BMJ Open Understanding people's experiences of extrication while being trapped in motor vehicles: a qualitative interview study

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ABSTRACT

Objective To explore patient's experience of entrapment and subsequent extrication following a motor vehicle collision and identify their priorities in optimising this experience.

Design Semistructured interviews exploring the experience of entrapment and extrication conducted at least 6 weeks following the event. Thematic analysis of interviews.

Setting Single air ambulance and spinal cord injury charity in the UK.

Participants 10 patients were recruited and consented; six air ambulance patients and two spinal cord injury charity patients attended the interview. 2 air ambulance patients declined to participate following consent due to the perceived potential for psychological sequelae. **Results** The main theme across all participants was that of the importance of communication; successful communication to the trapped patient resulted in a sense of well-being and where communication failures occurred this led to distress. The data generated three key subthemes: 'on-scene communication', 'physical needs' and 'emotional needs'. Specific practices were identified that were of use to patients during entrapment and extrication.

Conclusions Extrication experience was improved by positive communication, companionship, explanations and planned postincident follow-up. Extrication experience was negatively affected by failures in communication, loss of autonomy, unmanaged pain, delayed communication with remote family and onlooker use of social media. Recommendations which will support a positive patient-centred extrication experience are the presence of an 'extrication buddy', the use of clear and accessible language, appropriate reassurance in relation to co-occupants, a supportive approach to communication with family and friends, the minimisation of onlooker photo/ videography and the provision of planned (non-clinical) follow-up.

BACKGROUND

Motor vehicle collisions (MVCs) are a major cause of injury and death.¹ Following an MVC, some patients will remain trapped in their vehicle.² Entrapment following an MVC is associated with significant injuries and excess deaths.³

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study is strengthened by conducting and reporting with reference to Consolidated Criteria for Reporting Qualitative Research guidelines.
- ⇒ Using open-ended questions facilitated by personal interaction supports a rich, in-depth understanding.
- ⇒ This study is limited, it is single centre and only featured English-speaking adults from the UK.
- ⇒ The transferability of this study in respect to lower middle-income countries and other patient groups (especially children) may be limited.

Patients who are trapped following an MVC may require assistance to leave their vehicle. The type and amount of assistance will vary with the individual characteristics of the patient and the incident.⁴ The process of removing a patient from a vehicle is known as 'extrication'.⁵

Extrication practice has evolved over the last 50 years-from informal, ad hoc rescue services to today's situation with a legislated response, bespoke commercial tool manufacturers, industry standards and national operational guidance.⁴⁻⁸ The current accepted norms of extrication by rescue services include a primary focus on movement mitigation. This approach has evolved with the intention of minimising secondary spinal injury. To achieve absolute movement mitigation, rescue services will use cutting tools to create new methods of egress (such as removing the roof) and extricate the patient with the assistance of spinal boards and other movement restriction devices. Cutting tools are noisy and potentially dangerous to the patient and the rescuer. These extrication methods can be technically difficult to achieve, require considerable resources and take time to deliver; as such, the patient will be trapped for longer. New evidence that describes the injuries of trapped patients and outlines the excess death associated with entrapment indicates that current extrication approaches may not achieve optimal patient outcomes.³ Such evidence alongside studies describing the utility of current extrication methods may prompt change in national and international guidance which defines current extrication practice.^{3 9} Very little is known about casualty experience during the entrapment phase of an MVC.^{10–13} Obtaining patient views and experiences via engagement and representation is a fundamental step in this process of developing and describing evidencebased practice.¹⁴ This is not found in current operational guidance, and evidence which describes patient experience of entrapment is extremely limited.⁵

The aim of this project is to capture, interpret and understand the patient experience of entrapment and extrication to support and enable the development of patient-centred, evidence-based extrication guidance.

METHODS

This study used purposeful sampling of patients who had undergone extrication, using a semistructured interview guide to explore patient's experience of extrication. We report this study with reference to Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines.¹⁵

Research team and reflexivity

This study was designed and developed by TN, WS and LAW. TN is an experienced clinician who attends patients who have been extricated in the prehospital and emergency department phases of treatment. TN has trained alongside rescue services and has published research on extrication practices with a wide array of methodologies. WS is a paramedic and university-based academic; his interests include emergency medicine systems and qualitative research. WS has experience with the extrication and management of patients during clinical practice. LAW is an experienced clinician and academic who has cared for patients during extrication and postextrication.

All interviews were conducted by an experienced qualitative health researcher (JB). She also has psychotherapeutic skills, which were deemed useful for this sensitive area. Although experienced in prehospital care research she did not have any specific training or experience in relation to extrication and had not experienced extrication herself. The interviewer had not met any of the participants professionally or socially and did not liaise with the candidates prior to the interview other than to confirm details of consent and the administration of the interview.

TN introduced the study to participants and conducted the informed consent process.

Study design

Participant selection: Eligible participants were Englishspeaking adults (18+) who had been trapped in a vehicle following an MVC and were extricated with assistance. Patients were excluded if any of the study team were involved in their clinical care. The definition of 'trapped'

for the purpose of participant selection was not explicitly defined but relied on participant self-identification in this regard. Potential participants were identified and subsequently informed about the study by either the Patient Liaison Clinicians of the Devon Air Ambulance or 'Aspire', a spinal injury support charity. The Aspire charity was used to assist with recruitment to ensure that patients with spinal cord injury were represented in this study. Eligible participants were informed by email or in conversation about the study methods and intention. Those willing to engage further consented to their contact details being shared with TN. TN contacted potential participants and delivered the participant information sheet and consent form by email or post. After familiarisation with the study details, TN answered any additional questions. Once happy to proceed, they completed and returned the consent form to TN. With permission, participant details were then shared with the interviewer to arrange an interview. No incentives were offered for participation. A convenience sample based on participant availability was collected. Interviews were reviewed by TN and WS during the collection process to collate themes and identify if saturation had occurred.

Setting

This study was conducted in the UK. Participants identified by the Devon Air Ambulance had been treated by the air ambulance critical care team. Participants identified by Aspire had sustained a spinal cord injury before or as a result of the accident under consideration. The interviews were delivered over a secure online videoconferencing service (Zoom, Zoom Video Communications, California, USA, Version 5.0) or by telephone. The participants engaged with the interviews from a quiet place of their choosing and could have a friend or family member present if they chose. Only the interviewer, the participant and any nominated friend or family member were present during the interviews. Participants could choose to end the interviews at any point. JB is experienced in psychotherapy and offered de-escalation and follow-up with National Health Service referral if necessary.

Data collection

TN, WS and LAW developed a semistructured interview guide based on themes identified in the literature and from personal clinical experience (online supplemental material). Domains from a literature review identified the importance of pain control, the noise of extrication and the risk of hypothermia; these domains were incorporated into the interview guide.^{16–18} The guide was modified in subsequent interviews if new themes emerged. Interviews lasted between 20 min and 1 hour. Interviews were recorded using the secure recording capability of the data collection platform and then transferred securely for transcribing by a professional transcription service. TN reviewed the transcripts and identified themes for consideration which were discussed with the interviewer (JB)

prior to the next interview. Transcripts were not returned to participants following the interviews.

Approvals

Participants were specifically consented for participation, recording and secure sharing of their data. Participant withdrawal was possible until anonymisation and transfer of data for transcription as individual participants could no longer be identified. Recordings were deleted following data analysis. Anonymised transcriptions and patient details were not shared outside of the direct research team.

Data analysis

Transcripts were subjected to thematic analysis using NVivo V.12 (NVivo qualitative data analysis software; OSR International, V.12.6.1, 2018). The following steps were undertaken during the thematic analysis: (1) transcripts were read and re-read to develop an understanding of the whole and allow for immersion in the data; (2) specific meaning units were identified and condensed, that is, identify and shorten pieces of text that carry data related to the research question; (3) condensed meaning units were then labelled with descriptive codes; (4) categories were formed by grouping related codes together; as new categories emerged from the data an inductive approach was used to develop these^{19 20}; and (5) formation of themes. Triangulation was undertaken by each investigator reviewing and interpreting the coded data independently first. Hereafter, TN, WS and JB met to discuss codes, categories and themes in order to explicate diverse interpretations and converge these.²¹ Following discourse, themes and subthemes were further identified, refined and incorporated. Participants were not approached for feedback on the findings.

Trustworthiness

As described by Shenton, trustworthiness includes credibility, transferability, dependability and confirmability.²² Credibility was maximised through (1) the adoption of appropriate, well-recognised research methods, (2) ensuring the research team had no influence over the sampling of individuals serving as informants, and (3) providing multiple opportunities for participants to decline nor reporting whether they participated (or not) to the recruiting organisation. The nature of the questions and opening statement is designed to encourage participants to be frank and open with the interviewer, (4) the use of iterative questioning at the discretion of the interviewer, (5) maximising data quality and accuracy by using a professional transcription service and with internal quality checks, and (6) by triangulation of the results between TN, WS and JB.

The provision of detailed background information ensured that the reader had appropriate context to understand the potential for transferability to their setting. The reader was supported in judging dependability by



Figure 1 Participants, recruitment and progression to interview.

ensuring that the research process was logical and well documented following the COREQ guidelines.¹⁵

The principal researcher (TN) interrogated any bias he might have in this project and these were recorded and detailed prior to the collection of data. Transcribed data were checked and triangulated by other authors to further support confirmability. Appropriately detailed methods are provided along with a recognition of the shortcoming of such methods in the 'Discussion' section.

Patient and public involvement

A central tenant of this research is understanding the patient experience; patients were therefore intrinsically involved. Patients were not involved in the design or reporting of this research.

RESULTS

Patient identification, recruitment, consent and all interviews were completed between June 2020 and March 2021. A total of 10 participants consented to take part in the interviews of which eight successfully participated. The two participants who did not wish to be interviewed raised concerns related to the potentially negative psychological effects of recounting their experience. A further four participants met the inclusion criteria for the study but did not feel they could progress further as they had very limited or no memory of their accident or their experience of extrication (figure 1). Data saturation was reached as evidenced by informational redundancy, and confirmed during analysis as no new codes or themes were identified during triangulation and refinement.²³

Across the range of participants common categories and themes were developed (figure 2). This analysis resulted in one superordinate theme, that of communication. An additional three subordinate categories within this theme were identified: external environment, physical needs and emotional needs.



Figure 2 Themes and subthemes.

Communication

The main theme across all participants was that of communication; successful communication resulted in a sense of well-being and where communication failures occurred this led to distress. The subthemes of on-scene communication, physical and emotional needs and their component categories are presented below.

On-scene communication

This theme relates to instances where the communication on scene while the participant remained trapped impacted on their experience. The categories include 'bystanders to patient' where direct and indirect communication with bystanders at the scene of the accident was important and 'emergency workers to patient' which describes the on-scene communication with the patient from both rescue workers and clinicians.

Bystanders to patient

Participants were universally grateful for assistance and support of bystanders. Common themes included the reassurance that came from bystanders calling for professional help and the provision of companionship both at an early phase of an incident and beyond. Some bystanders remained outside of the vehicle and provided reassurance and coaching to participants in distress:

I remember talking to her through the window, and she kept saying, just stay with it; you're fine; you've got a good colour. And I was going, I can't breathe, I can't breathe, I can't breathe. And she was just saying, just keep calm; you're doing well; you're fine; you're doing all right; you've got a good colour; you're getting oxygen; you're all right. (P6)

Often participants were joined in the vehicle by a bystander. This companionship while in the vehicle was important to our participants and led to a sense of safety.

So, I was trapped, trapped under there as well. Came to, there was the nurse in the car... So, she came in. And then in then in the car behind her, were three paramedics from the Royal Marine base.... the marines, they actually stayed in the car till I was taken out. And so they kept talking to me the whole time... I definitely felt looked after. Yes. Very safe. (P3)

Participants expressed a need for companionship while in the vehicle and were keen for this companionship to remain throughout the process of extrication and when the companion departed there were requests to remain.

Yeah, they calmed me down completely. I can remember ... she was gonna get out of the car, and I said to her, y'know, do you think you could stay with me? And from that moment on she didn't leave my side. (P5)

Bystanders also offered very practical help which was useful and reassuring to participants.

I kept feeling like I was falling... And cos my leg was broken I was panicking cos I kept thinking my leg was just dropping. So he was holding me. (P8)

Bystanders who were merely observing were less appreciated, particularly those taking photographs, recording footage and making these available on social media and news platforms. This was distressing for participants and their families, particularly where publication of these images led to unwanted engagement from those remote to the incident (see also the 'Concern for others' section).

I had messages coming from all kinds of people that I hadn't spoken to in ages.... It was a bit overwhelming. (P8)

Emergency workers to patient

Communication between emergency workers and the patient was also paramount for participant experience. Explanations were important to our participants:

But they talked me through everything that they were going to do. Y'know, when they were gonna cut the side of the car, they said, like, you'll hear a bang. And I just felt really safe...I say I felt really looked after. (P3)

The 'manner' of emergency workers, particularly by creating an atmosphere of organisation, purpose and calm alongside participants, led to a positive experience despite the distressing circumstances.

They were so calm and they explained everything as they were going along. And that would be one of the things that I would say to you I found so reassuring. Well, they're calm, so ... why should I panic? (P1)

Explanations of the practical steps that were occurring and the justification for them were important in creating a positive experience for our participants.

Very, very helpful. They told me whenever they were going to do anything what they were going to do, why they were gonna do it, sort of thing. And explained that, y'know, they wanted to cover my face because of the glass from the windscreen and everything. So I [laugh] I just was a very good girl and just sat quiet and let them get on with it. (P5)

When participants did not feel listened to this was a negative experience. Participants were concerned when they were not involved in conversation which resulted in a loss of autonomy.

They should've just like listened to me instead of like making their own assumptions... But it was like they weren't listening to me. It was just like, listen to each other. I tried to explain to them I was fine. (P7)

Similar to the positive experience of bystanders, participants appreciated the presence of emergency workers particularly when they joined them in the vehicle. Distraction from interventions or the physical environment using calming language provided relief for participants.

Yeah, the paramedics and there was a lady... that came and sat next to me in the passenger seat. And she just kept chatting to me the whole time, just to try and distract me. Because when they were putting the needles in and stuff, I'm terrible with needles, so she was brilliant just talking me through it, just to take my mind off it. (P8)

The presence of a companion in itself was not enough to create positive emotions. They needed to engage with the patient, offer explanations and create a connection.

Yeah. No, they didn't speak to me once. It was like they had an ambulance driver [laughs] sit next to me while they cut the car open. But there was no, like, no name, no like conversation. (P7)

Physical needs

This theme relates to the physical needs of the participant during entrapment. The categories include 'Pain' which includes the pain experience itself and 'environment' which relates to environmental factors such as temperature and the effects of weather and their mitigation.

Patients who require extrication need assessment and treatment to facilitate this process.⁴ Delivering an adequate clinical assessment will often mean undressing a patient and is normally associated with physical contact such as chest or abdomen palpation to assess for potential injury.²⁴ How this physical assessment occurred, the communication of explanations around it was clearly important to our participants.

They all descend on you... they forget that you're lying there... I don't remember seeing anybody's face... It would've been nice to see somebody's face...and they didn't tell me they were gonna cut my clothes off. (P2)

Pain

Several participants reported a window of time immediately following their collision where they were unaware of their injuries. During this peritraumatic window the participants reported that they do not recall suffering pain, despite having significant injuries that would normally be associated with severe pain.

I didn't feel that I had any injuries at the time. And I was just wanting to get out of the car. I just, you know, got to get out and um. nothing hurt straight away. It started hurting after a little while but at that point, nothing hurt. (P3)

When the peritraumatic window passed a small number of participants reported sudden and severe pain.

And oh, my god, it was just like being smacked in the face with a frying pan or something. The pain just went bang. And I think I just came into reality. And the pain was just horrific. I then remember saying that I can't breathe. The pain is horrific, I can't breathe. I can't breathe. (P6)

Environment

MVCs and subsequent extrications occur almost exclusively outdoors. This can leave patients exposed to the elements. Participants did not report being cold—this may be attributed to the mitigation measures (such as blankets) or the 'shock response'.

And I think it was then that the paramedics arrived. And came and took over from my dad. And wrapped me up, cos I was freezing cold, cos it was back in February when it was really bitter... there was so much going on, and I think I was just too busy panicking that I didn't feel cold or pain or anything. (P8)

Emotional needs

This theme considers the emotional needs of the participants and how these needs are best supported. The categories include participants' concern for others, their concern for themselves and the value of debrief following an incident.

Concern for others

Participants' concern for others was another significant theme. This concern included copassengers in the vehicle, pets involved in the incident and friends and relatives at home. Participants appreciated positive, reassuring communication and practical assistance from both bystanders and rescuers in this regard.

Yeah and the dog, I was most worried about [laughs]. Luckily I could see him in the car behind, so I knew he was safe. Yeah. (P8)

An important issue was communication between the family and friends remote to the scene and 'onlookers' (via social media) or the rescue teams. Many participants were unhappy with how their families found out about the incidents. They were particularly concerned with communication delay, the accuracy of the information that was conveyed and the negative effects of uninformed onlooker narrative on social media and news channels.

I: So tell me about how did your loved ones get to hear about this?

This is the not good bit. My phone was in my handbag.... And I kept saying, can you please get my phone.... And I remember saying it quite a few times, to quite a few different people. They're like yeah, the police are doing that, it's all sorted; police are doing it. No, they didn't. (P3)

In a further example, uninformed updates posted to social media from onlookers from scene cause considerable distress to family. They found a site... that was having witness statements being given and updates... they actually had more stress than I did. A witness wrote down that the driver is still trapped in the car and he can't feel his legs... so my family and my children were, oh my god, Dad's trapped in the car still, and he can't feel his legs. (P1)

Concern for self

Participants were concerned for their own well-being. Concerns rarely related to their own initial injuries but instead reflected concerns related to the fear of fire and of not being recognised as alive and rescued.

I remember the sides of the car coming in. Then I was in a bubble...? And I couldn't move. I thought oh my god, they're gonna think I'm dead. Cos I'm in this bubble and I can't get out. (P6)

Cos I said to her I've never been in a car crash, and the car was smoking. I thought the car was on fire. (P7)

Debrief

Participants valued postaccident planned communication from the emergency services. In a majority of cases this had been provided by the Patient Liaison Clinicians from the Devon Air Ambulance service. Planned follow-up helped participants by acknowledging the importance of the incident as a life event.

How good it's been that people have rung me subsequently.... it's been amazing it has been something that I found very beneficial. That I wasn't just an accident and then that was it, right, move on to the next one. (P1)

They found postcollision professional follow-up useful in orientating themselves in understanding what had happened to them. However, participants found reminders of the collision in the form of photos on social media or on rescue services pages a negative experience.

Yes I'm shocked by what happened. Yes I was shocked by the pictures. (P5)

I've not been strong enough to see those photos yet. I've not seen them. So I don't know exactly how they got me out or what they had to do. (P6)

DISCUSSION

This study demonstrates that most participants were generally satisfied with their experience of extrication, despite some serious injuries. Their experience was improved by positive communication, companionship, explanations and planned postincident follow-up. Factors which led to a poor experience were communication failures, loss of autonomy, pain, poor communication with remote family and the negative effects of onlooker use of social media (particularly on remote family and friends). The importance of positive communication and reassurance identified in this study as an important aspect of psychosocial care are common themes in hospital studies looking at the acute treatment of injured patients.^{25 26} In the published prehospital literature, there is generally a focus on the practical rather than the psychosocial aspects of emergency care and improved patient experience (eg, the treatment of pain) which is at odds to the needs identified by our participants.²⁷ The positive role of planned companionship for patients across a range of healthcare environments is well described; however, the benefits of unplanned, ad hoc companionship from persons unknown to the patient as in this study are not.^{28–30}

The role of bystanders in supporting injured patients is often considered in the important task of contacting professional help and providing practical interventions.^{31 32} Heidari et al discussed the practical aspects of bystanders aiding with the injured but noted that their ability to provide further support may be inhibited by emotion.33 Alternative themes in the literature include the 'stress' experienced by bystanders leading to an urge to act in ways that may be potentially harmful to the patient, for example, dragging them from their vehicles or the fear of getting something wrong leading to inaction.^{11 34} This was notably different from the perspectives of our participants. The experience of the actions of engaged bystanders (as opposed to those of onlookers) was universally positive as recounted by our participants. Bystanders could be engaged to provide beneficial support to trapped patients by the inclusion of direction in 'first aid' courses or from direct instructions from the call handler when they make contact with the emergency services to report an MVC.

The importance of debrief and assisting with fragmented memories and narratives are demonstrated in our findings and the work of others.³⁵ Psychological sequelae following MVCs are high, this is in keeping with the participants who consented for this work and then declined to undertake the interview stage.³⁶ The participants who reported positive emotions associated with debrief and follow-up had had their accidents relatively recently (within 3 months). More research is needed to understand the long-term benefits and to identify any potential harms which may follow debriefing by associated clinical and rescue professionals (such as paramedic-led patient liaison services). Other researchers have found debriefing of MVC victims delivered by a professional psychologist contributes to negative long-term psychological health outcomes.³⁶

The peritraumatic window experienced by our participants and variable pain experience is consistent with the findings of others.³⁷ Our participants benefited from analgesics which is consistent with the findings of effectiveness studies.³⁸

When our participants experienced fear, it tended not to be in relation to their injuries or the future impact of such in injuries, but fear of further injury—particularly a fear of fire. This fear of fire is common to other

Box 1 Suggested behaviours for rescue teams performing an extrication

- ⇒ Communication and companionship for entrapped patients should be designated to a specific staff member who if safe to do so and not an impediment for extrication should join the patient in the car and remain there was as long as practical.
- ⇒ An 'extrication buddy' should be assigned to explain the procedure, ensure companionship and provide reassurance to the patient while entrapped.
- ⇒ Communication with the patient should be clear and use accessible lay language.
- ⇒ If co-occupants are safe, patients should be informed at the earliest opportunity for reassurance (this includes pets).
- $\Rightarrow\,$ If conscious, patients should be allowed to communicate with their family members.
- \Rightarrow Where possible, the ability of the public to photograph the vehicle and the patient should be minimised.
- ⇒ Rescuers and their affiliated organisations should not post extrication-related photos on their social media channels or websites.
- $\Rightarrow\,$ Where possible, planned follow-up should be offered to patients.

qualitative analysis of patients following MVCs, though the actual incidence of vehicle fire caused by road traffic collisions is vanishingly small.^{11 39} Reassurance specifically to address this fear should be considered by rescue teams.

This study is limited as it is single centre and only featured English-speaking adults from the UK. The transferability in respect to lower income to middle-income countries and other patient groups (especially children) may be limited. Further research to address these groups should be considered. It is a potential source of bias that a proportion of participants were recruited and consented by personnel associated with the air ambulance that attended them. We attempted to minimise this bias by excluding patients treated by the study team, reassuring patients of the anonymity of their interview and not having any air ambulance personnel present during the interview process. The use of an online platform for this research was a requirement due to restrictions associated with the COVID-19 pandemic; face-to-face interviews will have provided a different patient sample and may have given greater contextual depth.^{40–42}

The results of this study are useful in informing guidance for professional rescuers and the laypersons who have the potential to be bystanders. Instructions could be given to bystanders who call the emergency services or incorporated into first aid courses.

Suggested behaviours and practices for adoption by clinical and rescue teams are included in box 1.

Future work should focus on understanding how to empower bystanders to safely assist trapped patients and ensuring that patients and the public are regularly involved in the development of guidance which informs the rescue services approach to extrication. Public education programmes should deter onlookers from

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photographing or filming patients in their vehicles or reporting information from the scene. The principles outlined in box 1 have been shared with national-level stakeholders in the area of rescue and clinical practice. The principles have been made available to a panel of subject matter experts to inform a Delphi study; consensus was reached on all of these principles and they have been adopted for incorporation into operational and clinical guidance.⁴³

Further research should focus on the medium-term and long-term sequelae of debriefing by rescue services.

CONCLUSION

Extrication experience was improved by positive communication, companionship, explanations and planned postincident follow-up. Extrication experience was negatively affected by failures in communication, loss of autonomy, unmanaged pain, delayed communication with remote family and onlooker use of social media. Recommendations are made which may support a positive patientcentred extrication experience.

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