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BMJ Open Out-of-hospital births and the experiences of emergency ambulance clinicians and birthing parents: a scoping review protocol

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ABSTRACT

Introduction Emergency ambulance clinicians attend a wide range of prehospital emergencies, including out-of-hospital births (OOHBs). Intrapartum care comprises approximately 0.05% of emergency medical services' caseload, with only ~10% of intrapartum cases progressing to birth in emergency ambulance clinician care. However, this low exposure rate potentially allows obstetric clinical skills and knowledge to decay, which may impact on patient care. Additionally, unplanned OOHBs are known to have a higher incidence of complications and adverse outcomes than their counterparts born in hospital, such as postpartum haemorrhage or hypothermia. This scoping review will explore OOHBs and associated complications in emergency ambulance clinician care, investigate birth parent, significant partner and clinician experiences regarding OOHBs, and consider barriers and challenges to optimal patient care, to identify future research opportunities and associated knowledge gaps for this patient cohort.

Methods and analysis This scoping review will follow the nine-step methodological framework suggested by the Joanna Briggs Institute and use the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews. Five electronic databases (MEDLINE via EBSCO, CINAHL, Embase, Web of Science and Wiley Online) will be searched to identify articles for inclusion. The 'participant, concept, context' criteria will be used to identify suitable search words regarding OOHBs in emergency ambulance clinician care. The review will include peer-reviewed and preprint literature. Two reviewers will independently assess articles based on title and abstract for inclusion in the review. Data will be charted using a data extraction tool for consistency and provide a succinct descriptive summary of the results.

Ethics and dissemination This study does not require ethical review as all the information obtained will come from publicly available resources. Results will be disseminated via a peer-reviewed publication. This scoping review is preregistered with the Open Science Framework (<https://osf.io/ta35q>).

INTRODUCTION

Emergency ambulance clinician attends a wide range of prehospital situations ranging from low-acuity conditions to high impact

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ There appears to be no existing systematic or scoping reviews investigating the current evidence base regarding out-of-hospital births (OOHBs) in emergency ambulance clinician care.
- ⇒ This review will help describe birthing parents' experiences of their unplanned OOHB and may highlight areas where their experience can be improved.
- ⇒ Specific factors relating to emergency ambulance clinicians' confidence, experiences, clinical challenges and training will be explored to inform future training opportunities.
- ⇒ Unplanned OOHBs are low frequency presentations with potentially high risks, and up-to-date information regarding knowledge and research gaps is required for future research and training purposes.

trauma cases.¹ Included in this diverse case-work are obstetric patients who may present with either emergency perinatal or non-obstetric related conditions. In rare instances, emergency ambulance clinician assistance is required for an imminent birth when the birth parent has not been able to reach the intended birthing hospital or maternity suite in time. Such cases are given the acronyms 'births before arrival' (BBA) or 'out-of-hospital births' (OOHBs).² In addition to this, emergency ambulance clinicians may be requested to attend planned home births where the midwife requires emergency assistance for the birth parent, neonate or both. Reasons this may occur are varied but include labour not progressing in a timely manner requiring urgent transportation, postpartum haemorrhage or neonatal cardiopulmonary resuscitation.^{3 4}

While the number of intrapartum cases attended by emergency ambulance clinicians in Australia is low comparative to other medical issues (0.05% of cases attended by the Queensland Ambulance service between 2010 and 2011 were for intrapartum care,



a total of 6135 cases), this still equates to thousands of cases attended by emergency ambulance clinicians across the country each year, with approximately 10% of intrapartum cases progressing to birthing in emergency ambulance clinician care.⁵ The Australian Institute of Health and Welfare provides annual reporting on 'Australia's Mothers and Babies'. Reviewing the 2019 'Place of Birth' data, a total of 1876 births occurred in 'other' locations outside of hospitals, birth centres or planned home births, equating to 0.6% of all births in Australia. The category for 'other' birth locations includes unplanned home births, 'free births' where a birth occurs without a midwife or medical professional in attendance, community health centre births including those in remote areas of Australia and babies born before arrival at hospital.⁶ While it cannot be ascertained exactly how many of these 1876 births emergency ambulance clinicians attended, this amounts to just over 5 'other' births per day in Australia.⁶ Given the number of registered emergency ambulance clinicians (paramedics) in Australia for 2020/2021 is recorded at 21 492,⁷ (although this figure likely includes a number of non-operational clinicians), the likelihood of an emergency ambulance clinician assisting with an OOHb is rare. As such, OOHbs are classified as 'low-frequency, high-risk' callouts.⁵

Most often in high-income countries unplanned OOHbs occur at full term, which is defined as ≥ 37 weeks' gestation, and are simply a precipitous birth.^{8 9} Some birth parents who have described their unplanned OOHb experience explain they misinterpreted their bodies signals and felt they were still in early labour, or they were confused as to when to engage with the healthcare system.^{2 9} Being multiparous or having a short second stage of labour have been found to increase the risk of an unplanned OOHb, as these patients may have reduced pain and less frequent contractions.¹⁰ However, there are instances where unplanned OOHbs may inherently come with complications, with one example being premature labours.⁵ Prematurity is considered a complication by itself and contributes to significantly increased maternal and neonatal morbidity and mortality worldwide¹¹; however, it can be associated with additional complications if the fetus is underdeveloped. If < 37 weeks' gestation, the neonate may experience respiratory distress once born due to a deficiency in pulmonary surfactant.^{12 13} Furthermore, as the smaller fetus may not have engaged in the pelvis yet, non-cephalic presentations such as breech or cord prolapse are more common than with a full-term pregnancy.¹⁴ As such, emergency ambulance clinicians may not only be assisting with a premature OOHb, but they may also have a breech presentation, followed by a 'flat' neonate with breathing problems. Postpartum haemorrhage may also present more commonly with preterm births,¹⁵ which makes for a high-stress and high-risk situation for patients, bystanders and clinicians. Both birth parents and emergency ambulance clinicians have described some unplanned OOHbs as traumatic, requiring psychological support following

their experiences.^{9 16} Excluding planned home births under the care of midwives, birth parents and neonates born in the prehospital environment are at increased risk of adverse outcomes in comparison to their counterparts born in hospital.^{17 18} The most common maternal consequences are a prolonged placental birth (third stage) and postpartum haemorrhage, which may necessitate a blood transfusion.¹⁰ For the neonate, hypothermia is the leading complication^{8 10 17} and neonatal mortality rates have been shown to be significantly higher for unplanned OOHbs.^{17 18}

Emergency ambulance clinician's exposure to obstetrics situations during undergraduate education is typically limited,⁵ with instruction oftentimes forced to revolve around classroom simulations of varying fidelity. Given the low exposure to births and birthing complications emergency ambulance clinicians experience in both the education and workplace setting, prehospital clinicians have expressed feeling underprepared for obstetric emergencies, advise they lack confidence in their knowledge and skills and desire additional training in obstetric situations.¹⁶ The infrequency of OOHbs attendances by emergency ambulance clinicians means it can be many years between obstetrics training and using these specialised skills in real-world settings (with real-world consequences). After learning a new clinical skill, an individual's performance will increase over time with dedicated practice, eventually becoming proficient and competent in that skill. However, if that skill is not frequently practiced, decay starts to occur, and performance can fall below an acceptable competency level.^{19 20} Similarly, knowledge also decays rapidly over a short time-frame.^{19 21}

In the prehospital environment, it is essential that such specialised knowledge and skills are retained above minimum competency levels as they are vital for the well-being of the birth parent and neonate (or fetus). These skills and knowledge need to be readily retrievable during an emergency, and ideally emergency ambulance clinicians should be confident in their implementation while attending obstetric emergencies.

A further consideration regarding unplanned OOHbs is the potential for more prehospital births to occur resulting from SARS-CoV-2 and the impact this virus has had on healthcare systems worldwide. In 2020, there were less presentations and admissions to Australian hospitals than previous years largely attributable to SARS-CoV-2 restrictions.²² Townsend *et al*²³ describe changes to obstetric patients' engagement with healthcare systems worldwide, with reduced antenatal visits and an increase in virtual/remote care and unscheduled hospitalisations. Another outcome of hesitancy in healthcare seeking could be an increase in unplanned OOHbs.

A scoping review of the literature is necessary to develop a sound understanding of the current prehospital landscape regarding OOHbs in emergency ambulance clinician care and obstetric emergencies. Empirical evidence is required to understand the current epidemiology of

OOHBs in emergency ambulance clinician care and the risks and challenges inherent with this patient cohort. Given the limited training and education emergency ambulance clinicians receive in unplanned OOHBs and the low exposure rate on-road, this is likely to lead to rapid skill and knowledge decay. This lack of current training and exposure may increase clinician anxieties regarding obstetrics patients and birthing. Understanding clinician's experiences regarding unplanned OOHBs is important to clarify deficits in education and how emergency ambulance clinicians may best be supported with future training programmes. The birthing parents' experiences are also salient, as this will provide information on how OOHBs attended by emergency ambulance clinicians impact on patient care clinically and psychologically, and possibly any long-term consequences resulting from their experiences. This scoping review may identify areas for future research into OOHBs in emergency ambulance clinician care and prehospital obstetric emergencies and identify associated knowledge gaps. Additionally, it is unclear whether there is currently sufficient literature to undertake a full systematic review. This scoping review may therefore inform the feasibility of undertaking a systematic review and meta-analysis in the future.

A preliminary search of MEDLINE, CINHALL, Cochrane Database of Systematic Reviews, the JBI Database for Systematic Reviews and Implementation Reports and Open Science Framework indicates there are currently no published scoping or systematic reviews about patient's birthing in emergency ambulance clinician care.

Study objectives

The objective of this scoping review is to explore (identify, categorise, summarise and synthesise) the current evidence base concerning emergency ambulance clinician involvement in OOHBs; both unplanned OOHBs and planned home births requiring emergency ambulance clinician assistance. The review will also identify knowledge and research gaps in the existing evidence base for future research and training purposes, and the feasibility of undertaking a systematic review and meta-analysis.

The following questions will guide the review:

- ▶ What is emergency ambulance clinician involvement in OOHBs, including the incidence, risk factors and complications?
- ▶ What are the birth parent, significant partner and emergency ambulance clinician experiences with OOHBs?
- ▶ What barriers and challenges are there to optimal treatment provision for unplanned OOHBs and associated complications?

METHODS AND ANALYSIS

Scoping review design

The scoping review design has been based on the framework recommended by the Joanna Briggs Institute (JBI),²⁴ incorporating the updated JBI methodology reported by

Peters *et al*²⁵ and will follow the recommended nine-step process:

1. Defining and aligning the scoping review objectives and questions.
2. Developing and aligning the inclusion criteria with the objectives and questions.
3. Describing the planned approach to evidence searching, selection, data extraction and presentation of the evidence.
4. Searching for the evidence.
5. Selecting the evidence.
6. Extracting the evidence.
7. Analysis of the evidence.
8. Presentation of the results.
9. Summarising the evidence in relation to the purpose of the review, making conclusions and noting any implications of the findings.²⁴

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis extension for Scoping Reviews (PRISMA-ScR) will be used for reporting purposes.²⁶

Review registration

This scoping review has been registered with the Open Science Framework (<https://osf.io/bd62h>), registration DOI 10.17605/OSF.IO/TA35Q.

Review team

The review team are a multidisciplinary group comprised of a non-practicing registered paramedic and PhD candidate (MH), a registered paramedic involved with the newly emerging field of community paramedicine and a teaching academic (AM), a registered midwife, paramedic and teaching academic (BF), a senior lecturer from the School of Medical and Health Sciences specialising in health research (BM) and a vice-chancellor's research fellow from the Western Australian Academy of Performing Arts with a strong research track record and is the lead supervisor for MH's PhD (LH). The scoping review's research questions, methodology and search protocol have been a team collaboration.

Inclusion criteria

The search terms will be developed in line with the framework of 'population, concept and context' criteria as recommended by Lockwood *et al*²⁶ and with ongoing consultation with two Edith Cowan University librarians.

Participants

This review will include patients and partners who have birthed in emergency ambulance clinician care, or where there has been a planned home birth attended by a midwife and emergency ambulance clinicians have been requested to provide emergency assistance for either the birth parent or neonate during or immediately following birth. It will also include precipitous births where emergency ambulance clinicians arrive after the birth of the baby.



Concept

The phenomenon of interest is birth; specifically, patients who birth in an unplanned prehospital location and with emergency ambulance clinicians in attendance. Additionally, patients who have a planned home birth and encounter complications requiring emergency ambulance clinician assistance will be included. 'Free births' where there is no assistance from a professional health-care provider such as a midwife or doctor will be included if emergency ambulance clinician assistance has been requested during or immediately following the birth.

Context

Frequently, birth parents choose to birth in a maternity suite or in hospital under the expert care of midwives or obstetricians.²⁷ However, for this review, we specifically consider OOHBs where emergency ambulance clinicians are called for assistance. As healthcare systems vary considerably worldwide, only high-income countries as classified by the World Bank will be included in this review.²⁸ Countries use clinicians from many disciplines in their ambulance services, for example, Sweden uses specialist ambulance nurses²⁹ and Norway uses emergency medical technicians, while Australia uses paramedics.^{2,16} However, any prehospital clinician working in an emergency ambulance service will be included in this review.

Search limits

Specific inclusion and exclusion criteria are described in [table 1](#) below. This search will include empirical studies with qualitative, quantitative or mixed methods data, scoping and systematic reviews.

Search strategy

This review aims to locate peer-reviewed publications and preprint peer-reviewed articles. A three-step search process will be undertaken as suggested by JBI.²⁴ An initial search of the MEDLINE via EBSCO and CINAHL databases will be undertaken. Located articles will be analysed for the text words used in the title and abstract and identify the index terms used to describe the publication. A second search will incorporate all identified keywords and index terms across all databases. The last search will involve reviewing the reference lists from identified articles to locate additional studies.

The databases to be searched include MEDLINE, CINAHL, Embase, Web of Science, Wiley Online. The initial keywords reflect the phenomenon of interest and were selected with the assistance of an Edith Cowan University librarian: emergency birth, unplanned birth, born before arrival, home birth*, childbirth, parturition, labo*r, perinatal, postpartum, birth, out of hospital, out-of-hospital, prehospital, pre-hospital, emergency medical service*, ambulance, paramedic*, emergency medical technician*.

Online supplementary file 1 has further details regarding the search strategy. Search articles will be uploaded, collated and managed via the citation management software Endnote (V.X9.3.3). Duplicates will be removed. In order to reduce the possibility of selection bias and errors, two reviewers (MH, AM) will independently screen articles at the 'title and abstract' stage, and at the full-text screening to determine whether the article meets the inclusion criteria. Discrepancies will be resolved via consensus, or if necessary, by a third reviewer from within the project team. Studies excluded after

Table 1 Inclusion and exclusion criteria for scoping review of emergency ambulance clinician involvement in out-of-hospital births

	Inclusion	Exclusion
Participants	Birthing parents who have an out-of-hospital birth requiring emergency ambulance clinician assistance.	Obstetric patients/partners who were treated by emergency ambulance clinicians for non-birth-related conditions. Planned home births with a midwife in attendance and emergency ambulance clinician assistance is not requested.
Concept	Birth. Imminent birth and/or immediate postpartum care by emergency ambulance clinicians.	Non-birth related events.
Context	Out-of-hospital emergency care. Attendant is an emergency ambulance clinician. High-income countries as classified by the World Bank. ²⁸	Births in hospitals or birthing clinics. Transfers between institutions post-birth for either birth parent or neonate (eg, no emergency ambulance clinician involvement with birth process). Low-medium-income countries as classified by the World Bank. ²⁸
Source of evidence	Peer-reviewed. Full text.	Opinion articles, textbooks, articles without an abstract, abstracts only without full article, conference papers, letters to the editor, policy documents.
Language	English, translated to English.	Not in English.
Time	No limited will be applied to the timeframe of reviewed articles.	N/A

full-text screening will be reported in the PRISMA-ScR diagram with reasons for exclusion. Articles will be eligible for inclusion regardless of the quality of evidence. Empirical studies over 20 years old will be excluded as medicine evolves rapidly, and research older than this timeframe may reflect differing healthcare systems and practices from modern medicine.

Data charting process

An extraction tool will be developed to logically chart information and provide a succinct descriptive summary of the results. It is anticipated that the key information extracted will include the authors, year of publication, title of the article, country, study aims, participants, methods and key information pertaining to the research questions (emergency ambulance clinician involvement with OOHBs including incidence, risk factors and complications, challenges and experiences of both birth parent, partner and clinician). To ensure the inclusion of all relevant data in the extraction tool, three articles will be independently assessed by two reviewers (MH, AM) and extracted data compared. This will be an iterative process and the extraction tool may be refined following review of the first three articles. Further data extraction will predominantly be undertaken by one researcher (MH).

Analysis of results

Results will be reported in two sections; the first section will cover the search results depicted in a PRISMA-ScR flow diagram. The second section will provide key findings relating to the review objectives.^{25 26}

Quantitative data will be evaluated using descriptive analysis such as reporting on frequency counts or population characteristics. Thematic analysis of qualitative data is not usually recommended in scoping reviews; however, some basic coding of data into broad themes is likely to be useful to contextualise some of the research questions (specifically, ‘What are birth parent, significant partner, and emergency ambulance clinician experiences with OOHBs?’ and ‘What barriers and challenges are there to optimal treatment provision for OOHBs and associated complications?’)²⁵ Risk of bias or a critical appraisal of the level of evidence on individual articles will not be undertaken as this review simply aims to map the available evidence.²⁵

Dissemination

Findings from this review will be disseminated via publication in a peer-reviewed journal. The results of the scoping review will be presented using a summary table similar to the anticipated data extraction tool, structured in a way to address the research questions. The tabular summary will be supplemented with graphical representation and narrative descriptions.^{25 26}

Public and patient involvement

This research is based on a literature search and does not directly engage the public or include patient involvement, in accordance with the Guidance for Reporting

Involvement of Patients and the Public 2 reporting checklist.³⁰

Contributors Concept and design of the research: MH, BM, LH, AM and BF. Draft article: MH. Revisions: AM, BM, BF and LH. Content expert: BF.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

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REFERENCES

- Rosser A. PP16 A review of the annual case epidemiology and clinical exposure of 45 paramedics, in a UK ambulance service: a service evaluation. *Emerg Med J* 2020;37:e8,3–9.
- McLelland G, McKenna L, Morgans A, *et al*. Epidemiology of unplanned out-of-hospital births attended by paramedics. *BMC Pregnancy Childbirth* 2018;18:1–9.
- McLelland G, McKenna L, Morgans A, *et al*. Paramedics’ involvement in planned home birth: a one-year case study. *Midwifery* 2016;38:71–7.
- Foster T, Maillardet V. Baby on the way: was an ambulance in the plan? *Journal of Paramedic Practice* 2012;4:649–52.
- Flanagan B, Lord B, Barnes M. Is unplanned out-of-hospital birth managed by paramedics ‘infrequent’, ‘normal’ and ‘uncomplicated’? *BMC Pregnancy Childbirth* 2017;17:436.
- Australian Institute of Health and Welfare. Australia’s mother and babies: Place of birth. Mothers & Babies, 2021. Available: <https://www.aihw.gov.au/reports/mothers-babies/australias-mothers-babies/contents/labour-and-birth/place-of-birth>
- Paramedicine Board AHPRA. 2020/21 annual summary. annual report; 2021. <https://www.paramedicineboard.gov.au/News/Annual-report.aspx#:~:text=There are now almost 20%2C000,registration for the first time>
- McLelland GE, Morgans AE, McKenna LG. Involvement of emergency medical services at unplanned births before arrival to hospital: a structured review. *Emerg Med J* 2014;31:345–50.
- Svedberg E, Strömbäck U, Engström Åsa, . Women’s experiences of unplanned pre-hospital births: a pilot study. *Int Emerg Nurs* 2020;51:100868.
- Loughney A, Collis R, Dastgir S. Birth before arrival at delivery suite: associations and consequences. *Br J Midwifery* 2006;14:204–8.
- Lin J-H, Hsu Y-H, Wang P-H. Risks for preterm premature labor: many of them are preventable. *J Chin Med Assoc* 2020;83:421–2.
- Somaschini M, Presi S, Ferrari M, *et al*. Surfactant proteins gene variants in premature newborn infants with severe respiratory distress syndrome. *J Perinatol* 2018;38:337–44.



- 13 Blencowe H, Cousens S, Chou D, *et al.* Born too soon: the global epidemiology of 15 million preterm births. *Reprod Health* 2013;10:1–14.
- 14 Shruthi S, Apollo AA. Etiological factors and maternal outcome in pregnancies with malpresentation: an observational study. *Int J Reprod Contracept Obstet Gynecol* 2020;9:1407–12.
- 15 Pubu Z-M, Bianba Z-M, Yang G, *et al.* Factors affecting the risk of postpartum hemorrhage in pregnant women in Tibet health facilities. *Med Sci Monit* 2021;27:e928568–1.
- 16 Bhoopalam PS, Watkinson M. Babies born before arrival at hospital. *Br J Obstet Gynaecol* 1991;98:57–64.
- 17 Unterscheider J, Ma'ayeh M, Geary MP. Born before arrival births: impact of a changing obstetric population. *J Obstet Gynaecol* 2011;31:721–3.
- 18 Vagle H, Haukeland GT, Dahl B, *et al.* Emergency medical technicians' experiences with unplanned births outside institutions: a qualitative interview study. *Nurs Open* 2019;6:1542–50.
- 19 Pusic MV, Kessler D, Szyld D, *et al.* Experience curves as an organizing framework for deliberate practice in emergency medicine learning. *Acad Emerg Med* 2012;19:1476–80.
- 20 Nishisaki A, Scratish L, Boulet J. Effect of recent refresher training on in situ simulated pediatric tracheal intubation psychomotor skill performance. *Adv Patient Saf New Dir Altern Approaches* 2008.
- 21 Su E, Schmidt TA, Mann NC, *et al.* A randomized controlled trial to assess decay in acquired knowledge among paramedics completing a pediatric resuscitation course. *Acad Emerg Med* 2000;7:779–86.
- 22 Australian Institute of Health and Welfare. Hospital activity [Internet]. Hospitals, 2021. Available: <https://www.aihw.gov.au/reports-data/myhospitals/themes/hospital-activity> [Accessed cited 2021 Sep 14].
- 23 Townsend R, Chmielewska B, Barratt I, *et al.* Global changes in maternity care provision during the COVID-19 pandemic: a systematic review and meta-analysis. *EClinicalMedicine* 2021;37:100947.
- 24 Peters MDJ, Godfrey C, McInerney P. Chapter 11: Scoping reviews (2020 version). In: Aromataris E, Munn Z, eds. *Joanna Briggs insT man Evid Synth*, 2020: 1–24.
- 25 Peters MDJ, Marnie C, Tricco AC, *et al.* Updated methodological guidance for the conduct of scoping reviews. *JBI Evid Synth* 2020;18:2119–26.
- 26 Lockwood C, Dos Santos KB, Pap R. Practical guidance for knowledge synthesis: Scoping review methods. *Asian Nurs Res* 2019;13:287–94.
- 27 Macdonald D, Etowa J, Helwig M. Experiences of women who have planned unassisted home births: a systematic review protocol. *JBI Database System Rev Implement Rep* 2019;17:16–21.
- 28 World Bank. The World by Income and Region [Internet], 2022. Available: <https://datatopics.worldbank.org/world-development-indicators/the-world-by-income-and-region.html>
- 29 Persson A-C, Engström Åsa, Burström O, *et al.* Specialist ambulance nurses' experiences of births before arrival. *Int Emerg Nurs* 2019;43:45–9.
- 30 Staniszewska S, Brett J, Simera I, *et al.* GRIPP2 reporting checklists: tools to improve reporting of patient and public involvement in research. *BMJ* 2017;358:j3453.