

Research paper

Emergency nurses' experiences of the implementation of early goal directed fluid resuscitation therapy in the management of sepsis: a qualitative study

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ABSTRACT

Background: Severe sepsis can lead to organ failure and death if immediate treatment, such as intravenous fluids and antibiotics, are not commenced within the first hour. Time - critical initiation of intravenous fluids which in other words is early goal directed fluid resuscitation has not always been given its clinical priority. This qualitative study aimed at exploring the experiences of emergency nurses initiating early goal directed fluid resuscitation in patients with sepsis.

Methods: Using an exploratory approach, face - to - face semi - structured interviews were conducted with ten registered nurses working in emergency departments across New South Wales, Australia. Thematic analysis was used for data analysis.

Findings: Participants described various factors that inhibited the timely initiation of early goal directed fluid resuscitation, some clinical practice challenges, and strategies to improve nursing practice. Most participants, particularly those practicing as Clinical Initiatives Nurses suggested the incorporation of nurse initiated early goal directed fluid resuscitation for patients with sepsis as part of their scope of practice.

Conclusion: Our findings identified several barriers that inhibit effective nurse - initiated early goal directed fluid resuscitation. It is anticipated that these findings will provide validation for the re-evaluation of the existing protocols and practice guidelines to increase the scope of practice of emergency nurses initiating early goal directed fluid resuscitation.

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Introduction

Sepsis is a leading cause of death in healthcare settings worldwide. Globally, nearly 30 million people develop sepsis every year and has an attributable mortality rate of up to 50% which equates to one death every 3.5 seconds [1]. In Australia, more than 5000 people die of sepsis each year, three times the number of deaths caused by road traffic accident and is greater than deaths due to prostate, breast, colorectal cancers and HIV/AIDS combined together [2].

Sepsis is a time - critical emergency that requires early recognition and prompt management. To improve the recognition and outcomes of sepsis, evidenced - based practices were incorporated

collectively by the 'Surviving Sepsis Campaign' in 2002 to form the sepsis management guidelines. An integral part of the sepsis guidelines is the 'Sepsis Pathway' [4]. The Pathway is used widely across the world and in Australia and was introduced in NSW in 2011 as part of the 'Sepsis Kills' program. The Pathway recommends the use of a care bundle known as Early Goal Directed Therapy (EGDT), a group of evidence - based interventions which when implemented together have proven to be more effective than when implemented as individual therapies. EGDT has significantly improved patient outcomes with a 16% reduction in mortality [5]. The interventions include (i) obtaining lactate level and blood cultures, (ii) administering empirical antibiotics (iii) administering 30 ml/kg IV fluids to correct hypotension or lactate >4 mmol/L (iv) commencing vasopressors in life - threatening situations. The Pathway maintains that all of these interventions should be initiated immediately and collectively from the time of presentation with the primary aim of optimising vital organ perfusion and haemodynamic stability [6].

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The New South Wales Clinical Excellence Commission (NSW CEC) has modified the Sepsis Pathway and recommends initiating 20 ml/kg as an initial IV fluids bolus instead of 30 ml/kg and repeating further 20 ml/kg IV fluids bolus if haemodynamic stability is not returned [7]. Despite evidence of its significance, compliance with timely initiation of Early Goal Directed Fluid Resuscitation (EGDFR) is suboptimal. Studies have shown that the time to initiation of EGDFR can be delayed by up to over an hour after presentation and nearly half do not receive adequate IV fluids resuscitation [8,9]. Although a number of studies have analysed factors contributing to the delay in first antibiotic dose administration [10,11], there is limited data investigating, specifically, the individual element of fluid resuscitation. The aim of this study was to explore the experiences and the factors that emergency nurses considered inhibiting the initiation of EGDFR for patients identified with sepsis.

Method

An exploratory approach using face to face semi - structured interviews was used. The purpose was to describe inhibiting factors expressed by emergency nurses that impacted the timely initiation of EGDFR. Participants were ten registered nurses from both metropolitan and regional emergency departments (EDs) across NSW.

Sampling

To facilitate diverse participation, two purposive sampling techniques were used, maximum variation and snowball sampling. The maximum variation technique involved inviting participants with various levels of emergency nursing experience and working across various emergency settings, such as metropolitan, tertiary trauma centres, rural and non - tertiary hospitals [12]. The snowball sampling method allowed for new participants to be enrolled through referrals from existing participants [13].

Ethics

Ethics approval was obtained from the Western Sydney University Human Research Ethics Committee (approval number: H13030) prior to commencing the study.

Participant recruitment

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. 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 (Figs. 1 and 2).

Flyers promoting the study were posted on social media sites of professional organisations such as the Australian College of Emergency Nursing. The participants recruited through social media then assisted in further recruitment through snowball sampling. Participant information sheets and consent forms were provided prior to the interview. Health settings of participants included major trauma hospitals to smaller district hospitals and regional centres from metropolitan Sydney, Greater Western Sydney, North Sydney, and the Illawarra region. Twelve registered nurses expressed willingness to participate in the study. Two were excluded as they were not currently practising in the ED. The participants ranged from 25 to 68 years in age with an average age of 39.9 years. Eight participants were female and two were male.

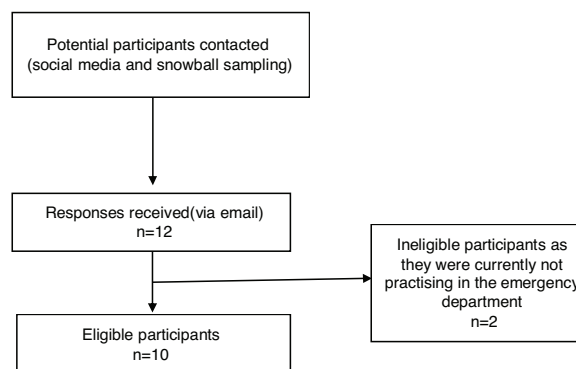


Fig. 1. Flowchart of participant recruitment.

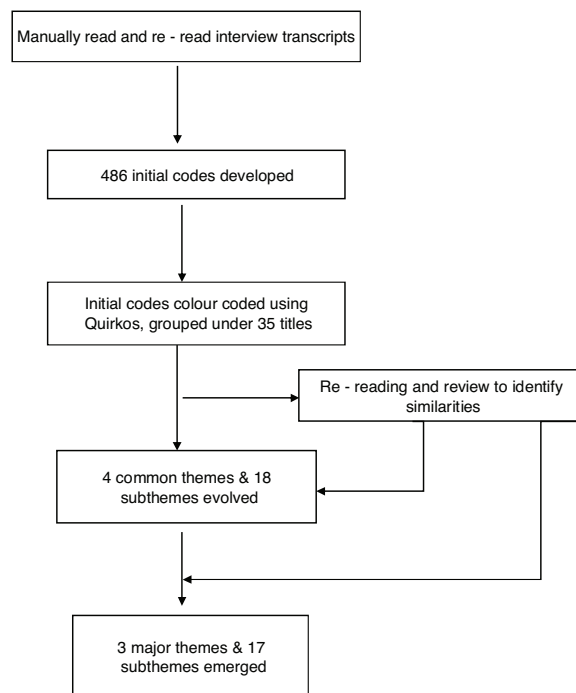


Fig. 2. Flowchart of data analysis.

The participants had on average 15.5 years of nursing experience as registered nurses with an average of 11 years of experience working in the emergency department. Six out of the ten participants were from metropolitan trauma hospitals, three were from smaller district hospitals and one was from a regional hospital.

Data Collection

Semi - structured face - to - face interviews were conducted. All interviews were conducted in neutral settings that were mutually agreeable for both participants and the interviewer. Participant demographics were collected as part of the study protocol. An interview guide with 12 questions was used during the interview, the approach, however, remained flexible to facilitate participation. The questions and prompts used in the guide were constructed through the emergency nursing experience of the researcher as well as through relevant literature and piloted by three clinical experts in emergency nursing. The data analysis began concurrently during data collection and continued until data saturation was achieved and determined after the tenth interview as no new patterns evolved. All interviews were digitally audio - recorded

Table 1
Demographic details of participants.

Participant Age	Gender	Job title	ED Beds	Years of nursing experience	Years of ED experience
68	Female	RN, CNE	24	48	25
30	Male	RN	55	6	5
47	Female	RN, CNE	16	23	23
35	Female	RN	23	10	5
47	Female	RN, Nurse Unit Manager	55	22	10
31	Female	RN	56	10	8
36	Female	RN	30	12	12
39	Female	RN	56	1	1
25	Male	RN, CNE	22	4	3.5
41	Female	RN, Sepsis Champion	56	19	18

Job Title Key:

RN = Registered Nurse

CNE = Clinical Nurse Educator: provides clinical nurse education within the emergency department

NUM = Nurse Unit Manager: manages and provides nursing leadership within the emergency department.

Sepsis Champion: provides training, strategies to optimise timely recognition and management of sepsis and monitor effectiveness.

using a digital voice recorder and transcribed verbatim with the participant's consent (Table 1).

Data Analysis

Data transcription was undertaken by external professionals. All transcripts were manually audited to check against original recording for accuracy. The final version of the transcripts were imported into the Quirkos software program (version 2.0.1, Edinburgh, UK) for coding which enabled the researcher to file, code, and retrieve data. The thematic analysis of the interview transcripts was informed by Braun and Clarke's 2006 six - step framework [14]. The researcher manually read and re - read all ten interview transcripts to become familiar with the concepts and identify similarities in the data. The codes initially developed were then grouped to identify similar texts, grouping texts with related content. The initial coding report was reviewed by the study authors. During thematic analysis, codes evolved into common patterns. The initial codes were analysed under three themes and seventeen subthemes. Subthemes were also grouped under the parent themes.

Findings

Among the ten participants, three themes were identified as being most relevant to their experiences: (i) nurses' perceptions and experiences; (ii) clinical practice challenges; and (iii) strategies to improve compliance.

Nurses' perceptions and experiences

Controversies regarding the importance of IV fluids was seen among the participants with the less experienced participants giving less importance to EGDFR. Participants recognised the significance of IV fluids bolus and attributed it to the positive outcomes they have seen in their patients.

"The fluid challenge is a huge one. We tend to get onto that pretty quickly" Macey (EDRN - 23)

"I just see a big response to it (IV fluids). It seems to work better than anything. . . , 100%" Jackie (EDRN -10)

However, less experienced participants indicated that initiating IV fluids is not a priority. They felt that treating the infection with antibiotics should take precedence over EGDFR.

"The fluids will only help with tachycardia and temperature, but won't treat the infection . . . We don't try to push the fluids; we try to push antibiotics"

Jill (EDRN - 1)

Participants highlighted the negative patient outcomes when IV fluids was not initiated early. They recalled real patient stories of deterioration.

"With the delay of treatment, they became more unwell. They end up in resuscitation area with inotropes, arterial lines and in High Dependency Unit" Annie (EDRN -5)

Participants also described poor patient outcomes, prolonged hospitalisation, complications, and critical care admissions associated with delayed initiation of EGDFR. Incorrect allocation of a triage category plays an important role in delayed IV fluids initiation where sepsis has been overlooked, particularly during after - hours.

"They came in, they were not picked up as a category 2, given a category 3, so . . . a lot of time to work them up: 30–40–60 minutes. And by the time you get the patient, 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 . . . "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 . . . ended up going to HDU [High Dependency Unit]" Jill (EDRN - 1)

It was also suggested that the ideal quantity of IV fluids to be administered would depend on the individual health status of the presenting patients.

"It depends on the morbidities, renal, heart function, whether they've got fluid restrictions and their age. 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" Sean (EDRN - 3.5)

Compliance with the Sepsis Pathway was reported as poor and adherence to the Sepsis Pathway was related to busyness and acuity. The actual time of intervention ranges from two to three hours, while the recommendation is to commence treatment immediately.

"Two hours. That's the worst I've seen. Previously, it was like 68 minutes" Diana (EDRN - 18)

However, participants, from a non - tertiary hospital and a rural setting, stated that medical officers were available in their departments to review sepsis patients within the first ten minutes of arrival.

"Yeah, everything in 10 minutes. The 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)

On further exploring the clinical practice to overcome limitations, 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 more experienced with up to 48 years of nursing experience, and those who have been in roles such as clinical nurse unit managers, clinical educators, and sepsis project champions. Experienced participants were more likely to practice intuitive decision - making when faced with clinical challenges.

“Because we actually do it anyway, which is how we just chart it illegally, but we know that they need their fluids” Jackie (EDRN -10)

“So, I know, based off experience some of us will . . . I would cannulate. I would start a bag of saline and 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” Sean (EDRN - 3.5)

However, participants with limited experience stated that they would not initiate IV 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. Just because I like to keep my registration.” Jill (EDRN - 1)

Clinical Practice Challenges

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

“I think there’s a real focus now on febrile tachycardia. If you’re missing particularly the temperature. . . if they present with a temperature of 35.5 . . . that’s where it gets missed” Macey (EDRN - 23)

Busy workloads were identified as the primary factor leading to delays in initiating treatment, describing EDs as constantly busy, overcrowded, and understaffed. Several unwell patients presenting at the same time was suggested as resulting in competing priorities.

“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) and “The staffing shortages and the cutback on staff . . . That’s got danger written all over it for our septic patients” Macey (EDRN - 23)

Participants conveyed that the complexity of patients’ presentations and comorbidities influenced the commencement of IV fluids immediately. Concerns were also expressed about unwell patients with difficult veins to cannulate.

“The only other thing that would stop me from being able to intervene was somebody who had very, very difficult veins. I have no choice but to put them back into the waiting room, therefore, nothing is done for them until they’re seen medically. That is a really big barrier” Jackie (EDRN - 10)

There was a discussion about the interdisciplinary conflicts that exist in the ED. Participants conveyed that interprofessional issues; such as attitudes, behaviour, and communications between nurses and medical officers were at times inhibiting. Other associated factors were the experience level of nurses, their clinical skill set, and assertiveness.

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.” Jackie (EDRN - 10) and “As a junior nurse, you can’t do a couple of stuff like cannulate or escalate” Annie (EDRN - 5)

Getting a medical officer’s order to initiate IV fluids can be a significant cause of delay because the current NSW Sepsis Pathway does permit nurses to initiate the recommended amount of IV fluids in sepsis. Participants stated they felt as if “their hands were tied” due to the limited scope of practice. Experienced emergency nurses have a broad range of experience working in various roles within

the emergency department and have generally completed the Transition to Emergency Nursing Program offered by NSW Health. These experienced nurses then progress to become advanced practice emergency nurses such as Clinical Initiatives Nurse (CIN). CIN nurses are authorised by the NSW Health Department to prescribe treatment initiatives such as analgesia and intravenous fluids within the scope of standing orders. This includes prescribing intravenous Hartmanns at the rate of 1 litre over 8 hours. However, this is incongruent with the Sepsis Pathway as it recommends commencing intravenous fluids as a 20 ml/kg intravenous fluid bolus.

“CIN can prescribe fluids, but we can only prescribe slow Hartmanns” Sean (EDRN - 3.5) and “The problem is we still want the doctor to come. It’s getting that doctor to come to order that fluids because the sepsis pathway doesn’t allow us to nurse- initiate IV fluids, does it? It has to be sighted by the doctor . . . even though they are advanced emergency trained, sepsis does not fall into that standing order for initiating fluids” Diana (EDRN - 18)

Strategies to Improve Compliance

Participants suggested that supporting nurse - initiated IV fluids for patients with sepsis would significantly improve the timeliness of EGDFR and questioned the authenticity of the constraints currently on nurses, citing that they have standing orders 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) and “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 felt that the current Sepsis Pathway is complex, overloaded with information and is non -clinician - friendly and suggested redesigning it

“It’s a little bit complex. It’s a bit busy. . . For a junior nurse to read that pathway, there’s no way” Macey (EDRN - 23)

They suggested that positive strategies included education, training, and constant re-enforcement regarding the Sepsis Pathway.

“I think everybody knows about the pathway . . . it is having that persistent training because people would forget.” Diana (EDRN - 18)

It was also suggested that more nurses could be taught ultrasound guided IV cannulation as that would speed up IV access for patients with difficult access

“We’re trying to run education for the nurses to start learning ultrasound cannulation” Cathy (EDRN - 25)

Discussion

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 [2]. EGDFR optimises organ tissue perfusion during sepsis and, in doing so, reduces the complications related to organ failure and death [15]. The findings from this study provide key insights regarding emergency nurses’ experiences; challenges around timely initiation of EGDFR and strategies to improve its timeliness. Throughout the data, the concept of patient deterioration associated with delayed initiation of EGDFR was repeated. It is evident that the factors causing delays in initiating EGDFR are common across various EDs. While some of the discussions are comparable to what is known from the literature review, several new insights have been revealed by the participants.

Most participants confirmed the positive effects of EGDFR. Their clinical decision to initiate intravenous fluids early is a result of the impact they see on their patients, such as improved tissue perfu-

sion. Several experimental studies, including the landmark study of the Early Goal Directed Therapy Collaborative Group [15] have confirmed that administering intravenous fluids, particularly in the early phases of sepsis, improves microcirculation and decreases mortality by 16% [16], reduces intensive care admissions and length of stay in hospitals [17].

However, a few less experienced participants in this study questioned the need for intravenous fluids and stated they would administer antibiotics to treat the infection and not intravenous fluids. An explanation for this may be that their inexperience in treating patients with sepsis, and the associated fear of fluid overload, may have influenced their perceptions regarding EGDFR resulting in adhering to the rules with no sense of intuition. This is in congruence with studies [18] that argue that excessive fluid administration in sepsis may lead to adverse effects, such as acute respiratory distress syndrome resulting from fluid overload. Nonetheless, these studies do not analyse the time of administration, but rather consider the total cumulative fluids administered and warn against injudicious use of intravenous fluids beyond the early resuscitation phase.

Several participants confirmed that delayed intravenous fluids initiation in sepsis results in patient deterioration with patients then requiring more aggressive management such as the use of inotropes, invasive arterial lines, and ICU admissions. This is further supported by the findings from a recent observational cohort study, where patient outcomes were measured in terms of end organ failure. Of the patients with sepsis who did not receive early intravenous fluids initiated by the ambulance, more than half showed signs of organ failure in ED. Conversely, of those who received intravenous fluids in their pre-hospital treatment, 40% showed improved outcomes [19].

The volume of intravenous fluids administered during the initial resuscitation phase plays a crucial role in patient outcomes. Participants described that the ideal volume of fluid that they prefer to administer is dependent on the patient's comorbidities. Concerns related to the development of pulmonary oedema associated with excessive intravenous fluid therapy, particularly in patients with pre-existing comorbidities are contradicted, in the findings from a 2014 retrospective cohort study which suggested that there is no significant association between the volume of fluid administered within the first 6–24 hours and acute respiratory distress syndrome [20].

Most participants affirmed anecdotally that their department's compliance with EGDFR would be poor with times ranging from two to eight hours and attributed several factors discussed below that contribute to extended delays. This finding supports those of previous studies analysing the time to EGDT [8,9]. 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 [21]. 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.

The busy workload of ED 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 retrospective analysis revealing that increased ED occupancy and patient hours significantly decreased the likelihood of patients with sepsis receiving intravenous fluids within the first hour [22]. Many participants in this study described that the time it takes for the first medical officer to review the patient after triage can cause significant delays in initiating EGDFR which is similar to findings from previous studies [8]. They reported that it can take up to eight hours

during night shifts, with patients remaining in the waiting room with no EGDFR commenced.

Critically ill patients with poor peripheral circulation on presentation tend to deteriorate rapidly. This is compounded by less experienced nurses without cannulation competency, leading to delays in initiating intravenous fluids. These findings are similar to that of a recent study, where Australia is identified as a nation with one of the lowest numbers of nurses who can cannulate. Undeniably, this skill gap can contribute to delays in initiating EGDFR [3].

This study reveals several new findings that are not previously reported in the literature including (i) interprofessional communication barriers (ii) limitations in the scope of practice for emergency nurses, and (iii) Intuitive clinical decision making and practising outside the scope of practice. Participants acknowledged that interprofessional communication difficulties can exist between medical officers and nurses, that were associated with poor communication skills and knowledge limitations of inexperienced nurses. However, there was agreement that senior medical officers do trust the clinical decision making abilities of experienced nurses.

This study has identified a clear disparity between advanced clinical practices. Clinical Initiatives Nurses have well developed advanced practice skills and are authorised to nurse-initiate intravenous Hartmann's over eight hours. While a Clinical Initiatives Nurse can initiate intravenous fluids for other medical presentations, they are not authorised by the Sepsis Pathway 2018 to initiate an intravenous bolus in patients with sepsis who require it urgently. In comparison, NSW Ambulance services authorise all paramedics to initiate intravenous fluids in accordance with the Sepsis Pathway on the scene and therefore, raises the question and validity of this restriction placed on emergency nurse practice. As a consequence, participants in this study revealed that they are intuitively practicing outside of their scope of practice in order to decrease the time to EGDFR. Participants justified this due to the patient's pressing need for intravenous fluids and the nurses' deep concern regarding the delay in treatment and the potential for patient deterioration.

A significant recommendation arising from this study relates to the authorisation of nurse-initiated bolus intravenous sodium chloride 0.9% in accordance with the Sepsis Pathway. Participants stated that nurses at the Clinical Initiatives Nurses level, who can otherwise initiate intravenous 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 recommendation would benefit as a "faster, cheaper, better" approach to clinical practice because it implies no additional cost on the existing models of care and infrastructure, building workforce capacity. Other concurrent recommendations for practice include (i) redesigning the existing NSW Sepsis Pathway; (ii) ongoing education, (iii) more staffing and resources, and (iv) advanced skill training of emergency nurses.

Conclusions

The findings from this study can inform a review and the development of policies and protocols 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 are multifactorial. The ultimate beneficiaries of the findings of this study are the patients presenting to ED 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, reduction in attributable mortality and mor-

idity, and positive cost - benefit for healthcare expenditure in Australia.

Limitations

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 which may not reflect their actual practice. Gender balance comprised mostly of women which could influence the data; however, this is reflective of the gender distribution in the Australian nursing workforce. Additionally, because the interviews were limited to emergency nurses in NSW, the transferability of these findings is limited to similar groups.

Funding

This research received no external funding.

Conflicts of interest

The authors would like to report no conflicts of interest.

What is known

- Every year, more than 5,000 Australians die of sepsis. Severe sepsis is a life-threatening medical emergency that can lead to multiple organ failure and death if intravenous fluids and antibiotics are not commenced within the first hour from presentation. The revised 2018 Surviving Sepsis Guidelines modified in response to the urgent and crucial nature of early effective fluid management recommends intravenous fluids to be started immediately on identifying patients with sepsis. Whilst a large number of studies have analysed administration of first dose antibiotics, there are limited studies regarding the time critical initiation of early goal-directed fluid resuscitation despite both being part of the recommendations.

What this paper adds

- This study provides a detailed view from a nursing perspective of inhibiting factors related to early goal-directed fluid resuscitation. This new knowledge addresses the existing gap in the literature and provides insight into the effective intervention strategies to minimise delays in early goal-directed fluid resuscitation. This aligns with the critical need to comply with the revised Surviving Sepsis Guidelines 2018 to initiate fluids immediately on recognising sepsis. By providing emergency nurses a voice, this study is anticipated to 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 in Australia. Empowering nurses by articulating their perceptions and providing an opportunity for nurse initiated fluids could lead to significant improvement in patient outcomes.

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