used in this study to explore the experiences of emergency nurses regarding factors that inhibit initiating EGDFR.

3.1 Study Design

This study used a qualitative exploratory approach for its design. Qualitative research is "an approach to scientific enquiry that allows researchers to explore human experiences in personal and social contexts and gain greater understanding of the factors influencing these experiences" (Gelling, 2015, p. 43). This approach relies on direct human experiences, focussing on the "why" rather than the "what" of social phenomena. A qualitative mode of inquiry is the most suitable approach to explore a participant's experience and is commonly used for analysing an issue in nursing practice (Schneider & Whitehead, 2013, p. 141). A qualitative approach is particularly useful in research implementation, where the primary intention is to explore the barriers and facilitators for adopting evidence-based practices. Knowledge gained through such exploratory studies can drive policy changes to improve how evidence-based practice is implemented (Palinkas et al., 2015). This study aims to identify factors that inhibit the initiation of EGDFR; a qualitative exploratory approach was selected because it best suits the aim of this study.

3.2 Ethical Considerations

A significant part of conducting research is addressing any ethical issues prior to commencing a study, to protect participants. The researcher undertook an online study unit of Ethics in Health Research to obtain a deeper understanding of the ethical considerations when conducting health research. In an effort to protect all research participants from potential harm, the study was carefully composed in accordance with the Western Sydney University's (2016) Research Code of Practice and the National Statement on Ethical Conduct in Human Research, outlined by the National Health and Medical Research Council (2018). The study only commenced once approval had been granted from the University Human Research Ethics Committee (approval number: H13030). These measures ensure that potential risks and benefits associated with the research are not subject to the bias or interests of the researcher conducting the study (Borbasi & Jackson, 2012).

In an effort to rigorously conduct the research, the following ethical principles were considered and adhered to.

3.2.1 Informed consent

All participants provided verbal and written informed consent prior to data collection. A participant information sheet (see Appendix 7.4), outlining the details of the study, was provided to the participants before obtaining written consent. The information in both the consent form (see Appendix 7.5) and participant information sheet was written in plain English language, following the guidelines provided by the University. Statements were included that explicitly explained the option to withdraw from the study at any stage without the need to provide any reason, and that the participants would not incur any negative consequences as a result. Completing and returning the consent form indicated the participant's willingness to

volunteer to participate in the semi-structured interview. Information regarding possible avenues of dissemination of the findings, such as thesis, publication and conference presentations, was provided to all participants at the recruitment stage, prior to obtaining written consent (National Statement on Ethical Conduct in Human Research, 2018).

3.2.2 Beneficence

Beneficence is doing no harm to participants and maximising all possible benefits (Polit & Beck, 2017). The researcher's in-depth, semi-structured interviews involved exploring participants' experiences in managing patients with sepsis. Care was taken to maintain anonymity to prevent the risk of exposure and embarrassment from disclosing information such as emotional expressions and practice errors disclosed during the interview (Ingham-Broomfield, 2016). Information regarding available support services, such as counselling, was explicitly stated in the participant information sheet provided to the participants prior to commencing the study. Care was taken by the researcher during data collection to ensure early identification of any signs of participant distress, including verbal expression; visible evidence of being upset, such as shaking and or being tearful; incoherent speech; poor eye contact; and indications of flashback (National Statement on Ethical Conduct in Human Research, 2018; Draucker, Martsolf, & Poole, 2009). No participants expressed or displayed any concerns or signs of psychological distress during this study.

3.2.3 Privacy and confidentiality

All hard-copy documents generated from data collection were stored using the Research Data Management Plan through the University portal, in accordance with the 2019 University Research Data Management Policy. All data were de-identified by removing any identifying details, such as names and places of work, and all participants were given pseudonyms prior to

storing the documents. The computer files were stored in a password-protected computer, using cloud storage systems accessible only by the researcher. The demographic data (see Appendix 7.6) collected was stored in accordance with University privacy laws (Western Sydney University, 2019).

3.3 Sampling

A purposive sampling method was used in this study. Purposive sampling is a non-random sampling method, which is used to ensure that participants with significant perspectives regarding the phenomenon (in this case, emergency nurses' experiences of factors inhibiting timely initiation of EGDFR in patients with sepsis) are present in the sample (Robinson, 2014). To facilitate identifying information-rich participants, two purposive sampling strategies were used, namely, maximum variation technique and snowball sampling. Using the maximum variation technique involved using participants with differing levels of experience in emergency nursing; participants working across different health settings, such as metropolitan, tertiary trauma centre, rural and non-tertiary hospitals, were identified for the purpose of documenting diverse and unique variations, which have emerged as a result of different practice settings and background levels of expertise. This technique helps to identify "the common patterns that cut across variations". It is designed to capture elements of both similarities and differences, because a depth of understanding requires knowledge of both similarities and differences (Palinkas et al., 2015, p.534).

Snowball sampling, also known as chain sampling, was used to identify participants. This is a recruitment strategy where a current participant recommends the study to other participants, which leads to "referral networks" (Handcock & Gile, 2011). This method yielded study participants through referrals made among people knowing others who have a particular interest

in the area of research. For instance, the first participant in this study introduced the study to her network of nurses, who had interest in improving sepsis management, resulting in the participation of an emergency nurse with the role of "Sepsis Champion" for the department. This "referral network" also led to finding participants with a higher level of expertise in emergency nursing, including those with roles such as acting nurse unit manager and acting clinical nurse educator (Robinson, 2014).

Participants were identified from emergency departments across NSW. These settings differed from each other, in relation to the hospitals' size and location, local health districts and local policies. The participants ranged in age and level of experience, gender and education qualifications in emergency nursing (see Table 3.1, p. 29). Snowball sampling allows for in-depth exploration and enriches the data with the perceptions of emergency nurses who have varying levels of expertise from different practice settings. This enables comparing and contrasting the similarities and differences in their experience with initiating EGDFR (Polit & Beck, 2017, p. 493).

3.3.1 Participant recruitment

A participant recruitment flyer was developed (see Appendix 7.3) and posted on social media such as Facebook, Twitter and the blog sites of professional organisations, namely, the Australian College of Emergency Nursing NEO (Nursing Engagement Online) site, Nurses Uncut, NSW Nurses and Midwife's Association, All Nurses, Nursing Voices, Emergency Care Institute NSW, College of Emergency Nursing Australia, Nurses Café, and Daily Nurse. The participants who were recruited through social media then assisted in further participant recruitment through snowball sampling.

Seven emergency nurses made contact via email, expressing a willingness to participate in the study. Five potential participants referred by other participants made contact via telephone, expressing an interest in participating. Participant information sheets (see Appendix 7.4) and consent forms (see Appendix 7.5) were emailed to 10 potential participants who met the study's inclusion criteria. The participant information sheet detailed information regarding the study, including how the collected data would be managed, and how privacy and confidentiality of participant details would be maintained, and provided contact information in the event of a participant requiring professional counselling services, as well as the procedure for grievances.

Interview times were scheduled based on the availability of both the participant and researcher, for those who expressed a willingness to participate after reading the information sheet and consent form. The consent forms were collected immediately prior to commencing the interview to minimise inconvenience for the participants in printing, scanning and emailing documents.

3.4 Study Population

The study population consisted of registered nurses who are employed in emergency departments in NSW. The inclusion and exclusion criteria for this study were as follows:

3.4.1 Inclusion criteria

The study population included registered nurses currently practicing full- or part-time in an emergency department in either metropolitan or rural NSW, and who provide informed consent to participate.

3.4.2 Exclusion criteria

The study excluded registered nurses who are currently not practicing in an emergency department in metropolitan or rural NSW, or those who are on a casual contract with only some allocations to work as a registered nurse in the emergency department, as well as those unwilling to consent to participate in the study.

3.4.3 Study participants

Twelve registered nurses expressed an interest in participating in the study. Two were excluded based on the exclusion criteria, because they were not currently practicing in an emergency setting. Ten participants were thus interviewed in this study. The duration of the interviews ranged from 35 to 55minutes.

The participants were registered nurses, who were currently practicing across seven emergency departments in NSW. Some participants held additional roles and responsibilities, including acting clinical nurse educator, part-time nurse unit manager and sepsis champion. The level of experience of the nurses who participated in the study ranged from a Year 2 registered nurse to a Clinical Initiatives Nurse trained registered nurse with 48 years of nursing experience. Five of the participants had no additional qualifications relevant to emergency nursing, while four had post-graduate certificates in nursing and one had a graduate diploma in emergency nursing.

The participants ranged from 25 to 68 years in age. Eight participants were female and two were male, which is representative of the gender distribution in the Australian nursing workforce, where 88.9% of nurses are female (Schwartz, 2019). The health settings of the participants include major trauma hospitals in the Greater Western Sydney region, non-trauma non-teaching metropolitan hospitals in the Greater Western Sydney and Sydney regions, a

major trauma hospital from the North Sydney and South Western Sydney regions, a major private hospital, and a non-trauma country hospital in the Illawarra Health region

Table. 3.1 Demographic details of participants

Participant	Age	Gender	Job title	Total number of beds in ED	Total number of years of nursing experience	Total number of years of emergency nursing experience	Post-graduate qualification in emergency nursing
1	68	Female	RN, Acting Clinical Nurse Educator	24	48	25	Graduate Diploma
2	30	Male	RN	55	6	5	Nil
3	47	Female	RN, Acting Clinical Nurse Educator	16	23	23	Post-Graduate Certificate
4	35	Female	RN	23	10	5	Nil
5	47	Female	RN, Acting Nurse Unit Manager	55	22	10	Nil
6	31	Female	RN	56	10	8	Post-Graduate Certificate
7	36	Female	RN	30	12	12	Nil
8	39	Female	RN	56	1	1	Nil
9	25	Male	RN, Acting Clinical Nurse Educator	22	4	3.5	Post-Graduate Certificate
10	41	Female	RN, Sepsis Champion	56	19	18	Post-Graduate Certificate

Notes: ED = emergency department; RN = registered nurse

3.5 Study Setting

All interviews were conducted in neutral settings, such as public libraries, meeting rooms and cafés, which were mutually agreeable and convenient for both the participants and researcher. The settings used in this study were university libraries, public library, hospital library, hospital cafeteria and hospital meeting rooms in NSW (see Table 3.2). The researcher ensured that the interview locations were as quiet as possible with minimal distractions.

Table 3.2 Study settings used in this study

Setting number	Settings	Number of times used
1	University library	2
2	Public library	1
3	Hospital library	1
4	Hospital cafeteria	2
5	Hospital meeting rooms	4

3.6 Semi-Structured Interviews

The semi-structured interview is a data collection strategy, which is designed to elicit subjective responses from a person regarding a specific phenomenon or situation that they have experienced. This strategy is used where there is sufficient objective knowledge regarding the phenomenon, but subjective data is lacking (McIntosh & Morse, 2015). Although some studies have analysed factors inhibiting EGDR in sepsis (Burney et al., 2012; Roberts et al., 2017; Tipler et al., 2013), research using an exploratory approach that investigates the subjective experiences of nurses in implementing EGDFR is scarce. The semi-structured interview approach was, therefore, considered to be the most appropriate data collection method for this

study. Interviews enable information to be obtained and provide the opportunity for the participants to elaborate on their experiences as they wish. This provides a holistic and comprehensive understanding of their experiences related to initiating EGDFR in sepsis patients (Polit & Beck, 2017, p. 510).

Prior to their interviews, participants were provided with all relevant information regarding the study and written consent forms. Participants were then provided the opportunity to ask questions or clarify any information before commencing the interview. The 12 questions in the interview guide (see Appendix 7.7) were used in every interview, with some additional specific questions based on the participants' responses to clarify and further explore the information provided by the participants.

3.7 Data Collection

An in-depth semi-structured interview was conducted with each participant to explore their perceptions and experiences relating to the implementation of EGDFR in patients with sepsis. Demographic data collection forms (see Appendix 7.6) were used to collect the participants' relevant demographic details; this was stored in accordance with the University's privacy regulations (Western Sydney University, 2019).

All 10 interviews were conducted face-to-face. This method has been viewed as the "gold-standard" to collect interview data, because it provides opportunities to explore non-verbal cues and contextual data, and it facilitates rapport-building and probing, which adds to the richness of the data collected (Novick, 2008).

A semi-structured approach was used; an interview guide (see Appendix 7.7) was used to ask questions and prompts during the interview, but the approach remained flexible to facilitate a conversational style. The interview guide allowed the researcher to explore the experiences of participants so as to enhance interview rigour and consistency (Polit & Beck, 2017, p. 497). The questions and prompts in the guide were constructed through knowledge and clinical expertise gained in emergency nursing, as well as the relevant literature. These questions and prompts were reviewed by an expert panel, consisting of the study supervisors. When constructing the interview guide, the principles of specification (focus of each question), division (questions that are appropriately sequenced and worded) and tactic assumption (process of using probes to make explicit the implicit themes in a participant's responses) were followed. These principles ensured that the interview remained within the focus of the research topic (McIntosh & Morse, 2015).

The interview guide was prepared in advance and was responsive to each participant's answers (Braun & Clarke, 2014). The participants were provided with opportunities to elaborate on the concepts discussed, thus providing more insight into their experiences regarding the initiation of EGDFR. The semi-structured interview approach provided scope for participants to raise issues that the researcher had not anticipated, such as the scope of practice of emergency nurses (Braun & Clarke, 2014).

3.7.1 Data saturation

An exploratory approach was used in reading and re-reading the data from interview transcripts, which helped to identify replication of data, which signals data saturation (Polit & Beck, 2017, p. 497). Data saturation was achieved after 10 interviews were conducted over a period of three

months. Saturation was determined by consistently recurring themes that occurred during the interpretation of the interview transcripts.

3.8 Data Management

All data collected were digitally audio-recorded with the participant's consent, using a digital voice-recorder device. Audio-recording interviews is considered to be a vital step in qualitative interviews, because it enables the precise capturing of a participant's details, responses, language and concepts discussed during the interview (Braun & Clarke, 2014). All 10 interviews were transcribed verbatim with the participant's consent. The transcription of all interview data was performed by external professionals, who had consented to maintain the confidentiality and privacy of the information in the data as well as any participant details recorded during the interview, such as participants' names. On receiving the transcripts, each one was manually audited by the researcher, who checked it against the original recording. All corrections, such as data recorded as "incomprehensible word" by the transcription service where medical terminology was used, were rectified by the researcher using track changes. The tracked changes were later removed in the final duplicate version that was uploaded to the Quirkos program for coding. This allowed the researcher to have another read before beginning the initial coding.

Clean copies of the interview data were imported into the Quirkos software program version 2.0.1, Edinburgh, UK. This program enables the researcher to file, code and retrieve data for thematic analysis. A systematic analysis allows for the identification of patterns in the data. Common themes, which are identified using thematic analysis, provide a deeper understanding of the meaning of the experiences (Ingham-Broomfield, 2016). The documents were de-identified by allocating a pseudonym to each participant prior to analysis.

3.9 Data Analysis

The thematic analysis of the interview transcripts was informed by Braun and Clarke's 2006 framework. Thematic analysis is a method rather than a methodology, which offers flexibility by not conforming to a theoretical or epistemological perspective. It is the process of identifying common themes, or patterns, within the collected qualitative data (Maguire & Delahunt, 2017). The six-step guidelines proposed by Braun and Clarke's (2006) framework were used to guide the thematic analysis. Thematic analysis brings to light the theoretical and practical understandings embedded in everyday language and unspoken interpretations (Ho Ken, Chiang Vico, & Leung, 2017). The data analysis began during data collection and continued until data saturation was achieved, after the 10th interview. Braun and Clarke (2014) explain two levels of themes – semantic and latent. While semantic themes look for the explicit, or surface, meanings of what the participants have said, latent themes explore beyond what the participants have described. To do this, the researcher analyses the underlying conceptualisations, assumptions and ideologies that shape the semantic themes present in the data. This study explored the latent themes shaping the participants' perceptions, which are based on their experiences with commencing EGDFR therapy. This approach was particularly beneficial when examining the possible recommendations to improve practice.

Braun and Clarke (2006) provide a six-phase framework for conducting thematic analysis. The six phases are as follows: (i) Become familiar with the data; (ii) Generate initial codes; (iii) Search for themes; (iv) Review themes; (v) Define themes; and (vi) Write up. The six-phase framework is a non-linear process; the researcher moved backwards and forwards several times to explore the data, particularly when identifying the latent themes (Braun & Clarke, 2006).

First, the researcher manually read and re-read all 10 interview transcripts to become familiar with the concepts and identify similarities in the data. Following this, 486 initial codes were developed by re-reading the data to identify similar texts and to group texts with similar content. These initial codes were colour-coded using Quirkos and grouped under 35 titles. The initial coding report was reviewed by the supervisors to ensure the codes evolved into common themes. After the initial codes were developed from the transcribed data, the researcher re-read the codes to identify similarities in the coded texts. The initial code names were then grouped using theme names, which summarised the content of the similar content of the derived codes. At this stage, a table was created with a list of four common (parent) themes and 18 subthemes, which evolved from re-reading the coded data; this was reviewed by the supervisors. The subthemes were grouped under the parent themes. The document containing the common themes that had evolved plus a number of subthemes under them, along with example statements by participants, was reviewed by the supervisors to ensure consistency. The four common themes were modified into three major themes. The names for the three major themes and 17 subthemes emerged at this stage, and the research story evolved. The data were continually evaluated to ensure the validity of the allocation and relevance of the text. In the final phase, the themes were written up. These themes have been elaborated in detail in the following chapters. Exploring the data in this way has revealed several concepts, which have been narrated using a selection of exemplar statements by the participants that best explain the theme.

3.10 Summary

This chapter has provided a detailed description of the exploratory qualitative design used in this study and discussed the ethical considerations pertinent to this study. The methodology guided the decisions about the sampling strategies and data collection method used. While the

maximum variation technique was used to facilitate the richness of the data obtained, the difficulties with sample recruitment were overcome by using the snowball sampling technique. The referral network established by participants enabled further the recruitment of interested participants. Data were collected using in-depth semi-structured face-to-face interviews, which were analysed using Braun and Clarke's (2006) thematic analysis framework. The six-phase method enabled a well-structured approach to handling the data. The findings are presented in the following chapter.

Chapter 4 – Findings

This chapter presents the findings from thematic analysis of the interviews conducted with emergency nurses, regarding their experiences in the implementation of EGDFR.

4.1 Overview

The accounts provided by the participants described the inhibiting factors related to initiating EGDFR. These experiences by nurses who deliver direct patient care, present an understanding of the complex nature of the challenges around initiating EGDFR and provide valuable guidance to improve clinical practice.

The findings describe how the clinical experience of the participants influences their perceptions and practice relating to EGDFR. The three themes and 17 subthemes are outlined by using exemplar statements from the participants' accounts. The exemplars were selected on the basis that they were the best source for describing core aspects of the experience.

Although EGDFR is a common terminology that is used widely in sepsis guidelines and protocols as well as the existing body of literature, in the clinical context, the terminology used for EGDFR is intravenous (IV) fluids. Therefore, the term 'IV fluid therapy' is used interchangeably when presenting the findings from participants' descriptions and discussing the findings.

The themes and related subthemes are presented below in Table 4.1.

Table 4.1 Themes and subthemes

Themes	Subthemes
Nurses' perceptions and experiences regarding IV-fluid administration in sepsis	1. Controversies regarding the importance of IV fluids in sepsis 2. Patients deteriorate 3. How much IV fluids should we give? 4. Unforgettable patient stories 5. Department's compliance with the Sepsis Pathway time to IV fluids 6. We actually initiate fluids anyway
Challenges related to initiating IV fluids	1. Undiagnosed sepsis 2. Ever busy, overcrowded and understaffed emergency departments 3. Complex patients 4. There's an "I'm a doctor, you're a nurse" 5. Nursing skill level and expertise 6. "My hands are tied" – the limited scope of practice
Strategies to improve compliance with EGDFR	1. Nurse-initiated IV fluids in sepsis 2. A simpler and clearer sepsis pathway 3. More personnel and technical resources 4. Education and training 5. Advanced ultrasound skill training

4.2 Nurses' Perceptions and Experiences Regarding IV-Fluid Administration in Sepsis

Participants described different aspects of their perceptions and experiences regarding the initiation of EGDFR in sepsis. The interviews revealed that most of the perceptions expressed by the participants were based on their patient experiences, and not on the guidelines stipulated in the Sepsis Pathway. The significance of EGDFR and the impact that delayed initiation of EGDFR had on patients with sepsis were evident in the participants' shared experiences. Six

subthemes, which capture the core aspects of the experience, are presented in Figure 4.1 and now discussed.

Figure 4.1 Nurses' perceptions and experiences regarding IV-fluid administration in sepsis

4.2.1 Controversies regarding the importance of IV fluids in sepsis

Responses by participants relating to the importance of IV fluids in sepsis emerged from their personal experiences with patients. Participants linked most of their responses to a specific patient situation that they recalled. Most participants recognised the significance of the IV fluid bolus. Additionally, they expressed that they routinely give importance to initiating IV fluids.

> *The fluid challenge is a huge one. We tend to get onto that pretty quickly, particularly if they're hypotensive* – Macey (EDRN-23)

While reference was made to the need for quick action, equal importance was given to administering the correct volume of IV fluids based on patient needs.

> *I think it's pretty important that it does get done pretty soon with an appropriate amount for the right patient* – Sean (EDRN-3.5)

Participants related the significance they attributed to IV fluids to positive outcomes they have seen in their patients, such as the stabilisation of their blood pressure. This was highlighted when the participants recognised the role that IV fluids play in stabilising the hemodynamic status of patients.

> *I just see a big response to it. It seems to work better than analgesia or anything to get to rehydrate them. Yeah, it's a dehydration part of it. That's a better response from the fluids, 100%* – Jackie (EDRN-10)

The majority of participants implied that initiating IV fluids is a time-critical intervention and placed emphasis on the time to patients receiving IV fluids. Many described it as a priority intervention.

> *If I was looking after them then I, yeah, do the bloods, put a cannula, start off the bag of fluids myself. I will prime the line and always get the doctor to see them … definitely, that is my priority* – Katie (EDRN-8)

However, two participants with a lesser number of years' experience in the emergency department indicated that initiating IV fluid bolus is not a priority and also voiced concerns regarding the need for fluid bolus. They felt that treating the infection with antibiotics should take precedence over EGDFR.

> *Is it really that important for the fluid stuff? Are they trying to get rid of the infection first? Why would I give fluids?* – Jill (EDRN-1)

One of the participants indicated that administering IV fluids improves the patients' symptoms, such as temperature and tachycardia. This participant had misconceptions that the IV fluids

were aimed at treating the symptoms and not the cause. This revealed a lack of understanding regarding the prevention of complications.

> *So, the fluids will only help with the tachycardia and the temperature, but they won't treat the infection … We don't try to push the fluids, we try to push antibiotics* – Annie (EDRN-5)

These participants viewed IV-fluid resuscitation, or EGDFR, as an unnecessary intervention in early sepsis. The perception that IV fluids are only indicated for hemodynamically unstable patients perpetuated their questioning of emphasis placed on IV fluids in the Sepsis Pathway.

> *I think fluids bolus is only appropriate for high septic shock, hypotension … I think fluids should go last* – Annie (EDRN-5)

This view was also as a result of patients they have seen with fluid overload, resulting in acute pulmonary oedema as a result of large-volume fluid resuscitation, which continued beyond the early resuscitation phase. These two participants preferred a cautious approach. However, a lack of understanding of the difference between EGDFR and injudicious use of IV fluids was evident in the following remarks:

> *They can be fluid overloaded, if we give them fluids. They might be overloaded. Sometimes, we end up giving a frusemide try to get rid of the fluids* – Annie (EDRN-5)

Most participants described the positive effects of IV-fluid administration in the early stages of sepsis; however, a relatively smaller proportion of participants have raised concerns regarding fluid administration. Controversies regarding fluid administration were identified among participants as the less experienced participants preferred a conservative approach with IV-fluid

administration likely from the lack of understanding of the role IV fluids play in sepsis management, warranting a need for education among registered nurses relating to the role of EGDFR. Several participants indicated that the patients' condition deteriorated when importance was not given to timely initiation of EGDFR.

4.2.2 Patients deteriorate

The significance that the participants attributed to IV fluids is based on the experiences that they had with negative patient outcomes when fluids were not initiated early. They recalled real patient stories of deterioration from their experience, where patients required inotropes to improve tissue perfusion and invasive arterial lines to monitor their blood pressure accurately.

> *With the delay of treatment, they became more unwell. They end up in the resus [resuscitation area] with inotropes, art [arterial] lines and in HDU [High Dependency Unit]* – Annie (EDRN-5)

Participants also explained that inadequate IV fluids being initiated has resulted in patients progressing to severe sepsis. They linked such events to delays resulting from time taken for medical review of the patient, where the medical staff were unavailable to review the patient, who required EGDFR as per the Sepsis Pathway. Failure of medical staff to respond appropriately to the concerns voiced by nurses is evident in the following scenario.

> *So, you have patient that has been on 10 ml per kilo instead of a 20 ml per kilo, and there's no improving or that the patient has been delayed … the nurses have escalated to the doctor, the doctor says, "Oh yeah, 10 minutes, 10 minutes, 10 minutes," but have forgotten … and hence, the patient has suffered that fluids wasn't started, antibiotics wasn't started, doctor hasn't come to see the patient* – Diana (EDRN-18)

This participant added that such delays in IV fluids and initial treatment contributes to the patient deteriorating then requiring more aggressive treatment, necessitating a shift to the resuscitation bay. The impact of such a failure to respond according to the Sepsis Pathway could potentially result in severe compromise in tissue and organ perfusion, placing the patient at risk of increased morbidity and mortality. Such an impact was acknowledged by several participants.

> *And so, if fluids have been started a lot earlier, I guess that would save the patient needing to go to resus [resuscitation area] and … then the sepsis would not be progressed that far* – Diana (EDRN-18)

One participant, however, expressed contrary views where she linked such a worsening of the patient's health status to a delay in time of patient presenting to the emergency department, where sepsis has progressed to severe sepsis, rather than a delay in initiating treatment.

> *It's certainly because they were just too far gone with their sepsis when they came in, more than that we missed something with them* – Cathy (EDRN-25)

Participants discussed situations where no IV fluids were initiated, resulting in patients becoming severely ill. They often recalled specific factors that have caused the delay, for instance, the busyness of the department.

> *It would be … not so much that they haven't received enough, it would be that nobody saw them, so they didn't receive anything. Not that it was inadequate (IV) fluid, but that there was none given based on the fact that the department was incredibly busy* – Jackie (EDRN-10)

Participant Justin further affirmed the position of Jackie and indicate that such failure to initiate EGDFR promptly often precede severe adverse outcomes like organ failure, unplanned admissions to ICUs and prolonged hospital stay most of which are usually preventable.

> *They end up in the resuscitation bay, generally … eventually, because there is such a delay in initial treatment, which we can avoid generally* – Justin (EDRN-5)

Participants have experienced deterioration in patient's health status resulting in inter-hospital transfers in resource-limited settings, such as smaller non-tertiary hospitals with no ICUs to provide care for severely ill septic patients. This is expressed by the experience shared by one participant.

> *Certainly, we do other things like inotropes, norad [nor-adrenaline] and call retrieval work straight away, because we don't have ICU or anything like that, you know, in hospital so usually we just pack and go* – Katie (EDRN-8)

Most participants expressed that a delay in the initial treatment of sepsis resulted in adverse events, most of which are preventable with timely initiation of EGDFR. Transfers of patients to resuscitation areas, inter-hospital transfers, and using aggressive management options such as inotropes was the common experience of participants. However, they were unclear regarding the specific volume of IV fluids to be administered as per EGDFR, despite recognising the significance of EGDFR.

4.2.3 How much IV fluids should we give?

When discussing regarding the ideal quantity of IV fluids to be administered in sepsis patients, participants stated it would depend on the individual health status of the presenting patients.

Throughout some of the participants' responses, it is clear that patient care decisions were made based on clinical judgement made by the nurse or doctor. This demonstrates a lack of referring to the Sepsis Pathway.

> *That would depend on how the patient looks or what their cap [capillary] refill is. Are they using any other accessories? Yeah … I think that would still be an individual thing* – Cathy (EDRN-25)

Observations, such as a patient's vital signs, were also used as determining factors in initiating EGDFR. Variations to recommended practice were evident in some instances, when the participant expressed that a slower bag of IV fluids would be commenced instead of a bolus.

> *Why would you bolus if the blood pressure is fine? I would probably do eight-hourly, but I would reassess* – Annie (EDRN-5)

Furthermore, participants stated that, in the absence of contraindications, 1–2 litres of IV fluids bolus would be administered.

> *And I think … maybe one to two litres, and then review. Or, and if they're older patients, maybe give them a little bit less fluid, you know … but just to prevent having to then take them to resus [resuscitation area] for getting the fluid out* – Jill (EDRN-1)

Several participants considered pre-existing patient comorbidities as determinants of further IV-fluid resuscitation beyond the initial phase. Critical thinking, despite a lack of clear guidance on ongoing fluid resuscitation, is thus evident.

> *You do the first one to as a stat [bolus] bag. And then it's really titrated to the blood pressure … the heart rate … If they're elderly and they've got any*

other comorbidities, it might be slowed down … if they've got kidney/heart disease, coronary cardiac failure … but, generally, the first bag, the stat [bolus] bag – Macey (EDRN-23)

Responses were based on common practice within their emergency department and did not include the NSW Surviving Sepsis protocol recommendation of 20 ml/kg. Variations in the actual volume of IV fluids administered was evident, because it was determined based on individual patient needs, medical backgrounds and clinical decisions. However, the general consensus was that 1–2 litres of IV fluids bolus would be administered for patients with no contraindications for a bolus dose. Participant Sean echoes similar views with those of Macey.

It depends on the morbidities, so renal function, heart function, whether they've got fluid restrictions and their age as well. Let's say, a 20-year-old male with sepsis that's got no comorbidities. I think, immediately, one to two litres and review every litre after that, if necessary – Sean (EDRN-3.5)

The participants based their responses on the wide range of patients they had cared for and incorporated critical thinking and clinical judgement. Importantly, participants indicated that they would still administer IV fluids immediately; however, the volume titrated would be based on individual needs, rather than the recommendation provided in the protocol. This issue raises concerns regarding existing compliance with the protocol and suggests that non-compliance with this aspect of the protocol is being overlooked.

4.2.4 Unforgettable patient stories

Participants recalled patient experiences and stories that have resulted in adverse outcomes. Their experiences described poor patient outcomes, prolonged hospitalisation, complications

and critical care admissions. The adverse outcomes were mostly attributed to busyness, processes and organisational system delays, such as unavailability of the imaging facility after-hours, or understaffing leading to delayed commencement of IV fluids. The following participant described, at length, the adverse impact of delayed initiation of IV fluids on an otherwise healthy patient with sepsis.

> *This particular patient was in a private setting. Came in … at 4 am … The department's extremely busy. She … was only 37 years old and she'd had a … bit of endometriosis that was cauterised off a week beforehand …* – Macey (EDRN-23)

The participant described the patient's presentation at triage, which was consistent with sepsis. However, factors such as limited resources, particularly during after-hours, and failure to initiate timely EGDFR resulted in severe adverse effects to the extent of the patient requiring advanced life support. The participant emphasised the delay in initiating IV fluids, despite the fact that the patient was tachycardic with clinical symptoms of poor perfusion. This demonstrates the participant's understanding of the significance of EGDFR in managing sepsis and the role it plays in preventing complications.

> *She was tachycardic, 169 at triage. She was agitated at triage and stressed … she was 37.5 … she looked pale, diaphoretic and in pain … the decision was made to send her for an abdo [abdominal] CT. Well, because the CT department's not there overnight … By the time they got in, we're looking at about 6 am. So, she'd been in our department two hours with no fluid, no fluid. No intervention, whatsoever… Documented blood pressure was starting to go down* – Macey (EDRN-23)

A complex array of emotions, which arose from poor patient outcomes, was reflected by the participant. She portrayed feelings of deep concern for the patient's health status. The severity of the patient's deterioration is evident from the participant's description. A clear link between the delayed initiation of IV fluids and the deterioration of the patient's health status can be seen.

> *We came on at 7 am … to have handover … And we looked at the heart rate … (which) was … at about 160 and we just went, "We've got to get stuff into her." We pushed her into resus [resuscitation area] we started the fluids. We put an IDC in, and … missed and went vaginally and a whole lot of pus came out. She then crashed … she dropped her GCS [Glasgow Coma Scale]; her blood pressure was 60/40. We fluid resuscitated … and close to initiating CPR … She got shipped out to [name removed] hospital because she was that unwell* – Macey (EDRN-23)

Incorrect allocation of triage category plays an important role in delayed IV-fluid initiation where sepsis has been overlooked, particularly during after-hours. The urgency of initiating treatment is influenced significantly by the triage category assigned, as per the Australasian Triage Scale (see Appendix 7.8). Despite this participant revealing she felt the need for immediate intervention, she felt overpowered by the pressure to conform to the doctor's orders to await diagnostic tests. Feelings of significant frustration and apprehension can be seen.

> *They came in, they were not picked up as a category 2, given a cat [category] 3, so … you have at least 50 minutes – a lot of time to work them up: 30–40–60 minutes. And by the time you get the patient, the blood pressure was dropping … She didn't have a cannula so we couldn't give fluids … we talked to the doctor … they were not concerned … they were like, "She's just (got) abdominal pain … when the scan comes, we'll discuss … in the morning, the*

blood pressure dropped, … (she) became febrile … she had sepsis … she ended up going to HDU – Jill (EDRN-1)

Further, this participant expressed feelings of guilt relating to the event. Her feelings of wanting to be the voice of the patient in advocating for patient safety was evident.

I don't think we gave her the care that she needed … because it was really poorly managed, you know, maybe you could have fought more for her – Jill (EDRN-1)

Participants have described feelings of helplessness when interventions could not be commenced, due to the limited scope of practice in performing clinical skills. The participant's inability to initiate treatment, despite recognising the urgent need for intervention, typified these feelings.

When I was very junior in emergency and I couldn't take blood … I had a renal patient, who'd had a transplant, who came in septic and waited eight hours in one of my acute care beds to be seen by a doctor. And I felt so helpless, because he was getting sicker and sicker and sicker. I couldn't do blood, I couldn't initiate fluids, I couldn't do anything, because I didn't have any of the skills – Jackie (EDRN-10)

Participants expressed their concerns regarding system delays, such as the unavailability of radiology after-hours, the busyness of the department which, in turn, delays medical review of patients within the recommended time frame, and the limited scope of practice of nurses, particularly at a junior level. Throughout the experiences described, associated feelings of guilt, helplessness and regret are evident.

These prolonged time delays described by the participants have a significant impact on patient outcome, duration of hospital stay and financial implications. Poor compliance with the Sepsis Pathway recommendations, specifically related to time to initiating IV fluids, is evident from the participants' experiences. This concept is further explored in the following section.

4.2.5 Department's compliance with the Sepsis Pathway time to IV fluids

Adherence to the Sepsis Pathway was related to busyness and acuity. Participants felt that their emergency department's compliance with the Sepsis Pathway, in relation to time to initiating IV fluids was not within the ideal range. The actual time of intervention ranges from two to three hours, while the recommendation is to commence treatment immediately at the time of presentation.

> *In a busy department, that's not probably possible [compliance with sepsis protocol], 'cause, when you get a patient, they've been assessed as triage category 2; by the time they get inside to a bed, it's taking forever ... and they're seen at ... the front of house. They'll be sent back outside before the results come back, it's already like two, three hours later that they're getting treatment, when it's already too late* – Jill (EDRN-1)

Another participant, Diana, confirmed a similar time frame for intervention. Despite the differences in bed capacity for the hospitals where the participants work, extended delays are identified as common practice. This raises concerns regarding current clinical practice in managing sepsis patients across overcrowded emergency departments in NSW.

> *Two hours. That's the worst I've seen. Previously, it was like 68 minutes and a bit* – Diana (EDRN-18)

Many participants believed that their department's time to initiate EGDFR was below average.

> *I don't think we will be particularly good at it. I think our time to fluids would be below average. And I think that it's a very busy department often. That would be, I think, the main thing that would stop somebody receiving fluids early is … (being) busy* – Jackie (EDRN-10)

The potentially fatal consequences of such prolonged delays in initiating EGDFR was at the forefront of participants' minds. This participant clearly identified the need for compliance with EGDFR to reduce sepsis-related mortality.

> *Clearly, it's [compliance with time to EGDFR] not because people are still dying of sepsis. People are still dying. They're still deteriorating* – Macey (EDRN-23)

Some participants also indicated that compliance will vary on a case-by-case basis, depending on influencing factors, such as the time of recognising sepsis. One of the concerns that dominated several of the participants' descriptions was that such delays result in the patient's condition deteriorating.

> *Depends when the patient gets picked up. So if, for example, at the triage point, the patient is picked up early, the fluid resuscitation can start anywhere within 10–30 minutes. But mostly it would extend, it may be two to four hours even, before they even get started with treatment of the sepsis. Which then can tend to be a somewhat poor result, in terms of how they are trending throughout their stay, they get more sick as we leave it* – Justin (EDRN-5)

Similar views were presented by participant Jill, who added that the situation changes depending on how unwell the patients present to the department. Nevertheless, a patient who presents hemodynamically stable at triage is not treated urgently.

> *They are in, like, serious cases, they're definitely started [IV fluids], but I think, in patients who are borderline, it takes a bit of a while* – Jill (EDRN-1)

A few participants, from a non-tertiary hospital and a rural setting, stated that their compliance with time to IV fluids was good. They indicated that doctors were available in their departments to review sepsis patients within the first 10 minutes of arrival.

> *Yeah, everything in 10 minutes. Doctor has to come over. We get fluid ready and, by the time the doctor comes over, we can actually say they'll have fluids* – Judy (EDRN-12)

> *I think we are. I've always found that we seem to give a reasonable amount of fluid on them* – Cathy (EDRN-25)

Many participants communicated that delays occur in initiating IV fluids and compliance with the Sepsis Pathway's recommended timeframe was unrealistic. Participants from a smaller hospital setting, however, stated that their department's compliance with the timeframe was good. The time taken for the doctor's initial review of the patient in a busy department with competing priorities is considered a major factor that delays initiating EGDFR. In settings where medical review occurs within the recommended time frame, compliance with the Sepsis Pathway is stated to be adequate. Where there was extended delays, nurses have used alternative approaches to initiate IV fluids, which are described in the following section.

4.2.6 We actually initiate fluids anyway

On further exploring the clinical practice to overcome limitations, several participants stated that they step out of their scope of practice when they see the need for initiating IV fluids in sepsis patients. These participants were the more experienced nurses, ranging from 4 years to 48 years of nursing experience, and those who have been in acting roles as clinical nurse unit managers, clinical educators and sepsis project champions in their emergency departments.

> *Because we actually do it anyway, which is how we just chart it illegally, but we know that they need their fluids, pretty much that if they're young and they've got no other co-morbidity* – Jackie (EDRN-10)

An ethical dilemma is portrayed when competing interests, such as urgency in initiating IV fluids, takes precedence over practicing within the scope of practice. Also notable is that undertaking a thorough nursing assessment before commencing IV fluids provides a distinction between negligence and conscientiousness.

> *So, I know, based off experience some of us will … I would cannulate. I would start a bag of saline and I would say to a doctor, "Hey, I've done this. Can you sign off?" And it will always be okay. I've gone through the checklist with a patient to make sure they don't have any risk factors, so they're giving them a litre bag of fluids* – Sean (EDRN-3.5)

The narratives of participants Katie and Cathy provide similar responses, despite the differences in the location of the hospitals.

> *If I ever had a patient with that, I feel I am the one that even writes the fluid order and I'm like, "Ask the doctor to sign it and I'll explain why I think it's needed," and then they just sign it* – Katie (EDRN-8)

I would probably start running a stat [bolus] bag and then go and say to the doctor, "This is what I've got, you need to be here now and have a look. I'm running the fluids stat [bolus]" – Cathy (EDRN-25)

Such practice was also evident in different organisational settings, such as private hospitals. Subtle differences in the approach of the participant, compared to public hospital settings, reveal the likely influence of organisational climate on interprofessional relationships between nurses and doctors.

But the problem is in private settings we don't have any standing orders for nurses. But the way we do it is that we give a handover to the doctor, they'll say, "Start this." And let him go back and we can write it up when we do it, so it's started faster – Macey (EDRN-23)

Two participants with limited years of experience, ranging from 1 to 5 years in the emergency department, stated that they would not initiate fluids because they would not step out of their scope of practice.

I don't personally initiate IV fluids; I have to put a doctor's order for that. I wouldn't start IV fluids. Just because I like to keep my registration. I'm putting the fluid up; my name is on the paper, so I'd rather not – Jill (EDRN-1)

I wouldn't do that [initiate bolus bag of IV fluids], but others have gone beyond their scope of practice – Annie (EDRN-5)

Many participants, particularly those at Clinical Initiatives Nurse level of training, expressed that they are stepping out of their scope of practice to meet the pressing needs of the patient.

Experience was identified as a factor influencing the participants to initiate EGDFR outside of their scope of practice. Although participants described the inevitable nature of stepping outside their scope of practice to expedite sepsis management, this places the nurses at risk of unsafe clinical practice.

4.3 Challenges related to initiating fluids

The participants described several challenges in initiating EGDFR; six of the key challenges are summarised in Figure 4.2 and explained below.

Figure 4.2 Challenges related to initiating fluids

In addition to limitations in their scope of practice, nurses identified several difficulties that they faced, which challenged their ability to initiate EGDFR. While some factors, such as the emergency department's fast pace, overcrowding and understaffing, were common among various hospitals in NSW, there were some unique challenges associated with specific patient

subgroups presenting to the emergency, such as oncology and geriatric patients. The following subthemes emerged based on factors the participants described as inhibiting EGDFR.

4.3.1 Undiagnosed sepsis

Participants indicated that early recognition of sepsis is a challenge. The presentation may not be congruent with sepsis on arrival, yet later, it progresses to severe sepsis when the patient deteriorates, and sepsis becomes more evident.

> *It's a challenge, yes. It can happen any time after admission* – Annie (EDRN-5)

> *They are well at that time and only later get a fever, or only later become tachycardic* – Katie (EDRN-8)

The participants acknowledged that a diagnosis of sepsis has been missed on several occasions. When pressure exists to work faster at triage, clinician errors are always a possibility.

> *But I'm sure we do miss them. I mean, that it'd be ridiculous to say "We never say we never did." That would be stupid, because I'd be lying* – Cathy (EDRN-25)

As explained by the participants, misdiagnosis by nurses at triage has been linked to delayed identification of sepsis. They described several factors as being associated with misdiagnosis. In particular, the presence or absence of fever has been pointed out as a significant determining factor in diagnosing sepsis. Absence of fever is considered as an absence of sepsis. The possible lack of understanding by triage nurses, regarding potentially more fatal hypothermic sepsis, is alarming. Other related factors described as a bias in diagnosing a sepsis patient includes the age of the patient. Younger patients are less likely to be diagnosed with sepsis. The negative

stereotyping of younger patients with no apparent source of sepsis or associated comorbidities also seems to play a vital role in clinical judgements at triage leading to misdiagnosis.

> *I think there's a real focus now on febrile tachycardia. If you're missing particularly the temperature ... People don't actually include ... if they present with a temperature of 35.5 ... that's where it gets missed. People also tend to miss the younger rather than the older ... it just goes on to say they've got "man flu". And if one of those parameters are missed, they're not septic, which is not necessarily the case* – Macey (EDRN-23)

Participant Jill, a registered nurse with one year's experience, confirms experiences similar to those of Macey, who has more than 23 years' emergency nursing experience. Sepsis presentations and related missed diagnosis by clinicians, such as emergency nurses and doctors, are reasonably common. Such misdiagnosis leads to under-treatment because they are deemed to be not septic. The potential impact of such misdiagnosis can lead to significant impacts on patient outcome and could be potentially life-threatening.

> *A patient will appear well when they come in – they've had fevers before but, today, they're not having any fever ... Then they deteriorate while waiting for anyone to actually review them, or wait for the blood test to come back* – Jill (EDRN-1)

Participants also described that a patient's fever may have been managed in the community with antipyretic drugs, prior to presenting to the emergency department. This practice was thought to contribute to under-diagnosis or misdiagnosis by the triage nurse.

> *Because they don't see it as septic ... Usually, because the patient's not febrile. They might have come to triage, reporting of having a high*

temperature and they've had rigours or chills at home, or they've been seen by a GP. By the time they get to us, they've had a dose of Panadol or Nurofen and they're not febrile … in saying… They're not septic. – Jackie (EDRN-10)

Participants expressed challenges relating to the early recognition of sepsis. These challenges were due to the heterogeneous and complex nature of the presentation, particularly when patients present to the emergency department with atypical symptoms, such as being afebrile.

4.3.2 Ever busy, overcrowded and understaffed emergency departments

All participants commented on the busy workload of the emergency department, and how busy work is the primary factor leading to delays in initiating treatment. Several unwell patients presenting at the same time was suggested as resulting in competing priorities.

Because it's very busy … sometimes, we are bed-blocked – there's no beds anywhere so we work with what we've got … they [doctors] can't get to the patient. They could have 20 category twos who've come in, they've gotta see each one – Jill (EDRN-1)

In terms of sepsis, it's quite difficult in treating them in time, especially because this is a busy department – Annie (EDRN-5)

Participants also described their concerns regarding the increasing number of patients when staff ratios are lower, particularly after-hours. Unavailability of adequate medical staff to review patients after-hours leaves patients in the waiting rooms for extended periods of time with no timely treatment commenced. This situation will have a direct impact on time-critical therapy such as initiating EGDFR, often leading to patient deterioration.

> *The only people that are being seen, often especially after 10 o'clock at night are the ones that the waiting room nurses see, otherwise they would wait in the waiting room for eight hours* – Jackie (EDRN-10)

Staff shortages create a high-risk environment, which compromises patient safety and results in poor patient outcomes. The time taken for comprehensive assessment is affected by the ergonomics of achieving work efficiency in a fast-paced environment. These concerns are exemplified in the following statement.

> *The staffing shortages and the cutback on staff ... That's got danger written all over it for our septic patients on the wards, that are coming back from a simple appendix* – Macey (EDRN-23)

These views were consistent across various hospital settings, including major trauma centres, non-tertiary metropolitan hospitals and the rural setting.

> *We don't have a lot of doctors, especially on night-time again – category 1 and 2, obviously, will be seen straight away, with category 3 sometimes have to wait for, like, two or three hours* – Judy (EDRN-12)

> *But at night it can be, because a lot of them take on the job get really good money for an hourly rate and they think, "Oh, it's a country hospital." Something happens. And then they suddenly find that they get stuck with a really sick patients and there's no other resources here. There's two doctors on at night* – Cathy (EDRN-25)

Regardless of the practice setting, the lack of resources after-hours was a significant concern. Inadequate medical staff result in delayed patient reviews and treatment, thus resulting in poor

patient prognosis. The concerns discussed by participants regarding staff shortages were similar across metropolitan, tertiary, non-tertiary and rural hospitals, despite the differences in the number of patient presentations. These hospitals have severe acuity sepsis patients presenting regardless of the hospital's location. The complexity of patient presentations leads to further challenges as discussed in the following section.

4.3.3 Complex patients

Many participants conveyed that the complexity of patients' presentations and comorbidities made them hesitant to commence IV fluids immediately. Feelings of apprehension were evident with initiating IV fluids in certain high-risk patient subgroups.

> *Depends on whether there's other medical background. Are they having cardiac problem? Do they have any renal problem? If we should start fluid, or have to give a small amount of fluid … If it's an oncology patient, the criteria are different straight away* – Judy (EDRN-12)

Renal compromise, oncology background with varying treatment protocols, and diabetes and cardiac conditions restricting the fluid intake were some of the comorbidities that the participants described, which would require cautious IV-fluid administration.

> *The comorbidities of the patient. For example, a patient with diabetes and chronic renal disease … Another thing is cardiac function – so all those red flags that would stop nurses from initiating treatment and waiting for more senior doctors to make a decision on how quickly fluid resuscitation* – Justin (EDRN-5)

One participant stated that patients in the community with a low level of health literacy also results in delays in seeking medical treatment in sepsis. Such patients present to the emergency department late, with complications of sepsis such as septic shock. The following participant works in a setting with large migrant population, with many patients coming from a non-English-speaking background. They also have a low socio-economic background, with limited access to government health provisions such as Medicare. Lack of knowledge regarding the urgency of sepsis has a detrimental impact on prognosis.

> *A lot of these patients have come from the community, and our community has a really low health literacy. So, understanding they're actually really sick. And then they come in and its already kind-of too late. You can intervene, but the interventions are not going to be as effective as they would have been two days ago, as opposed to now* – Sean (EDRN-3.5)

Concerns were expressed about patients who are unwell with difficult veins to cannulate, which significantly impacts the time to starting IV fluids. Participants conveyed that the only subsequent option is waiting for doctors or anaesthetists to perform cannulation, which inevitably prolongs time to EGDFR.

> *The only other thing that would stop me from being able to intervene was somebody who had very, very difficult veins. If I had three attempts … I have no choice but to put them back into the waiting room and, therefore, nothing is done for them until they're seen medically. And that is a really big barrier* – Jackie (EDRN-10)

The health status of the patient at the time of presentation, including compromised peripheral circulation that results in difficulty in cannulation, presence of comorbidities and varying

management protocols, such as oncology protocols, have been identified as barriers in initiating EGDFR as per the sepsis guidelines. Because the complexity of patient problems has an adverse effect on initiating EGDFR, a vicious cycle may be created. Hesitation and further delays may result in further patient deterioration.

4.3.4 There's an "I'm a doctor, you're a nurse"

The nurses conveyed that interprofessional issues – including attitudes, behaviour and communication issues, particularly between nurses and doctors – are an inhibiting factor in EGDFR. The extent of the issue is evident from the following statements by several participants.

> *It's also, to not blur the lines within what nurses and doctors can do. There's that very much about: "I'm a doctor, you're a nurse. You can do this within this parameter, but we can do this, we have powers above that." So yeah, I do feel a lot of that* – Jackie (EDRN-10)

> *It is trickier because there is a bigger divide between the doctors and nurses* – Macey (EDRN-23)

> *The doctor can be bit of a full on* – Judy (EDRN-12)

> *Then we have a couple that are: "Well, I'm the doctor, you're the nurse" type thing. Very few … and so you have to be … you're not going to go outside any protocols at all* – Cathy (EDRN-25)

These feelings were consistent across all hospital settings and all levels of nursing expertise. However, many participants stated that most senior doctors were more approachable, and the

communication style adopted by the nurse and knowledge level of the nurse are significant contributing factors to better interprofessional relationships.

> *If you are concerned, I always just go to a consultant or registrar and I get the response that I need out of them all the time* – Sean (EDRN-3.5)

> *So, depends on the nurses experience or how long they have been in emergency for. Generally, how they approach, so how, yeah, there is and there isn't, and it depends on about how they delivered the information about the patient and how unwell they are* – Justin (EDRN-5)

Participants perceived challenges in interprofessional communication as a factor inhibiting the early initiation of fluids. A significant power imbalance was embedded within interprofessional relationships. A breach in positive interprofessional relationships was also linked to exercising a cautious approach towards nurse-initiated fluids, because participants were hesitant to step outside their scope of practice when it involved a less-approachable medical professional. Communication styles and experience level of nurses were also explained as factors inhibiting healthy interprofessional relationships. The impacts of level of nursing skill and expertise is further explored in the following section.

4.3.5 Nursing skill level and expertise

Several participants identified the experience level of nurses, skill set and assertiveness to be significant factors in initiating EGDFR. They suggested that more support and education should be provided to junior nurses to facilitate upskilling. They discussed that the scope of practice widely varies among nurses in the emergency department. This limits the ability to initiate IV fluids in sepsis.

As a junior nurse, you can't do a couple of stuff like cannulate or escalate. As a senior, you can actually start a little bit of the pathway. So, it just depends on where you're – Annie (EDRN-5)

The participants also noted that it takes several years to progress to the level of a Clinical Initiatives Nurse (CIN), who is able to perform advanced level skills such as IV cannulation and nurse-initiate protocols. In a department with high staff turnover, however, his could imply a significant shortage of nurses with advance skills.

It takes a long time to be able to work your way up to emergency to get the skills and to actually be able to cannulate and nurse-initiate fluids – Jackie (EDRN-10)

This participant further added that this varying skill-mix impacts the care provided particularly in the acute assessment and treatment area before doctor review is completed on a patient.

If you've got an enrolled nurse doing waiting room nursing, they can't initiate fluids, can't do blood, the front of house (acute assessment and treatment area) coordinator should drop something and jump in with them and help, but sometimes they don't – Jackie (EDRN-10)

In addition, nurses' knowledge-deficit and lack of assertiveness have also been described as factors inhibiting EGDFR.

Lack of understanding of how important it is … we focus on the ECG [electrocardiogram] and swabs of the feet and all that sort of stuff … the lack of understanding … And I do still think assertiveness. Get that fluid order

written up and get it done … that could be delayed as well – Macey (EDRN-23)

The more experienced nurses shared concerns regarding the challenges faced by inexperienced junior nurses in a confronting and overwhelming work environment.

Well, one is exposure … So, being a junior nurse, you get allocated to spots that aren't as high acuity – Justin (EDRN-5)

I think, as a junior nurse, it's very difficult, especially in ED [emergency department] … It's sink or swim. You're really kind-of trying to keep your head above water – Sean (EDRN-3.5)

Several factors relating to nursing expertise such as skill level, scope of practice at varying skill levels and knowledge-deficit were described as inhibiting factors in initiating EGDFR. Such a lack of skilled workforce has its inherent risk of compromising patient safety. Besides the junior nurses, participants at the level of Clinical Initiatives Nurse also felt limitations in their scope of practice, specifically relating to implementing EGDFR.

4.3.6 "My hands are tied" – the limited scope of practice

Participants who were experienced nurses voiced concerns regarding the limitations of the scope of practice of nurses, which restrains nurses from initiating the recommended volume of IV fluids in sepsis patients.

CIN [Clinical Initiative Nurse] nurses can prescribe fluids, but we can only prescribe slow Hartmann's. We want to give 0.9% of sodium chloride STAT [bolus] (but) we need to get a doctor to review – Sean (EDRN-3.5)

Participants Katie and Cathy also stated similar standpoints, where the treatment regimen as per the Sepsis Pathway, to initiate bolus 0.9% sodium chloride, falls outside the scope of nurse-initiated IV fluids.

> *It's become part of our ED [emergency department] standing orders Hartmann's but it's only … 160 ml per hour, something really low is what we can prescribe, which I feel is useless when we need it. If I'm going to give them IV fluids because I think they need it, like, I want to give it stat [bolus] or within the hour* – Katie (EDRN-8)

> *But, as the nurses really can't order it … most of our nurses are advanced clinical nurses but it doesn't come under our* protocol – Cathy (EDRN-25)

Many participants further added that getting a doctor's order to initiate IV fluids is the significant cause of delay, because the protocol does not allow provision for nurses to initiate the recommended amount of fluids in sepsis.

> *The problem is we still want the doctor to come. It's getting that doctor to come to order that fluids because we are not, technically, if you think about sepsis … the pathway doesn't allow us to nurse-initiate IV fluids, does it? It has to be sighted by the doctor, assess and then they order that fluids … even though they are AEP, advanced emergency trained, sepsis does not fall into that standing order for initiating fluids* – Diana (EDRN-18)

Feelings of frustration were expressed through several participants' descriptions, where they felt that undue restrictions were placed on nurse-initiated EGDFR, while advanced practice nurses were permitted to nurse-initiate fluids for patients who do not present with sepsis.

So, you have to stick within the parameters of being able to order the fluid. My hands are tied. I can't. I have to get a doctor to do that, that would be very difficult ... I could cannulate, take blood, do blood cultures but I couldn't initiate the intravenous fluids without a doctor's order, and that's sometimes hard to do in emergency, because nobody wants to do it before they see the patient – Jackie (EDRN-10)

It's eight-hourly fluids. If they need more than that fluids, I will actually go to the doctor and tell them, "I can't do this" ... there's limitations for a CIN nurse. You can start fluids, but it will be eight-hourly. It can't be bolus. It can't be faster than that – Annie (EDRN-5)

Nearly all participants shared feelings of frustration and dissatisfaction with the current limitation Clinical Initiatives Nurses being unable to initiate EGDFR in sepsis, while they can initiate fluids for patients with other presentations. They believed that this results in patients not getting any IV fluids within the recommended time frame.

4.4 Strategies to Improve Compliance with EGDFR

The participants expressed their views about possible strategies that could be implemented and changes that could be made to support EGDFR. The following subthemes (see Figure 4.3) describe those strategies.

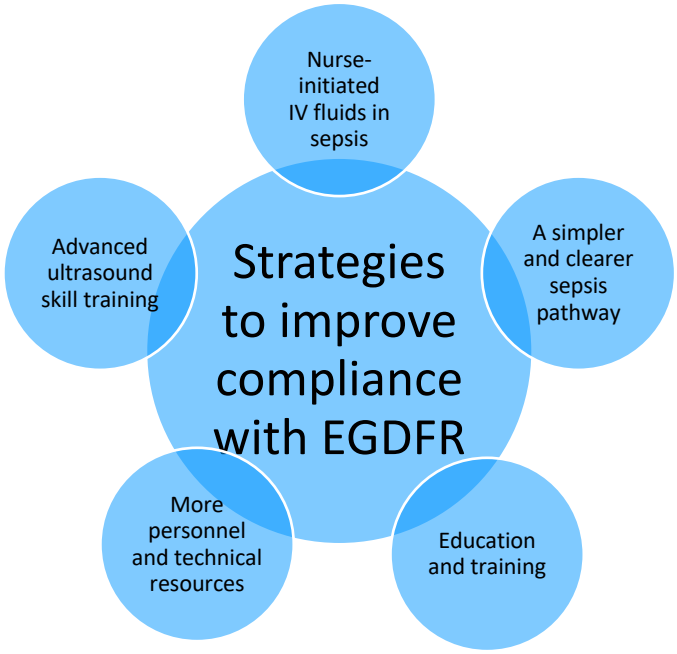

Figure 4.3 Strategies to improve compliance with EGDFR

4.4.1 Nurse-initiated IV fluids in sepsis

Given the restrictions placed on nurses initiating IV fluids, the participants proposed that nurse-initiated IV fluids for sepsis patients would significantly improve EGDFR because the delays in awaiting medical order for the initial IV fluid bolus would be eliminated.

Some participants expressed scepticism and questioned the authenticity of the constraints on nurses to initiate EGDFR, while they have the right to nurse-initiate opioid medication, which requires a similar level of clinical judgement to be exercised.

> *We can give morphine and fentanyl; I don't see why we can't give fluids* – Jill (EDRN-1)

A sense of powerlessness in using the current protocol was evident in the following statements.

> *The first bag should always be stat [bolus]. We know that but we don't have the power to do that, yet. So that would be really good* – Jackie (EDRN-10)

> *If it states that nurse can initiate fluids … if that gave us that power, that standing order to initiate fluids without the doctor sighting it, yes, I think that's what's holding us up* – Diana (EDRN-18)

Participants also made suggestions for reasonable restrictions that could be placed on nurse-initiated EGDFR in order to prevent adverse outcomes, such as fluid overload. They demonstrated an understanding of the complexity of treating sepsis and patient attributes to be considered.

> *Our only prescribing right is to do an eight-hour bag of Hartmann's. I think, in certain presentations such as sepsis, we should be able to do, essentially be given specific criteria. There needs to be reasonable restraints on comorbidities and age and everything. But, if they meet the criteria, such as young male or female with no comorbidities or limited comorbidities, no fluid restriction, then we should be able to initiate at least one litre of saline* – Sean (EDRN-3.5)

This participant further added that such a provision will be a significant step towards improving patient outcomes, particularly after-hours with less medical staff available.

> *Especially overnight on a night shift, given less medical staff and still a lot of patients coming through, having the independence of a CIN nurse to do something like this. To hang up fluids in sepsis, that would save a lot of time and potential further deterioration for the patient* – Sean (EDRN-3.5)

Other participants expressed similar ideas, reflecting on how efficiently EGDFR could be implemented if nurses could nurse-initiate fluids in sepsis patients presenting to constantly busy departments.

> *We almost need a sepsis ACN[Advanced Clinical Nurse] protocol. That is what we need, because then the nurses would just start initiating … We've got the fluids there. And even if the doctors are busy, we could at least do that bit* – Cathy (EDRN-25)

Also discussed was the skill level of nursing staff. Most participants felt that it would be appropriate for nurses at Clinical Initiatives Nurse level and above to be given the right to initiate bolus fluids in sepsis. Knowledge base and experience were stated as the reasons for their recommendation.

> *But senior nursing staff tend to have that knowledge base behind them that would make it generally safe* – Justin (EDRN-5)

> *I think CIN level nurses. Senior level, I think, because when you are senior level, obviously, your level of expertise in the emergency department, you've got the experience behind you as well* – Sean (EDRN-3.5)

Participants preferred the option of a nurse-initiated IV fluid bolus order in patients presenting with sepsis. If the restriction on the quantity of fluid that can be nurse-initiated by Clinical Initiative Nurse is removed for sepsis patients, they stated, that would align with the recommendations set by sepsis guidelines. This empowerment of advanced practice by nurses would not only result in a significant reduction in time to EGDFR, but also improve the rate of mortality and morbidity associated with sepsis, using a "faster and better" approach with no additional cost to the current model of practice in the emergency department.

4.4.2 A simpler and clearer sepsis pathway

Many participants felt that the current sepsis pathway is complex and overloaded with information, suggesting that the format is unclear. A simpler, clinician-friendly version would be beneficial. During the interviews, when a hardcopy of the Sepsis Pathway was given to the participants, most participants were unfamiliar with where to find specific information, such as the volume of fluid to be administered or time to administration.

> *I don't think it's as simple as the original one. That's a lot of reading to do* – Jackie (EDRN-10)

> *It's a little bit complex. It's a bit busy, it could be simplified a little bit. For a junior nurse to read that pathway, there's no way* – Macey (EDRN-23)

It may be inferred that, although participants were familiar with the concept of the Sepsis Pathway, it is likely that it is used less frequently.

> *There was quite a lot of things I had to go down before I actually found the things I could tick off for this person* – Cathy (EDRN-25)

Participants preferred a simpler flowchart with essential information to guide clinical decisions in sepsis. The current complex flowchart was perceived to be a misfit in emergency setting, because nurses are less likely to refer to a convoluted flowchart in a fast-paced environment, where they are constantly pressured to achieve work efficiency.

4.4.3 Education and training

From their previous experience, the participants suggested several strategies that they have observed to work in improving compliance with protocols. Positive strategies were ongoing education, training and constant re-enforcement regarding EGDFR and the Sepsis Pathway.

> *Education on this would be really, really handy* – Jackie (EDRN-10)

> *I think everybody knows about the pathway … what I'm a bit grey side is having that training because people would forget. It's that persistent training, continuous training is needed* – Diana (EDRN-18)

Emergency departments typically face challenges with staff retention and high staff turnover may indicate the need for ongoing educational sessions. Empowering nurses by frequently enhancing their knowledge base regarding sepsis management could improve compliance with EGDFR.

4.4.4 More personnel and technical resources

Lack of adequate personnel resources was perceived as a factor that heavily influences quality of patient care. Participants stated that an increase in the available resources – such as hospital beds, upskilling trainings for nurses and improving skill-mix and staff-patient ratios – would be practical strategies to improve EGDFR.

> *Bed block, fix the bed block and we would be able to move patients through the emergency department quicker* – Justin (EDRN-5)

> *If we had more CIN trained nurses, then it would be easier … I just think the empowerment of people* – Sean (EDRN-3.5)

Some participants also suggested that the availability of allied health professionals such as pathology technicians, who have expertise in cannulation, could mean quicker intervention for patients. This could be a potentially cost-effective strategy to staff more advanced trained nurses in busy emergency departments.

> *If we have more of a technical assistant that can cannulate … then the fluids can be hooked in, go on straight away* – Diana (EDRN-18)

Participants discussed that some of the strategies currently in place have relatively improved time to EGDFR since their implementation, particularly the acute assessment area model with the waiting-room nurse. This has helped in the early detection of deteriorating patients. A continuation of such strategies, therefore, would benefit patients.

> *Front-of-house model of care (acute assessment area), so that came in … I've been in emergency quite a while before that came in, so that changed emergency hugely. So that means the patient could be seen quicker and sorted quicker through the front-of-house model. The waiting room as part of the front-of-house model of care is fantastic* – Jackie (EDRN-10)

Participants also described a wide range of approaches to improve the efficiency of sepsis management. The effectiveness of these strategies depends on organising personnel and other resources appropriately, based on skill level and patient demands, to carry out the interventions that will improve timeliness to EGDFR.

4.4.5 Advanced ultrasound skill training

Recent trends in advanced nurse practice include nurse-driven ultrasound programs, where the nurses perform assessments using ultrasound and insert peripheral venous access devices in patients with difficult access. Traditionally, physicians have performed these procedures.

One participant suggested that advanced skill training, such as the use of ultrasound by nurses to assess a patient's fluid status, would provide more confidence in nurse-initiating fluids.

> *Once they get in treatment, probably will be established earlier… in regard to assessment, improving upon that training, ultrasound has a big plus in terms of how well the patient is responding (to IV fluids), so they can check via ultrasound a lot of under-fillings, overfilling … and it's easy bedside. So, just better trained in terms of ultrasounds* – Justin (EDRN-5)

A few participants also suggested that more nurses could be trained in using ultrasound-guided IV cannulation. This could assist in obtaining IV access in patients who are unwell with difficult access, without further delays resulting in further patient deterioration.

> *And if they're really difficult, we usually get the doctors to use the ultrasound. We're trying to run educational things for the nurses to start learning ultrasound cannulation* – Cathy (EDRN-25)

The approaches described by the participants align with current trends in targeted interventions in clinical practice. Empowering nurses through advanced skill training, using their current knowledge, would improve work efficiency and improve overall sepsis-associated mortality and morbidity. These would include CIN training of nurses, training nurses in skills such as cannulation and modern techniques such as use of ultrasound.

4.5 Summary

In summarising the experiences of the participants, it is evident that the factors causing delays in initiating EGDFR are common across various emergency departments, despite the differences in the size and location of the hospitals, and the experience level of the participants. While some of the discussions are comparable to what is known from the literature review, several new insights have been revealed by the participants. This includes the seemingly common practice of stepping outside of the nursing scope of practice in initiating IV fluids to meet the perceived urgency in initiating EGDFR. In addition to providing an understanding of the latent inhibiting factors, such as the limited scope of nursing practice, these findings provide an insight into possible strategies, such as provision for nurse-initiated IV fluids, that can improve compliance with timeliness in initiating EGDFR.

5. Chapter 5 – Discussion

Nurses typically spend most time with their patients and are the first point of contact at triage when patients present to emergency department. They are, therefore, in an advantageous position to recognise sepsis early. This chapter discusses key findings from the experiences of emergency nurses regarding initiating EGDFR in relation to contemporary literature, and presents the recommendations and implications for future research and clinical practice.

Nurses play a critical role in the optimal implementation of EGDFR. The findings from the thematic analysis of interviews with emergency nurses, presented in the previous chapter provide valuable information regarding the challenges around initiating EGDFR. Emerging from this study were a number of key findings, pertaining to the experiences of emergency nurses around initiating EGDFR. Several participants discussed the significance of EGDFR. However, some controversies among emergency nurses regarding need for EGDFR were seen, which is consistent with previous studies found in the literature. Throughout the data, the concept of patient deterioration associated with delayed initiation of EGDFR was repeated. While participants confirmed poor compliance with initiating EGDFR, they provided insight into the complex multidimensional factors that cause poor compliance, such as the difficulty in precisely diagnosing sepsis at triage. Several participants also discussed conflicting views, regarding the factors used to determine the volume of IV fluids to be administered in sepsis. During the interviews, a recurring theme was the clinical skills and abilities of nurses for initiating treatment for sepsis patients in the emergency environment. Several participants

argued that such autonomy is crucial for the wellbeing of their patients, who typically present to overcrowded and understaffed emergency departments. A thorough understanding of the potential risks of injudicious use of IV fluids was also described by participants, which is clearly evidence of high-level critical thinking and clinical decision-making ability. These key findings will now be discussed further in the following sections.

5.1 Positive Outcomes of Early Fluid Administration

The participants in this study acknowledged the importance of IV fluid therapy in treating sepsis. They recognised the need for initiating IV fluids as early as possible. This is in congruence with the revised Sepsis Pathway from the Surviving Sepsis Guidelines, which was updated in June 2018. Several experimental studies, including the landmark study of the Early Goal-Directed Therapy Collaborative Group (2001), which was conducted in the USA, have confirmed that administering IV fluids, particularly in the early phases of sepsis, improves microcirculation. The 2010 study of Ospina-Tascon et al. confirmed that fluid resuscitation in the early phase of sepsis improves microcirculation. Because tissue perfusion is the major goal of fluid management, early fluid administration has significant implications for positive patient outcomes. In this study, one of the key findings is that the experience of most participants confirms the positive effects of early fluid administration in patients with sepsis, which is EGDFR.

Participants stated that "*the fluid challenge is a big one*" and that they try to initiate IV fluids quickly. Many participants conveyed that the effectiveness of IV fluid therapy in sepsis has been demonstrated, in their experience, stating, "*I see a big response to it*". Their clinical decision to initiate IV fluids early is a result of the impact they see it having on their patients, such as improved tissue perfusion and vital signs such as blood pressure. These statements are

congruent with the findings of a large retrospective cohort study, which analysed the relationship between mortality and timeliness of IV-fluid administration within the first three hours of recognising sepsis. In that study, all survivors received EGDFR (Lee et al., 2014). Conversely, in the experiences of the participants in this study regarding the positive effect of timely EGDFR, their perception regarding the significance of EGDFR was not unanimous, with a few participants disputing the need for EGDFR, leading to controversies.

5.2 Controversies Regarding EGDFR

Most participants in this study stated that IV fluids are important in sepsis management. Two participants, however, questioned the importance of rapid IV-fluid administration in sepsis and the need to initiate fluids immediately, stating, "*IV fluids are not required in hemodynamically stable patients.*" These participants had fewer years of emergency nursing experience and limited exposure in severe acuity areas, such as the resuscitation bay. Their inexperience in treating patients with sepsis, and associated fear of fluid overload, may have influenced their perceptions regarding EGDFR.

Some studies argue that excessive fluid administration in sepsis may lead to adverse effects, such as acute respiratory distress syndrome resulting from fluid overload (Chang et al., 2014; Finfer, 2014; Hariyanto, Yahya et al., 2017). A current study by Corl et al. (2019), in its pilot stage in the USA, argues that, compared to usual care (where patients received IV fluids based on the clinical decision without any suggested limit), restrictive fluid therapy shows no difference in mortality. However, these studies do not contradict fluid resuscitation in the early stage of sepsis, or the need for timely initiation of IV fluids.

A recent meta-analysis of the studies supporting restrictive fluid management in sepsis by Brown and Semler (2019) concludes that administering an initial IV bolus of 20 ml/kg is a reasonable first step in fluid resuscitation, considering the risk-benefit to patients. These controversies likely influence the decisions of the nurses and doctors, resulting in hesitation to initiate a bolus dose of IV fluids. However, most participants provided evidence that they have witnessed patient deterioration resulting in septic shock when IV fluids were not initiated in a timely manner.

5.3 Delayed Treatment and Patient Deterioration

Through their experience, several participants confirmed that delayed initiation of IV fluids in sepsis results in the patient deteriorating. These patients then require aggressive management such as the use of inotropes, invasive arterial lines, and admissions to ICUs and high dependency units (HDU) to improve microcirculation and perfusion. These statements support the findings from a recent observational cohort study of 788 patients, where patient outcomes were measured in terms of end-organ failure. The study concluded that, of the patients who did not receive early IV fluids initiated by the ambulance services, more than half showed signs of organ failure in the emergency department. Conversely, of the patients who received IV fluids in their pre-hospital treatment, 40% showed improved outcomes in emergency (Amesz, de Visser, & de Groot, 2019). Similar studies reviewing patient mortality have also shown that delayed treatment, such as delay in initiating EGDFR, has resulted in increased mortality (Chelkeba et al., 2015; Leisman et al., 2016).

Through relating patient stories, the participants linked perceptions regarding patient deterioration due to delayed EGDFR to their personal experiences. Feelings of powerlessness, guilt and deep concern for the wellbeing of patients were exhibited by the participants while

discussing some of their unforgettable patient stories. The participant's statements explicitly explain the link between delayed initiation of IV fluids and patient deterioration. These findings were similar across different hospital settings, such as metropolitan, rural and tertiary trauma centres, and non-trauma non-tertiary hospitals, as well as among participants with varying skill levels. Also evident during the interviews was the similarity in responses between participants regarding the preferred volume of IV fluids to be administered.

5.4 Adverse Effects Relating to the Volume of IV Fluids Administered in Sepsis

The volume of fluids administered during the initial resuscitation phase plays a crucial role in patient outcomes. When the participants were asked to describe the ideal volume of fluid that they prefer to administer to patients with sepsis, they stated that the volume depends on the patient comorbidities. They described that if the patient's condition is less complex, the fluid approach is more liberal, and the initiation of EGDFR is faster.

Participants were concerned about complications associated with fluid overload and pulmonary oedema resulting from excessive fluid therapy, particularly in patients with pre-existing comorbidities. These concerns are contradicted, however, in the findings from the 2014 retrospective cohort study of Chang et al., which analysed the relationship between the development of acute respiratory distress syndrome and volume of fluid administered during the early resuscitation phase. The study's findings show that there is no association between the volume of fluid administered within the first 6–24 hours and acute respiratory distress syndrome, irrespective of patient comorbidities.

An experimental study analysing real-time stroke volume, or volume of blood pumped by the left ventricle during every contraction, following initial fluid bolus of 1000 ml over 10 minutes, showed a significant 10% increase in stroke volume following the first fluid bolus; however, much less effect was observed after subsequent fluid bolus bags. The study strongly recommends an initial bag of fluid bolus (1000 ml over 10 minutes) due to the beneficial effects it has on the patients, such as improved perfusion (Seckel & Ahrens, 2016).

The perceived fear and hesitation regarding fluid administration of participants in this study could be related to findings from studies such as Finfer (2014) and Hariyanto et al. (2017), where the reasearchers report that there are adverse outcomes associated with excessive fluid resusciation. Nonetheless, these two studies do not analyse the time of administration, but consider the total cumulative fluids administered beyond the early resusciation phase. They warn against injudicious use of IV fluids beyond early resusciation phase. Similarly, a retrospective analysis by Sakr et al. (2017) found a higher mortality rate in patients with severe sepsis who had a higher cumulative fluid intake analysed at 24 hours, 3 days and 7 days after ICU admission. However, the authors acknowledge that the study has no implications for early-phase resuscitation and the timeliness of fluid resuscitation.

Findings from studies do not dispute the need for IV fluids during the initial phases of resucitation, but recommend a cautious approach when administering IV fluids after the early phase. It is believed that controversies have resulted in unwarranted hesitation among doctors in prescribing EGDFR, particularly in the older population with pre-existing comorbidities. There is a need for more empirical evidence that specifically evaluates early-phase fluid resuscitation to substantiate the recommendations provided in the Sepsis Pathway regarding the optimal volume of fluids required. Currently, the Sepsis Pathway does not indicate any specific

considerations for patient subgroups, such as those with pre-existing comorbidities, older people and oncology patients. This lack of clarity regarding the ideal volume of IV fluids to be administered in patients with comorbidities, the lack of knowldege regarding distinction between EGDFR and injudicious use of IV fluids, and the needless fear regarding pulmonary oedema, along with other factors, could potentially result in poor compliance with EGDFR.

5.5 Poor Compliance with EGDFR

Compliance with the Sepsis Pathway is widely debated in the literature. Most participants in this study affirmed anecdotally that, compared to the guideline recommendations, their department's compliance with EGDFR would be poor. They stated that time to IV fluids would be significantly delayed, ranging from 2 to 8 hours. They attributed several factors that contribute to such extended delays. This finding supports those of previous studies, which have analysed the time to EGDT (Leung et al., 2017; Bentley et al., 2016). Typically, fluid resuscitation was evaluated as part of the overall sepsis care bundle and limited in-depth analysis was conducted regarding inhibiting factors specific to delays in initiating EGDFR.

It is also evident from the existing literature (Burney et al., 2012; Roberts et al., 2017; Tipler et al., 2013) that much more emphasis has been placed on the time to IV antibiotics, because several studies have analysed factors inhibiting timely administration of antibiotics in sepsis patients, despite both EGDFR and IV antibiotics being critical components in the Sepsis Pathway. Factors that influence compliance with EGDFR are multifactorial, such as difficultly in diagnosing sepsis and the busyness of the emergency department.

5.6 Complexity in Diagnosing Sepsis

Diagnostic difficulties relating to sepsis, for example, differentiating between a patient with pneumonia with sepsis and acute heart failure, in the absence of fever, is almost an impossibility. This may result in uncertainty and misdiagnosis; therefore, delaying the initiation of treatment for sepsis (Cronshaw et al., 2010). When reflecting on the challenges associated with initiating EGDFR in sepsis, several participants conveyed that timely recognition of sepsis is a huge challenge. Patients present with diverse medical symptoms but no concrete diagnostic evidence of sepsis. An example of this is a patient who is afebrile with a normal blood pressure, who does not present at triage with parameters meeting the sepsis criteria. The difficulty of emergency clinicians, such as nurses and doctors, in recognising sepsis may be a result of limited understanding of the pathophysiology behind sepsis.

Despite advances in technology, our understanding of the pathophysiological process, particularly the inflammatory dynamics involved in sepsis, is limited and is still evolving. Patients with acute sepsis, who have an already weakened immunity and in the late stages of sepsis, do not have the typical inflammatory response like those with a healthy immune system. For example, these patients may not be releasing cytokines and other inflammatory mediators, resulting in varied presentations that do not fit into the sepsis criteria described by Burrell et al. (2016). These chemical releases also correspond to the time of onset of sepsis. Patients presenting to the emergency department with sepsis may present with a diverse range of symptoms and parameters, which may not fit into the set criteria listed in the Sepsis Pathway (Iskander et al., 2013; Seckel & Ahrens, 2016). This complexity is evident from the various patient stories that the participants described, which have resulted in delayed diagnosis and severe patient deterioration, and which are congruent with the findings established in the literature (Cronshaw et al., 2010). The time taken to establish the diagnosis of sepsis is further

complicated by the busy workload of the department, where several critically ill patients may present at the same time.

5.7 Overcrowding and Understaffing in the Emergency Department

The findings from this study show that the busy workload of an emergency department with a high patient–nurse ratio, particularly during after-hours, has routinely caused significant delays in initiating EGDFR. This concurs with the findings from a previous study by Gaieski et al. (2017), who undertook a retrospective analysis revealing that increased emergency department occupancy and increased patient hours (where several patients with severe illnesses are in the emergency department for an extended time) significantly decreased the likelihood of patients with sepsis receiving IV fluids within the first hour.

The time to review by doctors has also been identified as a factor contributing to initiating EGDFR (Bentley et al., 2016). Many participants in this study described that the time it takes for the first doctor to review the patient after triage can cause significant delays in initiating EGDFR. They reported that it can take up to eight hours during night shifts, with patients remaining in the waiting room with no EGDFR commenced. However, a few participants from the non-tertiary and rural settings stated that doctors were available to review most category 2 patients within first 10 minutes of presentation, except during after-hours. This might be likely due to the decreased number of patients presenting to the emergency department, compared to major trauma and metropolitan hospitals. This implies an unavailability of medical resources in proportion to average presentations, particularly after-hours. Metropolitan hospitals and trauma centres, catering to the needs of a high-density population with higher-than-average

emergency presentations, require more medical staff. This disparity in the distribution of resources may impact compliance with the Sepsis Pathway in these larger hospitals.

Advanced practice nurses, who have the ability to use ultrasound technology to assist with cannulating patients with difficult veins, are limited in number. Critically ill patients with poor peripheral circulation on presentation tend to deteriorate rapidly. This is compounded by less-experienced nurses without cannulation competency, who have also identified this as a barrier leading to significant delays in initiating IV fluids. These findings support those of some recent studies, where Australia is identified as a nation with one of the lowest numbers of nurses who can cannulate (Alexandrou et al., 2018; Sou et al., 2017). Undeniably, this skill gap can contribute to delays in managing sepsis by initiating EGDFR.

5.8 New Findings from this Study

This study identifies several significant findings related to the factors inhibiting initiation of EGDFR. These include: (i) poor interprofessional relationships, (ii) limitations in the scope of practice for emergency nurses, and (iii) breach of scope of practice for emergency nurses. These findings will now be elaborated further.

5.8.1 Poor interprofessional relationships

Participants indicated that interprofessional communication issues and the presence of a power-gradient between doctors and nurses are factors that inhibit the timely initiation of EGDFR. To explain this further, there is a traditional hierarchical relationship documented in literature where doctors are considered to be superior to nurses (Siedlecki & Hixson, 2015). However, the participants stated that senior medical officers have a better working relationship with senior nurses, likely due to their level of clinical expertise. Doctors, stated the participants, trust the

clinical decision-making abilities of experienced nurses; this trust facilitates positive interprofessional interactions. Associated inhibiting factors were identified as poor communication skills, a lesser level of expertise in nurses and the knowledge limitations of inexperienced nurses. The participants stated that experience, therefore, plays a significant role in overcoming the communication barriers to initiate EGDFR.

5.8.2 Limitations in the scope of practice for emergency nurses

Participants explicitly stated the limitations that are specifically related to sepsis management. Clinical Initiatives Nurses in emergency departments are given the advanced practice provision to nurse-initiate IV Hartmann's at an eight-hourly rate. However, the Surviving Sepsis Guidelines recommend initiation of bolus bag of 30 ml/kg intravenous sodium chloride 0.9% immediately on presentation. Clinical Initiatives Nurses, who can initiate IV fluids for other presentations to emergency department, are thus unable to initiate IV fluids in sepsis patients who require it urgently, due to this limitation in their scope of practice. In comparison, NSW Ambulance services provide the provision to all paramedics to initiate IV fluids in accordance with the Sepsis Pathway on scene (NSW Ambulance Protocol and Pharmacology, 2018). This leads to questioning the validity of the restriction placed on emergency nurses in nurse-initiating IV fluids in sepsis, and requires further investigation.

5.8.3 Breach of emergency nurses' scope of practice

The participants in this study revealed that they are stepping out of their scope of practice. Participants justified this due to a patient's pressing need for IV fluids and the nurses' deep concern regarding the patient's health status and potential deterioration. Participants stated that, after their assessment of risk factors, they initiate a bolus bag of IV fluids in sepsis patients while waiting for the doctors to review the patients. The participants who indicated this practice

were experienced nurses with advanced practice roles, such as acting clinical nurse educators, acting nurse unit managers, and sepsis champions. Conversely, some of the inexperienced participants stated that they would not nurse-initiate fluids because they were concerned about the implications of breaching their scope of practice, such as losing nursing registration.

Very few participants, those coming from the smaller non-trauma hospitals, also stated that they have doctors available to review the patients within the first 10 minutes. The increased availability of medical officers diminished the need for nurse-initiated fluids in such settings. Increasing the scope of practice of advanced practice nurses is, therefore, imperative to improve patient outcomes in settings with ongoing shortages of medical officers.

5.9 Strategies to Improve Compliance with EGDFR

Participants proposed several significant strategies that could positively impact timely initiation of EGDFR, which are summarised in Figure 5.1 and discussed below.

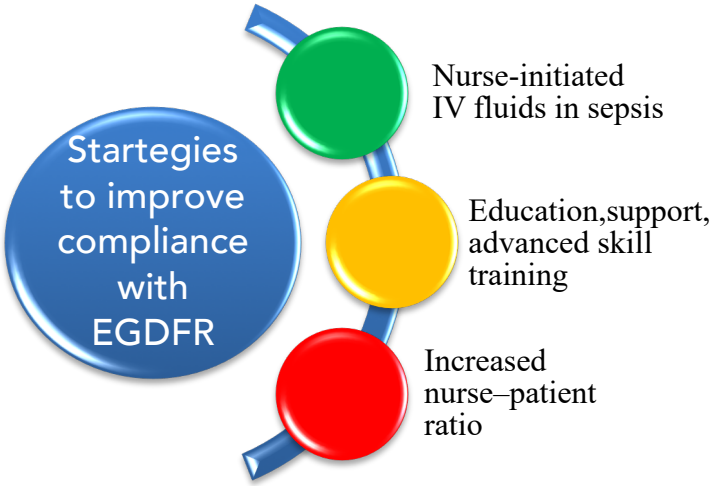

Figure 5.1 Summary of strategies to improve compliance with EGDFR

A significant strategy arising from the findings relates to the provision of nurse-initiated bolus bag of IV sodium chloride 0.9% in accordance with the Surviving Sepsis guidelines. Participants stated that nurses at the Clinical Initiatives Nurses level, who can otherwise initiate IV fluids in other presentations, would be the most appropriate level of nurses because they have the required skills and knowledge to make judicious clinical decisions. This would empower nurses to increase their initiation of EGDFR in accordance with the recommendations in the Sepsis Pathway, and to avoid stepping out of their scope of practice. Such provision, although rarely documented in literature, has been proven to be effective in the single centre quality initiative study of Ferguson, Coates, Osborn, Blackmore and Williams (2019), conducted over a period of seven years in the USA, where a nurse-directed sepsis protocol with nurses initiating 2 litres of IV fluids in sepsis patients on arrival has shown a considerable decrease in mortality. This strategy would serve as a "faster, cheaper, better" approach because it implies no additional cost on the existing models of care and infrastructure, and will build workforce capacity. Timely initiation of EGDFR would result in a significant improvement in overall quality of care delivered to sepsis patients.

Other strategies suggested by participants that could be used concurrently to build workforce capacity include (i) redesigning the existing Sepsis Pathway used in NSW; (ii) ongoing education and training, (iii) provision of more staff and resources, and (iv) advanced skill training of emergency nurses. These strategies will now be discussed further.

(i) Participants indicated that the current guidelines contain complex information in a non-clinician-friendly format. They suggested that a simple flowchart, with only essential information relevant to the busy emergency department setting, will assist in improving compliance with the Sepsis Pathway because this would facilitate

rapid decision-making. In their study in an acute medical unit, Kafle and Nath (2014) used a similar approach, where they modified the Sepsis Pathway by making it as simple as possible and changing background colours. The results showed positive feedback from nurses and doctors, and increased use of the pathway.

(ii) The need for ongoing education and training to orient less-experienced or novice staff, and to reinforce to expert staff as to the significance of EGDFR was viewed as important. In a department with high staff turnover, ongoing education is a vital intervention in ensuring sustainable improvement in compliance with EGDFR. Participants suggested that adequate staffing and more in-patient beds would be effective strategies to prevent bed blocks. This, in turn, would improve work efficiency and prevent extended delays before medical reviews and commencing treatment.

(iii) Participants stated that adequate staffing in emergency department is crucial for timely management of patients. Although increasing staffing ratios and skill-mix would require significant financial investment from the government, there would be substantial financial benefits of costs per life year gain, of up to an estimated AUD 8700 by preventing unnecessary complications, as reported in an Australian longitudinal evaluation study conducted in 2010 (Twigg, Geelhoed, Bremner, & Duffield, 2013). This indicates that there would be significant financial gains in addition to improved patient outcomes.

(iv) A few participants suggested that there should be more opportunities for advanced skill training for emergency nurses in the use of ultrasound. This would increase

capacity for the rapid assessment of fluid status in patients as well as cannulation in patients with difficult venous access. Such innovative strategies would be a positive option. The literature shows evidence of the positive impact of using ultrasound in determining pulmonary fluid status, through using bedside lung ultrasound (Judith & St-Onge, 2017), and in cannulation (Sou et al., 2017). This will enable workplace innovation by incorporating technical advances in clinical practice. It would facilitate the performance of IV cannulation of patients with difficult access and improve the most appropriate clinical decision-making for each patient by determining fluid status of high-risk sepsis patients, such as those with renal impairment, before administering bolus IV fluid. These strategies could have a direct and positive impact on sepsis patients presenting with complex and severe illness, and have the potential to decrease both the length of stay in the emergency department and unplanned admissions to ICUs.

5.10 Summary of Findings

The aim of this study was to explore the experiences of emergency nurses in initiating EGDFR in patients with sepsis, using a qualitative exploratory approach. Data were collected from 10 emergency nurses, practicing in various hospital settings across NSW, through in-depth semi-structured interviews. The interview transcripts were analysed thematically, using the Braun and Clarke (2006) framework.

The findings from this study extend and add new insights to EGDFR in managing sepsis. The participants in this study affirmed the positive impact of EGDFR, which was evidenced by their own patient experiences, where patients showed a notable improvement in their clinical condition following timely initiation of EGDFR. The participants also suggested several

practical strategies to improve timeliness to initiating EGDFR. These include providing for advanced practice or expert nurses to nurse-initiate EGDFR in sepsis, advanced skill training for nurses in the use of ultrasound, consistent training and awareness programs regarding the significance of EGDFR, and a supportive organisational climate, including additional resources such as staffing and education.

It is clear from the findings that controversies do exist among the nurses who participated in this study, regarding the ideal fluid management related to sepsis particularly for patients with pre-existing comorbidities, despite the implementation of the Surviving Sepsis Guidelines for EGDFR. Participants also described several inhibiting factors to initiating EGDFR, similar to those found in existing literature, such as overcrowding, understaffing, lack of resources during after-hours such as night shifts. They provided new insights into the challenges for practice change by expanding the scope of practice for nurses to nurse-initiate bolus IV fluids as per EGDFR. In addition, participants suggested increasing the opportunities for advanced skill education in the use of ultrasound to determine fluid status and to obtain peripheral vascular access in sepsis patients with difficult veins. They also described interprofessional communication barriers as causing delays in initiating treatment. Impaired communication between less-experienced nurses and less-experienced doctors seemed to cause delays in initiating EGDFR. Improving interprofessional communication skills through interdisciplinary training programs would improve the timely management of sepsis patients.

The qualitative approach taken in this study has enabled an exploration of the emotional experiences of nurses when dealing with patients with sepsis, particularly those who have deteriorated due to delayed initiation of EGDFR. At times, feelings of fear, guilt, helplessness

and deep concern for patient wellbeing resulted in stepping outside the scope of practice to provide timely care, in accordance with the Surviving Sepsis Guidelines.

5.11 Limitations

Interviews are known to provide a comprehensive view of a participant's experiences because they incorporate verbal and non-verbal expressions, compared with other data collection methods such as observation and questionnaires. However, like any other data collection tool, interviews are susceptible to subjective interpretation. The perceptions of the participants are subjective and are, therefore, subject to change with time. In relation to their experiences, the participants may only give what they are prepared to reveal (Alshenqeeti, 2014).

Measures were taken in this study to account for some of these limitations, by appropriately designing the questions with an expert panel and by using an exploratory approach. It is acknowledged that, on its own, an interview may be insufficient to provide a holistic view of a participant's experiences. Additionally, because the interviews were limited to emergency nurses in NSW, the transferability of these findings is limited to similar groups.

5.12 Implications for Practice

Each year, more than 5000 Australians die from sepsis. Severe sepsis leading to organ failure causes death in almost one in three patients hospitalised with sepsis (Australian Sepsis Network, 2019). EGDFR optimises organ tissue perfusion during sepsis and, in doing so, reduces the complications related to organ failure and death (Fullerton et al., 2017). The integrative literature review outlined in Chapter 2 did not reveal any studies that had explored factors inhibiting timely initiation of fluids, particularly using a qualitative methodology. This study addresses this existing gap in the literature; it provides insight into effective intervention

strategies to minimise delays in fluid initiation and aligns with the critical need to comply with the revised Surviving Sepsis Guidelines 2018, which advise initiating fluid bolus immediately on recognising sepsis (Levy et al., 2018). It is anticipated that, by providing emergency nurses with a voice, this study will lead to positive changes in the existing Sepsis Pathway.

In addition, this study has revealed a significant lack of compliance with the Sepsis Pathway in relation to timely initiation of IV fluids following presentation to the emergency department. This was also supported by previous studies (Bentley et al., 2016; Leung et al., 2017). One of the key implications for clinical practice highlighted from the findings is to empower advanced practice emergency nurses, such as Clinical Initiatives Nurses, to initiate bolus IV fluids of 20 ml/kg in accordance with the NSW Sepsis Pathway guidelines, which would lead to significant improvement in the timely initiation of EGDFR.

An implication that emerged from this study is also the need to establish consistent ongoing education for inexperienced emergency nurses, regarding the significance of EGDFR and the current sepsis guidelines. Developing a supportive organisational culture, which provides for upskilling advanced practice nurses in the use of ultrasound for cannulation and for assessing the fluid status of patients, would reduce unwarranted delays due to busy workloads and the unavailability of doctors. Fostering supportive interprofessional relationships will also enhance the effective clinical management of patients.

Strategic changes such as revising the existing format of the Sepsis Pathway flowchart with a simplified clinician-friendly version would also improve compliance with the protocol, as suggested by the participants in this study. The study participants represent various hospital settings across NSW and have varying levels of emergency nursing expertise, ranging from a

second-year registered nurse to a nurse with more than 48 years' nursing experience. Many of the experiences described were consistent among the participants, despite demographic variations. This strongly supports both the meaningfulness and relevance of the findings to the clinical setting.

5.13 Implications for Future Research

This study has identified the following inhibiting factors that influence the timely initiation of EGDFR in NSW – controversies regarding EGDFR, complexity in recognising sepsis, overcrowding and understaffing in emergency departments, poor interprofessional relationships, and limitations in the scope of practice for emergency nurses. However, further studies, using a larger cohort of participants from across Australia, would be able to provide a more comprehensive understanding at a national level. Other data collection methods, such as direct observation and surveys, could be used to further enhance the data. The findings from this study serve well as a pilot to develop an experimental research design to determine the impact of nurse-initiated EGDFR in sepsis patients, and could be used to inform a national study.

5.14 Conclusion

This thesis explored the experiences of emergency nurses in initiating EGDFR in patients with sepsis, using a qualitative approach. The purpose of the study was to identify the potential inhibiting factors in the timely initiation of EGDFR and to explore strategies to improve timeliness. The participants in this study have provided a significant understanding of the practical challenges and inhibiting factors, and have suggested innovative strategies that can improve timeliness.

The findings from this study can inform a review and the development of policies and protocols related to managing sepsis and EGDFR, such as the NSW Sepsis Pathway. These findings have key implications for current clinical practice associated with EGDFR and for future research. However, it is important to consider that managing patients with sepsis is complex and the challenges associated with the timely initiation of treatment are multifactorial. An integrative approach among health professionals, such as doctors and nurses, that includes good interprofessional communication is necessary.

The ultimate beneficiaries from this study are the patients presenting to the emergency department with sepsis. Empowering nurses to articulate their perceptions and providing an opportunity for nurses to expand their scope of practice will lead to significant improvements in patient outcomes, such as early the recognition of patients with sepsis, decrease in the extent of organ dysfunction, reduction in attributable mortality and morbidity, and positive cost–benefit for healthcare expenditure in Australia. The findings from this study could also be of interest to global stakeholders, who are striving to reduce mortality and morbidity associated with sepsis.

6. References

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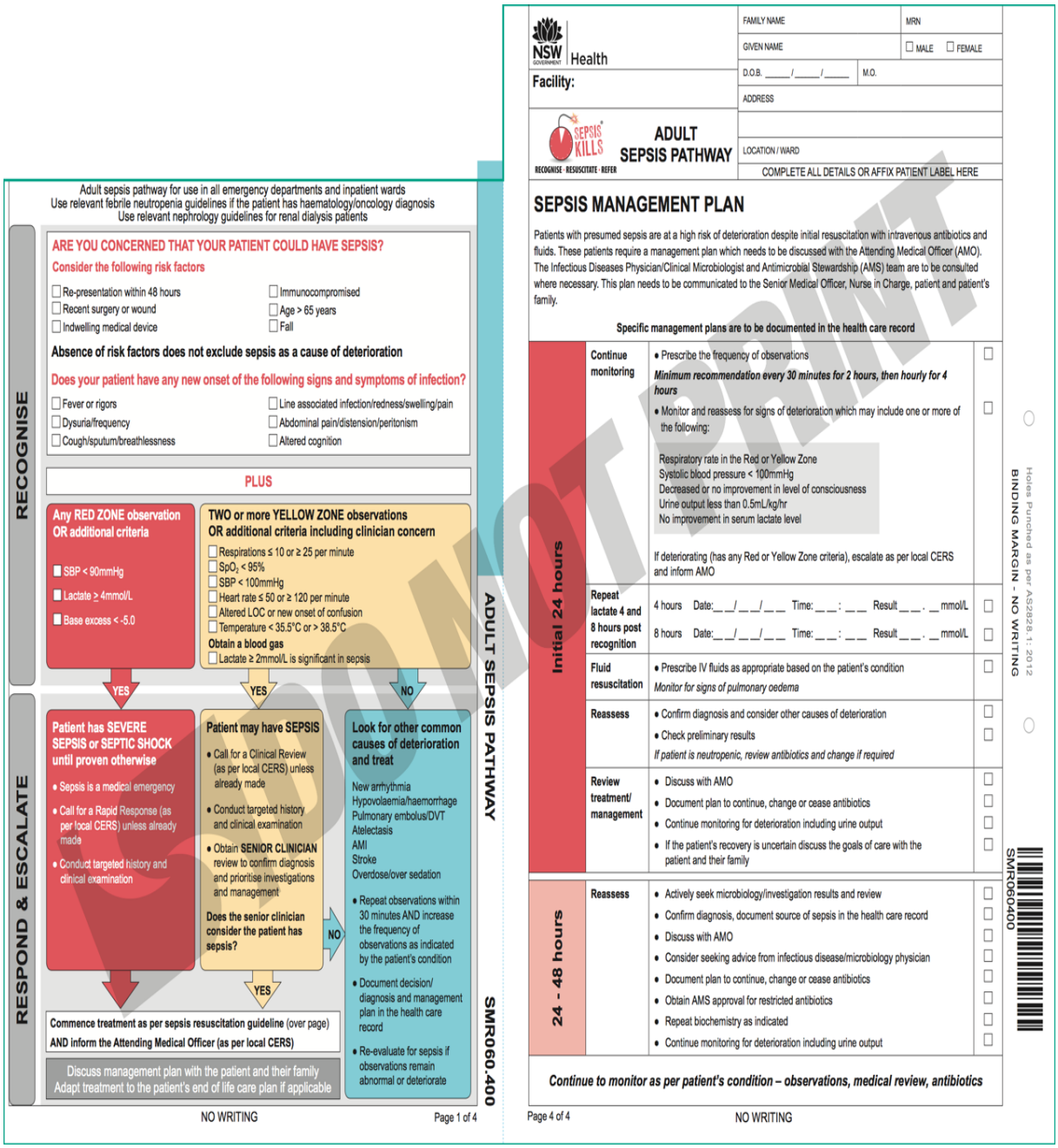
7. Appendices

7.1 Sepsis Pathway



Adult sepsis pathway for use in all emergency departments and inpatient wards
Use relevant febrile neutropenia guidelines if the patient has haematology/oncology diagnosis
Use relevant nephrology guidelines for renal dialysis patients

RECOGNISE

ARE YOU CONCERNED THAT YOUR PATIENT COULD HAVE SEPSIS?

Consider the following risk factors

- Re-presentation within 48 hours
- Recent surgery or wound
- Indwelling medical device
- Immunocompromised
- Age > 65 years
- Fall

Absence of risk factors does not exclude sepsis as a cause of deterioration

Does your patient have any new onset of the following signs and symptoms of infection?

- Fever or rigors
- Dysuria/frequency
- Cough/sputum/breathlessness
- Line associated infection/redness/swelling/pain
- Abdominal pain/distension/peritonism
- Altered cognition

PLUS

Any RED ZONE observation OR additional criteria

- SBP < 90mmHg
- Lactate ≥ 4mmol/L
- Base excess < -5.0

TWO or more YELLOW ZONE observations OR additional criteria including clinician concern

- Respirations ≤ 10 or ≥ 25 per minute
- SpO_2 < 95%
- SBP < 100mmHg
- Heart rate ≤ 50 or ≥ 120 per minute
- Altered LOC or new onset of confusion
- Temperature < 35.5°C or > 38.5°C

Obtain a blood gas

- Lactate ≥ 2mmol/L is significant in sepsis

YES / YES / NO

RESPOND & ESCALATE

Patient has SEVERE SEPSIS or SEPTIC SHOCK until proven otherwise

- Sepsis is a medical emergency
- Call for a Rapid Response (as per local CERS) unless already made
- Conduct targeted history and clinical examination

Patient may have SEPSIS

- Call for a Clinical Review (as per local CERS) unless already made
- Conduct targeted history and clinical examination
- Obtain SENIOR CLINICIAN review to confirm diagnosis and prioritise investigations and management

Does the senior clinician consider the patient has sepsis? NO / YES

Look for other common causes of deterioration and treat

New arrhythmia
Hypovolaemia/haemorrhage
Pulmonary embolus/DVT
Atelectasis
AMI
Stroke
Overdose/over sedation

- Repeat observations within 30 minutes AND increase the frequency of observations as indicated by the patient's condition
- Document decision/ diagnosis and management plan in the health care record
- Re-evaluate for sepsis if observations remain abnormal or deteriorate

Commence treatment as per sepsis resuscitation guideline (over page)
AND inform the Attending Medical Officer (as per local CERS)

Discuss management plan with the patient and their family
Adapt treatment to the patient's end of life care plan if applicable

ADULT SEPSIS PATHWAY SMR060.400

NO WRITING Page 1 of 4

NSW Health

Facility:

FAMILY NAME | MRN
GIVEN NAME | ☐ MALE ☐ FEMALE
D.O.B. ____/____/____ | M.O.
ADDRESS
LOCATION / WARD
COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE

SEPSIS KILLS
RECOGNISE · RESUSCITATE · REFER

ADULT SEPSIS PATHWAY

SEPSIS MANAGEMENT PLAN

Patients with presumed sepsis are at a high risk of deterioration despite initial resuscitation with intravenous antibiotics and fluids. These patients require a management plan which needs to be discussed with the Attending Medical Officer (AMO). The Infectious Diseases Physician/Clinical Microbiologist and Antimicrobial Stewardship (AMS) team are to be consulted where necessary. This plan needs to be communicated to the Senior Medical Officer, Nurse in Charge, patient and patient's family.

Specific management plans are to be documented in the health care record

Initial 24 hours	Continue monitoring	• Prescribe the frequency of observations ***Minimum recommendation every 30 minutes for 2 hours, then hourly for 4 hours*** • Monitor and reassess for signs of deterioration which may include one or more of the following: Respiratory rate in the Red or Yellow Zone Systolic blood pressure < 100mmHg Decreased or no improvement in level of consciousness Urine output less than 0.5mL/kg/hr No improvement in serum lactate level If deteriorating (has any Red or Yellow Zone criteria), escalate as per local CERS and inform AMO	☐ ☐
	Repeat lactate 4 and 8 hours post recognition	4 hours Date:__/__/__ Time:__:__ Result__.__ mmol/L 8 hours Date:__/__/__ Time:__:__ Result__.__ mmol/L	☐ ☐
	Fluid resuscitation	• Prescribe IV fluids as appropriate based on the patient's condition *Monitor for signs of pulmonary oedema*	☐
	Reassess	• Confirm diagnosis and consider other causes of deterioration • Check preliminary results *If patient is neutropenic, review antibiotics and change if required*	☐ ☐
	Review treatment/ management	• Discuss with AMO • Document plan to continue, change or cease antibiotics • Continue monitoring for deterioration including urine output • If the patient's recovery is uncertain discuss the goals of care with the patient and their family	☐ ☐ ☐ ☐
24 - 48 hours	Reassess	• Actively seek microbiology/investigation results and review • Confirm diagnosis, document source of sepsis in the health care record • Discuss with AMO • Consider seeking advice from infectious disease/microbiology physician • Document plan to continue, change or cease antibiotics • Obtain AMS approval for restricted antibiotics • Repeat biochemistry as indicated • Continue monitoring for deterioration including urine output	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Continue to monitor as per patient's condition – observations, medical review, antibiotics

Holes Punched as per AS2828.1: 2012
BINDING MARGIN - NO WRITING
SMR060400

Page 4 of 4 NO WRITING

NSW GOVERNMENT Health

Facility:

FAMILY NAME | MRN

GIVEN NAME | ☐ MALE ☐ FEMALE

D.O.B. ____/____/____ | M.O.

ADDRESS

LOCATION / WARD

COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE

SEPSIS KILLS
RECOGNISE · RESUSCITATE · REFER

ADULT SEPSIS PATHWAY

SMR060400

Holes Punched as per AS2828.1: 2012
BINDING MARGIN - NO WRITING

Sepsis recognition Date: __/__/__ Time: __:__

☐ **Emergency Department Patient** Triage category 1 2 3 4 5

☐ **Inpatient** Ward: _____ ☐ Clinical Review ☐ Rapid Response

RESUSCITATE

A **Airway** - Assess and maintain patent airway

B **Breathing** - Assess and administer oxygen if required; aim SpO_2 ≥ 95% (or 88-92% for COPD)

C **Circulation - Vascular access, blood/culture collection, fluid resuscitation and antibiotics**

Consider intraosseous access after two failed attempts at cannulation

Collect Blood Cultures Take two (2) sets from two (2) separate sites	☐ Yes ☐ Not obtained
For patients with a central venous access device (CVAD), take one set from the CVAD plus one set peripherally	
Collect Lactate Lactate ≥ 2mmol/L after adequate fluid resuscitation is significant	☐ Yes ☐ Not obtained Lactate: ___ mmol/L
Collect FBC, EUC, CRP/PCT, LFTs, coags and glucose BGL > 7.7mmol/L in the absence of diabetes may be significant	☐ Yes ☐ Not obtained BGL: ___ mmol/L
Order and collect other investigations and cultures prior to antibiotics (unless a **SENIOR CLINICIAN** assesses that this would result in an unacceptable delay in commencing antibiotic therapy) Eg. Urine, cerebrospinal fluid, wound swab, joint or organ space aspirate	Document investigations and cultures collected: _____ _____ _____ _____
Fluid Resuscitation (intravenous or intraosseous) • Use crystalloid • Aim Systolic Blood Pressure > 100mmHg • Monitor for signs of pulmonary oedema and review at risk patients more frequently	☐ **Emergency Department patient** Give initial 20mL/kg bolus STAT, if no response repeat 20mL/kg STAT ☐ **Inpatient** Initial 250-500mL bolus STAT, if no response repeat 250-500mL STAT **If no response in SBP after 1000mL call a Rapid Response**
Consider commencement of vasopressors	

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RESUSCITATE

C **Antibiotics** First/new antibiotic administered Date: __/__/__ Time: __:__

Blood cultures (at least two sets) and other relevant cultures should be collected **PRIOR** to antibiotic administration. However in patients with severe sepsis or septic shock, if difficult to obtain cultures do not delay administration of antibiotic(s). Refer to local Antimicrobial Stewardship policies/procedures regarding antibiotic instructions.
Consult Infectious Diseases Physician or Clinical Microbiologist if required.

☐ Severe sepsis or septic shock	Use CEC Adult Antibiotic Guideline for Severe Sepsis & Septic Shock or locally endorsed antibiotic prescribing guideline	Prescribe and administer antibiotics **within 60 MINUTES** of sepsis recognition
☐ Sepsis	Use locally endorsed antibiotic prescribing guideline	Prescribe and administer antibiotics promptly *in a timeframe directed by senior clinician (must be within 2 hours)*

D **Disability - Assess level of consciousness (LOC)** using Alert, Voice, Pain, Unresponsive (AVPU)

E **Exposure** - Re-examine the patient for other potential sources of infection to guide further investigations

F **Fluid** - Monitor/document strict fluid input/output and consider IDC (if not already inserted)

G **Check Blood Glucose Level** - Manage as per local guidelines

Monitor and Reassess

Continue monitoring, assess for signs of deterioration and escalate as per local CERS

- Respiratory rate in the Red or Yellow Zone
- SBP < 100mmHg
- Decreased or no improvement in level of consciousness
- Urine output < 0.5mL/kg/hour
- Serum lactate level of ≥ 2mmol/L (or increasing) or no improvement after adequate fluid resuscitation may be indicative of septic shock
- Consider other causes of deterioration

REFER

If no improvement Intensive Care may be required

Update the Attending Medical Officer on the patient's condition using ISBAR ☐

Discuss the management plan with the patient and their family/carers ☐

Sepsis management plan documented by a medical officer in the health care record as per page 4 (over) ☐

Name: _____ Designation: _____ Signature: _____

NO WRITING

7.2 Synthesis Table

Citation	Type of report	Type of data	Study purpose	Number	Population	Sample design
Bentley, Henderson, Thakore, Donald, & Wang, 2016	Retrospective chart review, PDSA intervention, audit, post-intervention survey	QN and QL	To evaluate the application of all aspects of the NHS Tayside Sepsis 6 bundle within one hour of ED triage time, to identify what human factors may influence achieving the one-hour Sepsis 6 bundle	155 pre-intervention group, 140 post–intervention group	Retrospective chart review prior to intervention of patients admitted with sepsis as diagnosis, senior and junior medical and nursing staff involved in the intervention, patients in ED with admission criteria selected as sepsis were prospectively selected, interventions – education and training	Patient electronic medical records retrieved from EMIS Health system, patients with admission criteria selected as sepsis pre- and post-intervention
Bruce, Maiden, Fedullo, & Son Chae, 2015	Retrospective chart review	QN	To evaluate the impact of a nurse-initiated ED sepsis protocol on time to initial antibiotic administration, ascertain compliance with 3-hour SSC targets, and identify predictors of in-hospital sepsis mortality	195	Medical records of all adult patients admitted through two tertiary emergency departments discharged with diagnosis of severe sepsis pre- and post-protocol implementation	All available patient medical records in two EDs discharged with diagnosis of severe sepsis

Burrell, McLaws, Fullick, Sullivan, & Sindhusake, 2016	Prospective and retrospective chart review for performance measures	QN	To implement a statewide program for the early recognition and treatment of sepsis in NSW, Australia	13,567	Data of patients entered in Sepsis Kills program in 97 emergency departments in NSW hospitals	Process measures (time to antibiotic, time to IV fluid) data obtained from Sepsis Kills database voluntarily submitted by the 97 emergency departments
Chelkeba, Ahmadi, Abdollahi, Najai, & Mojtahedzadeh, 2015	Meta-analysis	QN	To evaluate the effect of EGDT on mortality in severe sepsis and septic shock patients	4783	Nine randomised controlled trials, comparing EGDT with usual care	NA
Cronshaw, Daniels, Bleetman, Joynes & Sheils, 2010	Retrospective chart analysis	QN	To assess the recognition and management of patients presenting with severe sepsis across three EDs within the West Midlands, UK	255	Patients admitted to the three EDs with the diagnosis code of severe sepsis for three months	Medical records of all patients with diagnosis code of severe sepsis in a three-month period
Leisman et al., 2017	Observational cohort study	QN	To assess patterns of early crystalloid resuscitation provided to sepsis and septic shock patients at initial presentation and determine the association between time to initial crystalloid resuscitation with hospital mortality, mechanical ventilation, ICU use, and length of stay	11,182	Adult sepsis and septic shock patients captured in a prospective quality improvement database in nine tertiary and community hospitals over 1.5 years	Consecutive-sample observational cohort

Finfer, 2014	Review	NA	To review the two areas, namely, choice of resuscitation fluid and intensity of glucose control, in the management of critically ill patients with severe sepsis	NA	Review Randomised Controlled trials, analysing patients receiving crystalloids and colloids in severe sepsis	NA
Fullerton et al., 2017	Post-hoc analysis	QN	To estimate the impact of adopting the proposed new diagnostic criteria for sepsis, based on Sequential Organ Failure Assessment (SOFA) criteria, on the diagnosis and apparent mortality of sepsis in Australian and New Zealand ICUs	3780	Adult patients in 77 Australian and New Zealand ICUs on seven study days, between 2009 and 2014	Prospectively collected research data from clinical trial
Hariyanto, et al., 2017	Case report	NA	To describe the use of ROSE fluid management, along with parameters for monitoring a safe and adequate fluid balance throughout the development of sepsis	NA	An 86-year-old, previously healthy Sudanese man, who developed septic shock	NA

Hayden et al., 2016	Retrospective Quasi-experimental study	QN	To evaluate the efficacy of early, rapid identification of sepsis during ED triage, followed by a SWAT protocol emphasising rapid mobilisation of resources, standardised order sets, and early broad-spectrum antibiotics and fluid resuscitation	238	Retrospective chart analysis of adult ED patients with 108 pre-SWAT interventions and 130 post-SWAT interventions	Pre-intervention group was identified by reviewing the Epic electronic medical system, post-intervention group identified as having SWAT protocol activated in ED
Le Conte et al., 2017	Retrospective chart review	QN	To assess the compliance with the Severe Sepsis Campaign 3-hour bundle (blood culture, lactate dosage, first dose of antibiotics and 30 ml/kg fluid challenge)	130	Medical records of patients admitted to two French university hospital EDs, from February to August 2015	All available patient records screened
Leisman et al., 2016	Prospective observational study	QN	To evaluate the association of IV fluid resuscitation initiation within 30 minutes of severe sepsis or septic shock identification in the ED with in-hospital mortality and hospital length of stay	1866	All patients diagnosed with severe sepsis or septic shock for 13 months, presenting to the tertiary emergency setting	Retrieved data from a performance improvement database, where information of all patients diagnosed with severe sepsis or septic shock in ED were entered in real time for 13 months

Leung, Aguanno, & Van Aarsen, 2017	Retrospective chart review	QN	To describe ED fluid resuscitation of patients with septic shock and/or sepsis-related in-hospital mortality, prior to implementation of a sepsis medical directive	13,506	Patients with septic shock, or who expired in the ED/ hospital, were selected for manual chart review of clinical variables, including time, type and volume of ED IV-fluid administration	Data from electronic health records
Lopes Cunha & Ajeje Lobo, 2015	Prospective observational study	QN	To evaluate cumulative fluid balance during the period of shock and determine what happens to fluid balance in the 7 days following recovery from shock	40	Patients in ICU with septic shock with a mean arterial pressure ≥65 mmHg and lactate <2.0 mEq/L who are <12 hours after weaning from vasopressor	Simple random sampling
Madhusudan et al., 2014	Review	NA	To highlight current concerns and review the science behind current practices, and clarify some of the controversies surrounding fluid resuscitation in sepsis	NA	Studies discussing crystalloid and colloid fluid replacement, fluid resuscitation strategies used	NA
Marik et al., 2017	Retrospective medical records analysis	QN	To analyse the prescription of IV fluid for patients with sepsis, within the first day of ICU admission, and to evaluate the association between the volume of fluid administered and the outcome.	6,186,940	Patients older than 18 years of age with diagnosis of severe sepsis or septic shock on admission to ICU from Emergency across 500 hospitals in USA in 2013	Medical records from 2013 Premier Hospital Discharge Database

Nguyen et al., 2004	Prospective observational case-series study	QN	To examine the clinical utility of lactate-clearance before ICU admission (during the most proximal period of disease presentation) as an indicator of outcome in severe sepsis and septic shock	111	Patients with severe sepsis and septic shock in an urban ED and ICU over one-year period	Convenience sampling
Pittard, Huang, McLean & Orde, 2017	Retrospective patient records audit	QN	To evaluate the association of positive fluid balance and mortality in sepsis and septic shock in an Australian cohort	186	Patients identified to be in septic shock	754 adult patient records admitted to ICU from August 2012 to May 2015 were screened
Rivers et al., 2001	Randomised controlled trial	QN	To evaluate the efficacy of EGDT before admission to the ICU	263	Adult patients presenting to ED of a tertiary hospital, who meet minimum two of the four systemic inflammatory response syndrome criteria over a period of three years	Random allocation of patients to experimental and control groups
Roberts et.al., 2017	Survey	QN	To evaluate the knowledge, practices and perceptions of critical care nurses regarding antibiotic initiation in patients with newly recognised septic shock	133	Critical care nurses working in ED and four adult ICUs in a 320-bed academic medical centre	Paper-based self-administered questionnaire recruited via face-face invitation by Clinical Nurse Educators

Rochwerg et al., 2014	Systematic review and meta-analysis	QN	To examine the effects of different resuscitative fluids on mortality in patients with sepsis	18,916 patients (14 studies)	Randomised trials that evaluated the different resuscitative fluids in adult patients with sepsis or septic shock and death	NA
Romero et al., 2017	Pre–post retrospective randomised medical record audit	QN	To explore the number of patients presenting with sepsis before and after guideline implementation ; the impact of sepsis guidelines on triage assessment, ED management and time to antibiotics	Pre group: 47,307 Post group: 52,354	Adult patients presenting to ED of an Australian metropolitan tertiary hospital with a diagnosis of sepsis over a period of 12 months	Random medical records of all adult patients with a diagnosis of sepsis presenting to ED over 12 months, before and after implementatio n of sepsis guidelines
Singer et al., 2014	Comparative pre- and post-test analysis	QN	To determine whether introducing bedside lactate POC testing reduces the time to lactate measurement, thereby shortening the time to recognition of severe sepsis and initiation of IV fluids and antibiotic therapy	80 patients pre-test 80 patients post-test	Adult patients with suspected sepsis with lactate level greater than or equal to 2 mmol/L before and after introduction of POC lactate testing	Random allocation of patients with suspected sepsis and lactate level ≥2 mmol/L

ARISE Investigators and ANZICS Clinical Trials Group, 2014	Prospective, randomised, parallel group trial	QN	To test whether EGDT, compared with usual care, would decrease 90-day all-cause mortality among patients presenting to the ED with early septic shock in diverse health-care settings	1600	Adult patients presenting with early septic shock to 51 hospitals, mostly in Australia and New Zealand	Random allocation of patients assigning to EGDT and usual care arms
Zhang et al., 2015	Systematic review and meta-analysis	QN	To analyse all studies implementing EGDT for the management of patients with severe sepsis or septic shock	10 RCTs with 3700 patients	Patients with severe sepsis or septic shock, who received EGDT or a sepsis bundle including EGDT. Analysis of all RCTs comparing EGDT with usual care or other strategies for patients with severe sepsis or septic shock	NA

Notes: ED = emergency department; EGDT = early goal-directed therapy; ICU = intensive care unit; IV = intravenous; NA = not applicable; NHS = National Health Service (UK); NSW = New South Wales; PDSA = Plan, Do, Study, Act; POC = point of care; QL = qualitative; QN = quantitative; RCT = randomised controlled trial; ROSE = resuscitation, optimisation, stabilisation and evacuation; SSC = Surviving Sepsis Campaign; SWAT = sepsis work-up and treatment; UK = United Kingdom.

7.4 Participant Information Sheet

WESTERN SYDNEY
UNIVERSITY

Participant Information Sheet – General (Extended)

Project Title:

Emergency nurses' perceptions of the factors that inhibit the implementation of early goal-directed fluid resuscitation therapy in the management of sepsis.

Project Summary:

You are invited to participate in a research study exploring the inhibiting factors perceived by emergency nurses in the implementation of early goal-directed fluid resuscitation therapy for patients with sepsis presenting to the emergency department. The study is being conducted by *Mrs Gladis Kabil*, *Dr Stephen McNally, Dr Evan Alexandrou, Professor Deborah Hatcher from the School of Nursing & Midwifery, Western Sydney University.*

The aim of this study is to explore the explore the experiences of emergency nurses related to the initiation of early goal-directed fluid resuscitation in the care of patients with sepsis

How is the study being paid for?

This is an unfunded research project

What will I be asked to do?

1. To confirm that you have read and understood the information in this Participant Information sheet and confirm your signature on the Consent Form.
2. You will be required to participate in a face to face/video conferencing (if you are in rural NSW) interview lasting 40 to 60 minutes at a mutually agreeable location and time.
3. The face to face interview will be audiotaped and later transcribed for analysis

How much of my time will I need to give?

The face to face interview will take 40-60 minutes to complete

What benefits will I, and/or the broader community, receive for participating?

We cannot guarantee that you will receive any benefits from the study. However, it is anticipated that your awareness related to intravenous fluid management of patients with sepsis may improve following the study which may improve patient outcomes. This project can lead to positive changes in the existing Sepsis pathway such as the provision of nurse-initiated fluid therapy. The ultimate beneficiaries of this project would be sepsis patients presenting to Emergency Departments.

Will the study involve any risk or discomfort for me? If so, what will be done to rectify it?

This study is not expected to involve any risk or cause discomfort. However if you do become distressed for whatever reason, support and counselling can be sought from the list of the services provided below and or you may withdraw from the study without any consequences.

i) https://www.counsellingonline.org.au/how-we-can-help/chat-to-a-counsellor

ii) https://www.relationships.org.au/what-we-do/services/counselling

iii) https://www.beyondblue.org.au/get-support/get-immediate-support

How do you intend to publish or disseminate the results?

It is anticipated that the results of this research project will be published and/or presented in a variety of forums. In any publication and/or presentation, information will be provided in such a way that the participant cannot be identified. The researcher would like to ensure you that confidentiality of your identity, anonymity and privacy will be maintained at all times. There will be no identifying details included in any dissemination of findings.

Will the data and information that I have provided be disposed of?

Please be assured that only the researchers will have access to the raw data you provide. However, your data may be used in other related projects for an extended period of time. Please be assured that only the researchers will have access to the raw data you provide. Please note that minimum retention period for data collection is five years post publication. The data and information you have provided will be securely disposed of.

Can I withdraw from the study?

Participation is entirely voluntary and you are not obliged to be involved. If you do participate you can withdraw at any time without giving reason.

If you do choose to withdraw, any information that you have supplied will be destroyed. All electronic data stored and backed up on computer bin will be deleted and paper- based data destroyed using data shredding program.

Please contact Mrs. Gladis Kabil at 18214518@student.westernsydney.edu.au if you wish to withdraw from the research.

Can I tell other people about the study?

Yes, you can tell other people about the study by *providing them with the Mrs. Gladis Kabil's contact details. They can contact Mrs. Gladis Kabil to discuss their participation in the research project and obtain a copy of the information sheet.*

However, suitable participants will be entered into the study till the sample size is met if they wish to participate.

What if I require further information?

Please contact *Mrs. Gladis Kabil at 18214518@student.westernsydney.edu.au*

should you wish to discuss the research further.

What if I have a complaint?

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through Research Engagement, Development and Innovation (REDI) on Tel +61 2 4736 0229 or email humanethics@westernsydney.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you will be asked to sign the Participant Consent Form. The information sheet is for you to keep and the consent form is retained by the researcher/s.

This study has been approved by the Western Sydney University Human Research Ethics Committee. The Approval number is *[H13030]*.

7.5 Consent Form

WESTERN SYDNEY
UNIVERSITY

Consent Form – General (Extended)

Project Title:

Emergency nurses' perceptions of the factors that inhibit the implementation of early goal-directed fluid resuscitation therapy in the management of sepsis

I hereby consent to participate in the above named research project.

I acknowledge that:

•I have read the participant information sheet (or where appropriate, have had it read to me) and have been given the opportunity to discuss the information and my involvement in the project with Mrs Gladis Kabil

•The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

I consent to:

Please tick one relevant box below:

☐ Complete the face to face interview with Mrs Gladis Kabil

☐ Complete the video conferencing interview with Mrs Gladis Kabil (if you are in rural NSW)

☐ *Having the interview audio recorded*

I consent for my data and information provided to be used in this project and other related projects for an extended period of time.

I consent for my data and information provided to be used for this project.

I understand that my involvement is confidential and that the information gained during the study may be published but no information about me will be used in any way that reveals my identity.

I understand that I can withdraw from the study at any time without affecting my relationship with the researcher/s, and any organisations involved, now or in the future.

Signed:

Name:

Date:

This study has been approved by the Human Research Ethics Committee at Western Sydney University. The ethics reference number is: H *[insert number]*

What if I have a complaint? If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through Research Engagement, Development and Innovation (REDI) on Tel +61 2 4736 0229 or email humanethics@westernsydney.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

University of Western Sydney
ABN 53 014 069 881 CRICOS Provider No: 00917K
Locked Bag 1797 Penrith NSW 2751 Australia
westernsydney.edu.au

7.6 Demographic Data Collection Form

Data Collection Form:

ID Number:

Demographic Data:

1) Job Title: ……

2) Number of beds in your emergency department: ……...

3) Number of years of experience as a registered nurse: …….....

4) Number of years of experience as an emergency nurse: ……

5) Do you have any qualifications in emergency nursing? If yes, state type:

……..

7.7 Interview Guide

Semi structured Interview Guiding Questions

Script prior to interview:

I'd like to thank you once again for participating in this interview. As I have mentioned to you, my study is about identifying factors that inhibit or prevent the initiation of early goal directed intravenous fluid therapy in patients with sepsis presenting to the emergency department. The aim of this research is to document the possible reasons that prevent nurse's early initiation of IV fluids. Our interview today will last approximately 40 minutes to 1 hour during which I will be asking you about your views based on your experiences.

You have completed a consent form indicating that I have your permission to audio record our conversation. Do you still agree with me recording our conversation today?

___Yes ___No If yes: Thank you! Please let me know if at any point you want me to turn off the recorder or keep something you said off the record.

Before we begin the interview, do you have any questions? [Discuss questions] If any questions (or other questions) arise at any point in this study, you can feel free to ask them at any time. I would be more than happy to answer your questions.

Question 1:

What is your experience with treating patients with sepsis? Can you describe it?

Question 2:

a) From your experience with managing sepsis patients, can you describe a situation when there was a delay in initiating treatment according to the sepsis protocol?

b) What are your views about it?

Probe: Is there any specific aspect of the sepsis protocol that you think is not given priority?

Question 3:

What are your thoughts about how much IV fluids should be given to sepsis patients?

Probe: Is there a reason why you think so?

Question 4:

What do you think has to be the first intervention in sepsis patients?

Probe: What is the rationale for your views related to that question?

Question 5:

What is your experience with initiating IV fluid therapy for sepsis patients at your workplace?

Probe: a) Is there a time when you experienced difficulty? What were the difficulties?

Question 6:

a) What would you suggest are the factors that inhibit or prevent nurses from early initiation of IV fluids?

b) What recommendations do you suggest that would improve the early initiation of IV fluids?

Probe: How do you think this strategy would work?

Question 7:

What do you think about the current Surviving Sepsis guidelines for the early initiation of IV fluids for sepsis patients?

Probe: Do you have any suggestions that can improve the current guidelines?

Question 8:

In your experience with managing sepsis patients, have you faced indecision related to the early initiation of IV fluid?

Probe: (If yes…) Do you feel anything could have been done differently?

(If no…) Is there anything that you think helped with the prompt decision?

Question 9:

Has there been any incident that you recall when you felt less confident in initiating IV fluids for sepsis patients?

Probe: What are the reasons for your answer?

Question 10:

Do you think priority is given to the early initiation of IV fluids for sepsis in your work place?

Probe: What are the reasons for your answer?

Question 11: *(Hard copy of current sepsis pathway by NSW Health will be presented to the participant)*

Is there anything that you see in this pathway you think can be modified to improve timely intravenous fluid initiation?

Conclusion:

Question 12:

Is there anything you think I have missed or overlooked?

Probe: Would you like to say anything more about early goal-directed fluid resuscitation in sepsis?

Thank you very much for your time!

7.8 The Australasian Triage Scale

The Australasian Triage Scale (ATS) is a clinical tool used to establish the maximum waiting time for medical assessment and treatment of a patient.

ATS Category	**Treatment Acuity** (Maximum waiting time for medical assessment and treatment)
ATS 1	Immediate
ATS 2	10 minutes
ATS 3	30 minutes
ATS 4	60 minutes
ATS 5	120 minutes

(Source: Australasian College of Emergency Medicine, 2019)