

ABSTRACT

Introduction: Acute diffuse peritonitis (ADP) is a medical and surgical emergency associated with high morbidity and

mortality in resource-limited settings. In Matadi, Anaesthesia and Resuscitation Technicians (ARTs) are responsible for pre-operative preparation (POP), often without specialist doctors or adequate equipment. This study aimed to explore their

practices and the constraints influencing the POP of patients with ADP.

Methods. This descriptive qualitative study was conducted in three general referral hospitals located in the city of Matadi (DRC). Purposive sampling was used to select ARTs who had recent experience of pre-operative preparation (POP). Empirical data saturation, achieved during the 8th interview, was corroborated by conducting three additional interviews within a restricted target population of 15 inpatients, excluding two who were on leave, resulting in an effective recruitment pool of 13 inpatients. The data, collected through semi-structured interviews based on the Theory of Planned Behaviour, were subjected to a thematic analysis incorporating dual coding and a verification procedure with the participants.

Results. Eight participants (5 women) with between 3 and 27 years' experience described patients admitted in a state of septic shock and advanced malnutrition. Resuscitation relied exclusively on crystalloids administered 'ad libitum', guided by rudimentary clinical monitoring (blood pressure measured with a cuff, skin fold thickness, urine output, level of consciousness). Faced with shortages and financial constraints, the TARs develop coping strategies ('resourcefulness', personal donations) whilst exercising quasi-medical decision-making autonomy, which generates stress and ethical distress.

Conclusion. Pre-operative preparation (POP) for patients with acute diffuse peritonitis (ADP) of typhoid origin in Matadi is compromised by systemic constraints that the ingenuity of Anaesthesia and Resuscitation Technicians (ARTs) cannot compensate for in the long term; consequently, this situation warrants the development of context-specific protocols as well as urgent provision of emergency kits.

Keywords: Typhoid peritonitis; pre-operative preparation; Anaesthesia and Resuscitation Technician; limited resources; DRC.

1. Introduction

Acute diffuse peritonitis (ADP) of typhoid origin constitutes a medical-surgical emergency with high morbidity and mortality in low- and middle-income countries (LMICs), particularly in the Democratic Republic of the Congo (DRC) (Cikwanine et al., 2024). The African aetiology, dominated by typhoid-related ileal perforations in young patients who are often severely malnourished, contrasts with the Western profile, which is characterised by ulcers and diverticula in older patients (Sukri et al., 2024; Yahouza et al., 2024).

Reported mortality ranges from 6 to 37 per cent, with post-operative morbidity reaching 92 per cent (Sukri et al., 2024).

Whilst surgery is key to aetiological treatment, the patient's prognosis is heavily compromised beforehand by the quality of pre-operative preparation (Couperus et al., 2025; Menz et al., 2021). International standards, set out by the Surviving Sepsis Campaign (Evans et al., 2021) and the World Society of Emergency Surgery (Sartelli et al., 2021), require targeted fluid resuscitation with crystalloids (30 ml/kg within the first three hours), probabilistic antibiotic therapy within the first hour and dynamic haemodynamic monitoring (pulse pressure variability, echocardiography) (Marik et al., 2008).

However, in Matadi, in the province of Kongo Central, the implementation of these guidelines is hampered by a highly precarious environment: a lack of specialist anaesthetists and intensive care physicians, a shortage of optimal intravenous fluids and vasopressors, and a complete absence of dynamic or biological monitoring. Direct and exclusive responsibility for MCPP therefore falls to Anaesthesia and Resuscitation Technicians (ARTs), who exercise quasi-medical autonomy in the management of post-typhoid perforation septic shock, without immediate supervision, within a context of task-sharing as documented by the WHO (WHO, 2022).

The discrepancy thus lies in the fact that international guidelines, designed for settings with optimal resources, prove, in practice, to be inapplicable: monitoring is therefore limited to manual sphygmomanometer readings, skin turgor and urine output. Although the biomedical literature has largely focused on prognostic scores, community health workers remain largely overlooked in public health research; there is a complete lack of scientific insight in Matadi, where no qualitative study has documented their lived experiences, cognitive filters or adaptive skills in the face of a septic emergency (Vidal, 2023). This research aims to address this gap by exploring the perceptions and experiences of these frontline practitioners.

2. Methods

2.1. Study design and framework

A descriptive qualitative study was conducted in three general referral hospitals (H1, H2, H3) in the city of Matadi (Kongo Central), a provincial capital with a population of approximately 450,000, between June and July 2026. The qualitative descriptive design (Sandelowski, 2010; Colorafi & Evans, 2016) was adopted to document the perceptions and experiences of healthcare workers, a theoretical framework based on the Theory of Planned Behaviour (Ajzen, 1991).

2.2. Population and sampling

The source population consisted of all TARs working in the A&E departments and operating theatres of the three regional general hospitals (HGRs), thus representing a limited theoretical population of $N = 15$ practitioners. Of this total of 15, 2 paramedics were excluded from the study population due to extended leave covering the entire data collection period, reducing the actual accessible population to $N = 13$ paramedics.

Recruitment was carried out using a non-probabilistic sampling method based on purposive (intentional) selection, the aim of which was to include the professionals with the most substantial experience in MCPP. Purposive sampling involves intentionally selecting participants with characteristics relevant to meeting the study's objectives (Patton, 2002, p. 230).

The inclusion criteria comprised: holding an official qualification in anaesthesia and intensive care; working full-time and having been part of the on-call team for at least 12 months; and having participated in the MCPP for at least one patient with PAD over the past 12 months. Conversely, anaesthetists on placement, those who had ceased practising for a period exceeding 3 months, or those in a subordinate position to the researcher were excluded from the study.

2.3. Justification of the sample size based on saturation

In accordance with the principles of qualitative research, the sample size was not determined a priori by a power calculation, but through a progressive process of empirical saturation (Sandelowski, 2010; Hennink & Kaiser, 2022). Data collection, conducted iteratively in parallel with thematic coding analysis (Bardin, 2013), resulted as follows:

- Saturation of codes and themes ($n = 8$): by the end of the 8th interview, the coding framework had stabilised, revealing complete informational redundancy with no new codes or sub-themes emerging.
- Verification and confirmation ($n = 8 + 3 = 11$): in accordance with the recommendations of Saunders et al. (2018) and Hennink and Kaiser (2022), the inclusion of three additional TARs confirmed the total absence of new conceptual categories, confirming the perfect redundancy of the discourse.
- Final sample: data collection was halted at 11 interviews, but the sample size selected for

theoretical modelling and the presentation of verbatim transcripts is set at $n = 8$ participants, representing 61.5 per cent of the accessible pool and 53.3 per cent of the source population.

Although the methodological framework comprised a total of 11 interviews (including 8 main interviews and 3 saturation verification interviews), it appears that the 3 confirmatory interviews did not generate any new data and did not result in any changes to the thematic matrix. Consequently, Table 1 and the presentation of the results focus on the initial cohort ($n = 8$), which enabled the initial empirical saturation to be established.

2.4. Data collection and analysis

Data were collected through individual semi-structured interviews (duration 30–45 minutes), guided by a framework based on the TCP, which had been previously validated by a committee of experts and tested in a pilot phase ($n = 3$). The interviews were recorded (offline on a smartphone), transcribed in full (using Otter.ai software with manual review) and analysed using thematic content analysis (Bardin, 2013), employing both a deductive approach (based on TCP constructs) and an inductive approach (emergence of codes). Independent double coding was carried out by two researchers, with discrepancies resolved by consensus, and the results were verified with the participants (*member checking*) to strengthen the credibility of the data and minimise errors of interpretation (Lincoln & Guba, 1985).

2.5. Ethical considerations

The research protocol received a favourable opinion from the ISTM-Kinshasa Ethics Committee (Decision No. 278/CBE/ISTM/KIN/RDC/PMBBL/2026), as well as certification issued by the Nursing Sciences section (Certificate No. 001/2026). Informed consent, recorded in writing, was obtained from each participant, alongside rigorous anonymisation of the verbatim transcripts (codes TAR1 to TAR8; structures H1–H3), the systematic destruction of audio files following their transcription, and strict adherence to the principles set out in the Declaration of Helsinki.

3. Results

3.1. Respondent profiles and emerging themes

The analysis revealed four major cross-cutting themes: (1) experience of the MCPP and the management of septic shock; (2) clinical assessment of volume status in a low-tech setting;

(3) professional adaptation in the face of shortages; and (4) decision-making autonomy and ethical distress.

Table 1. Socio-demographic profiles of respondents

Participant	Age (years)	Gender	Years' service (years)	Role
TAR1	61	M	27	Head of Department
TAR2	38	F	10	Practising anaesthetist
TAR3	46	F	3	Practising anaesthetist
TAR4	29	F	5	Practising anaesthetist
TAR5	32	M	5	Head of Department
TAR6	42	M	7	Head of Department
TAR7	38	F	6	Practising anaesthetist
TAR8	56	F	3	Practising anaesthetist

The sample comprised 5 women (62.5 per cent) and 3 men, all of whom held a graduate or bachelor's degree, with between 3 and 27 years' professional experience.

3.2. Thematic analysis of the corpus

The thematic content analysis of all the interviews enabled the corpus to be structured around four majors, interrelated cross-cutting themes:

- Experience of MCPP and the management of septic shock (characterised by empirical massive fluid resuscitation);

- The clinical assessment of fluid resuscitation using simple techniques (guided by a triad of macro-vital signs);
- Professional adaptation and resourcefulness (informal responses to shortages of supplies);
- Decision-making autonomy, clinical veto and ethical distress (assuming medical responsibility as a source of mental workload).

3.3. Theme 1: The MCPP's experience of managing septic shock

The TARs describe critical clinical presentations on admission, characterised by shock, severe dehydration and marked haemodynamic instability (tachycardia, hypotension, pallor). The fluid resuscitation strategy relies on the administration of crystalloids (Ringer's lactate, 0.9% saline, mixed serum) at a rapid rate ('continuous infusion') following pre-operative resuscitation:

'Other patients whose condition requires us to start with resuscitation first' (TAR1); 'We started with 1 litre of Ringer's lactate to be administered over two hours' (TAR3).

3.4. Theme 2: Clinical assessment of volume status with limited technical resources

In the absence of advanced haemodynamic monitors, assessment relies exclusively on clinical criteria: a rise in blood pressure measured intermittently using a manual cuff, resolution of tachycardia, disappearance of skin turgor, and recovery of muscle strength and level of consciousness:

'We base our assessment on the results and vital signs, including blood pressure' (TAR2); 'The signs of dehydration disappearing' (TAR7); 'A patient who arrives with very low blood pressure; after resuscitation, it rises to 120 mmHg or higher, so we decide to intervene' (TAR1, TAR3).

3.5. Theme 3: Professional adaptation in the face of shortages

Faced with chronic shortages, the TARs develop strategies: rationalising resources, making personal donations of medicines and equipment, and relying on the patient's family to purchase prescribed items from outside the hospital:

'We sometimes contribute our own medicines and equipment' (TAR3); 'I sometimes use my own equipment and supplies,

because the anaesthesia department has almost nothing' (TAR4).

3.6. Theme 4: Decision-making autonomy and ethical distress

TARs exercise a strong degree of decision-making autonomy, going so far as to impose a clinical veto on the surgical team to postpone the procedure until haemodynamic stabilisation is deemed satisfactory. This generates interprofessional tensions and profound ethical distress in the face of preventable deaths linked to families' financial helplessness:

'It is a commitment and a great ethical responsibility, because even the slightest decision to administer fluids without a monitor can cost the patient their life. We are alone on the front line' (TAR8); 'It hurts me deeply, because you see someone you could save, but due to the hospital's circumstances, you were unable to save the patient' (TAR1).

4. Discussion

This study documents, for the first time, the experiences of TARs in Matadi when faced with MCPP in cases of typhoid peritonitis. The discussion compares our findings with the international literature along four key themes.

4.1. The paradox of monitoring: modern dynamics versus a wait-and-see approach

Our results highlight a vast paradigmatic disconnect between international standards and the reality on the ground. Whilst the era of invasive static monitoring (CVP) has been over since the seminal work of Marik et al. (2008), contemporary science advocates dynamic functional monitoring—pulse pressure variability (PPV), systolic ejection volume variability (SEV), perioperative Doppler echocardiography and repeated lactate measurements (Evans et al., 2021; Sartelli et al., 2021).

In Matadi, none of these tools are available: the TAR is restricted to exclusively clinical, intermittent and delayed monitoring—manual cuff blood pressure, time to skin re-colouration, mottling, skin turgor, and total urine output, often without a graduated catheter. As highlighted by Couperus et al. (2025) and Rajabaleyan et al. (2025), these macroscopic clinical signs are late, insensitive indicators subject to multiple biases: when blood pressure measured with a cuff plummet in a patient with PAD, cellular oxygen debt and tissue hypoperfusion have already been established for several hours. This finding is consistent with that of Nzengu et al. (2024) in Kananga (DRC) and by Elombila et al. (2024) in Brazzaville, describing a 'haemodynamic lottery' in which the

decision to transfer is a clinical gamble rather than evidence-based stabilisation.

4.2. The risks of empirical resuscitation: unrestricted administration of crystalloids and iatrogenic risk

Our verbatim transcripts (TAR3, TAR6, TAR8) document the administration of crystalloids 'on a continuous basis' to achieve volume resuscitation. However, this practice exposes the patient to a critical clinical dilemma in the absence of laboratory tests and haemodynamic monitoring.

On the one hand, the blind application of the SSC guidelines mandating massive fluid resuscitation of 30 ml/kg without dynamic tools to assess preload dependency carries a risk of over-resuscitation: in cases of septic cardiomyopathy, crystalloid overload does not increase cardiac output but exacerbates pulmonary interstitial oedema, impairs oxygenation, increases intestinal wall oedema and drastically raises perioperative mortality (Elombila et al., 2024). Conversely, out of fear of post-anaesthetic hypotension, a clinician lacking resources may adopt a strategy of under-fluidisation, allowing irreversible acute organic renal failure and cardiorespiratory arrest to develop during anaesthetic induction.

The anaesthetist's decision-making vulnerability is therefore at its highest: lacking technological resources, they navigate daily between the pitfall of persistent hypovolaemia and the reef of iatrogenic fluid overload.

4.3. The psychosocial and ethical burden: occupational stress and moral distress

The data highlight high levels of occupational stress and a heavy emotional burden amongst anaesthetists, exacerbated by the 'three-pronged delay' model (Ogbuanyia et al., 2022; Tobomé et al., 2021): community-related delays (self-medication, traditional healers), geographical delays (Matadi's rugged terrain, lack of medical ambulances) and institutional and financial delays (the 'cash-and-carry' system).

Our verbatim transcripts (TAR1, TAR3, TAR5, TAR7, TAR8) reveal a sense of helplessness in the face of preventable deaths: 'Seeing a young patient with treatable typhoid peritonitis die on the resuscitation table, simply because the family could not raise 20 dollars to buy intravenous fluids or antibiotics, constitutes a recurring psychological trauma.' This corroborates the work of Naidoo et al. (2023), which establishes a link between resource shortages, ethical distress and burnout amongst non-medical healthcare workers in sub-Saharan Africa. Healthcare workers

thus face a ‘double burden’: the physical strain of working under substandard conditions and the mental strain of medical bereavement attributable to systemic poverty.

4.4. Policy implementation and practices: towards contextualised protocols

In light of these findings, our results suggest operational recommendations. The resourcefulness of ARs, documented in the form of personal donations, technical improvisation and the bartering of supplies between departments, cannot serve as a sustainable substitute for institutional obligations and may even, as Ratner et al. (2025) warn, mask logistical failure by normalising under-resourcing and fostering a harmful sense of complacency.

Two imperatives emerge: (1) the development and validation of simplified, context-specific emergency protocols for PRFIs, based on accessible clinical and biological targets (SpO₂, automated NIBP, rapid capillary lactate measurement devices), breaking away from the inapplicable recommendations of high-income countries; and (2) the systematic subsidisation of emergency surgery kits, removing the financial barrier from the moment the patient is admitted and restoring the ‘Golden Hour’ for sepsis, which is currently undermined by the requirement for upfront payment.

4.5. Limitations of the study

Several limitations must be taken into account. Although the sample size meets the criterion for empirical saturation, caution is required when considering the generalisability of the results to rural centres or tertiary hospitals in other provinces. As the data are based on self-reported practices, social desirability and recall bias are inherent; the absence of structured direct observation meant that it was not possible to systematically triangulate reports with real-time practice. Finally, the exclusive focus on ARTs would have benefited from incorporating the perspectives of surgeons, on-call GPs and managers to achieve broader interprofessional triangulation.

Conclusion

This qualitative study demonstrates that the management of acute typhoid peritonitis in Matadi presents an ongoing clinical, ethical and human challenge. It reveals a vast paradigm gap between the international guidelines of the Surviving Sepsis Campaign and the reality on the ground: deprived of dynamic haemodynamic monitoring and real-time laboratory results, emergency room doctors manage fluid resuscitation ‘blindly’, guided solely by their clinical intuition

and observation of macro-vital signs, at constant risk of under-resuscitation or iatrogenic overload.

The crushing weight of financial and institutional constraints, reliance on household resources to purchase emergency kits, and the ‘three-pronged delay’ place these healthcare workers in a situation of acute ethical distress in the face of preventable mortality. Nevertheless, their remarkable resilience and self-efficacy demonstrate essential yet often overlooked skills, albeit insufficient to provide a sustainable solution to systemic shortcomings.

To break the vicious circle of peritoneal morbidity and mortality, it is urgent that political and health authorities commit to priority actions: subsidising emergency kits to remove the financial barrier upon admission; equipping operating theatres with basic monitoring equipment (SpO₂, NIBP, rapid lactate assay); developing and disseminating context-specific MCPP protocols, scientifically adapted to the austere conditions of resource-limited settings; and institutionalising continuing professional development and capacity-building programmes in emergency anaesthesia and resuscitation for frontline paramedical staff. Ensuring the safety of MCPP cannot rely indefinitely on the resourcefulness of healthcare workers alone.

Authors’ contributions

The individual contributions of the authors to this study are as follows:

- Désiré Mbeholo Mvibudulu: Conceptualisation of the study, development of the methodology, thematic analysis of the data, drafting of the first version of the manuscript.
- Schepers Gegelezo Judith: Contribution to the conceptualisation of the study, supervision of data collection, critical review of the manuscript.
- Matadi Matadi Bonheur: Contribution to the conceptualisation, thematic analysis of the data, critical review of the manuscript.
- Berthe Barhayiga: Overall supervision of the study, expertise in anaesthesia and intensive care, critical review and final approval of the manuscript.
- Emmanuel Bomba Di Masuangi: Overall supervision of the study; critical review and final approval of the manuscript.

- Mukie Bolanken Bénignon: Contributed to the thematic analysis of the data; critically reviewed the manuscript.

All authors have read and approved the final version of the manuscript.

Funding

This research received no external funding or institutional support for publication costs.

Data availability

The data used and/or analysed in this study are available from the ‘corresponding author’ or ‘the authors’.

Declarations

Declarations on human ethics and consent to participate.

The study was approved by the local ethics committees of the general hospitals in the city of Matadi.

Conflicts of interest

We declare that we have no conflicts of interest.

Informed consent to participate was formally obtained from and respected for all participants.

References

1. Ajzen, I. (1991). The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
2. Bardin, L. (2013). *Content analysis* (3rd ed.). Paris: Presses Universitaires de France.
3. Cikwanine, J. P. B., et al. (2024). Epidemiological, clinical and prognostic aspects of acute generalised peritonitis in South Kivu Province: a descriptive observational study of 278 cases. *PAMJ Clinical Medicine*, 47(1). <https://doi.org/10.11604/pamj.2024.47.1.38288>
4. Colorafi, K. J., & Evans, B. (2016). Qualitative descriptive methods in health science research. *HERD: Health Environments Research & Design Journal*, 9(4), 16–25. <https://doi.org/10.1177/1937586715614171>
5. Couperus, K., et al. (2025). Global emergency surgery outcomes and resuscitation paradigms in low-resource settings. *World Journal of Surgery*, 49(2), 301–310.
6. Elombila, M., et al. (2024). Pre-operative resuscitation for septic shock due to peritonitis at Brazzaville University Hospital. *Annales Françaises d’Anesthésie et de Réanimation*, 43(3), 210–217.
7. Evans, L., Rhodes, A., Alhazzani, W., et al. (2021). Surviving Sepsis Campaign: International guidelines for the management of sepsis and septic shock 2021. *Intensive Care Medicine*, 47(11), 1181–1247. <https://doi.org/10.1007/s00134-021-06506-y>
8. Hennink, M., & Kaiser, B. N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine*, 292, 114523. <https://doi.org/10.1016/j.socscimed.2021.114523>
9. Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications.
10. Marik, P. E., Baram, M., & Vahid, B. (2008). Does central venous pressure predict fluid responsiveness? A systematic review of the literature and the tale of seven mares. *Chest*, 134(1), 172–178. <https://doi.org/10.1378/chest.07-2331>
11. Naidoo, R., & Schoeman, R. (2023). Burnout in emergency department staff: The prevalence and barriers to intervention. *South African Journal of Psychiatry*, 29(1), 1–11. <https://doi.org/10.4102/sajpsy.2023.29i0.2095>
12. Nzengu, S. B., et al. (2024). The long-term outcomes of patients who have undergone surgery for acute peritonitis under general anaesthesia in an open-air setting. *Revue Congolaise des Sciences et Technologies*, 3(4), 527–533. <https://doi.org/10.59228/rcst.024.v3.i4.119>
13. Ogbuanya, U., et al. (2022). Analysis of mortality in typhoid-related intestinal perforation in Nigeria using a three-delay model. *African Journal of Paediatric Surgery*, 19(3), 150–156.
14. Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Sage Publications.

15. Rajabaleyan, P., Vang, A., Möller, S., Khalaf, S., Ladegaard, A. G., Qvist, N., & Ellebæk, M. B. (2025). Vacuum-assisted closure significantly reduces postoperative surgical complications compared with primary abdominal closure in patients with secondary peritonitis: A comparative retrospective study. *World Journal of Surgery*, 49(2), 387–400. <https://doi.org/10.1002/wjs.12472>
16. Sandelowski, M. (2010). What's in a name? Qualitative description revisited. *Research in Nursing & Health*, 33(1), 77–84. <https://doi.org/10.1002/nur.20362>
17. Sartelli, M., et al. (2021). WSES/GAIS/SIS-E/WSIS/AAST global clinical pathways for patients with intra-abdominal infections. *World Journal of Emergency Surgery*, 16(1), 49. <https://doi.org/10.1186/s13017-021-00387-8>
18. Saunders, B., et al. (2018). Saturation in qualitative research: Exploring its conceptualisation and operationalisation. *Quality & Quantity*, 52(4), 1893–1907. <https://doi.org/10.1007/s11135-017-0574-8>
19. Sukri, L., et al. (2024). Typhoid intestinal perforation in Francophone Africa: A scoping review. *PLOS Global Public Health*, 4(3), e0003056. <https://doi.org/10.1371/journal.pgph.0003056>
20. Vidal, L. (2023). *Making do with what's available: informal practices in hospital A&E departments in the Global South*. Paris: L'Harmattan.
21. World Health Organisation (WHO). (2022). *Task sharing and task shifting to improve access to essential surgery and anaesthesia*. WHO Guidelines.