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QUALITY IMPROVEMENT IN EMERGENCY MEDICAL SERVICES: SHARED EXPERIENCES OF SOUTH AFRICA WITH PRE-WAR UKRAINE

In the Republic of South Africa (RSA) healthcare quality including Emergency Medical Services (EMS) is impaired by scarce resources and variable governance and management. The National Health Quality Improvement Plan (NHQIP) seeks to transform health care quality through standards setting.

In RSA EMS managers monitor and adjust quality to comply with the Regulations Relating to Standards for EMS. EMS management training is deficient, and it is unknown how prepared they are to meet quality standards.

Object of research: How can the knowledge, attitude, and practice (KAP) of EMS managers be transformed to comply with the standards regulations for EMS.

A mixed methods explanatory sequential design was conducted in two phases. Phase one consisted of a KAP quantitative survey (n=352). Phase two included the non-participant observations (N-PO) at country-wide management workshops (n=7 provinces) and interviews (n=11) with key informants/power brokers. The data was analyzed to develop themes to deepen the understanding of the survey data.

Fragmentation of EMS into districts; ineffective workforce management; poor fleet management; poorly trained dispatchers, underutilization of information communication technology and vehicle tracking are factors that compromises the access, safety and contribute to ineffective and inefficient EMS. The World Health Organization (2020) report on EMS in Ukraine identified similar challenges.

EMS quality challenges in RSA are not unique, and sharing common challenges, experiences and solutions may benefit EMS organizations in other developing countries such as Ukraine.

Keywords: *emergency medical services (EMS), EMS management, quality improvement, standards setting, South Africa, Ukraine.*

1. Introduction

The quality of healthcare is a global concern as the ideal that underpins universal health coverage, together with equity and health justice. Healthcare quality is undermined unless quality improvement becomes central to the health and social agenda of governments across the world [1]. It is important to gauge the quality of Emergency Medical Services (EMS) as this component of the health system is a key entry point for patients needing urgent care [2, 3]. At the Seventy-second World Health Assembly, member states, including the Republic of South Africa (RSA), agreed that a functional emergency care system saves lives, increases the impact, reduces costs and is essential for universal health coverage [4].

The WHO recognizes the six dimensions of quality healthcare services as being: safety, timeliness effectiveness, efficiency, equity, and patient-centred [5, 6]. Provision of high-quality health care in South Africa is impacted prima-

rily by the 2020 COVID-19 pandemic, the quadruple burden of disease, the racial, spatial and urban-rural inequalities, high unemployment, crime, poor management, a lack of ethical leadership and accountability [7]. Improving the quality of health care is central to the proposed health care reforms in South Africa [8]. This article will present the findings of the RSA EMS study in quality which will be discussed in relation to the quantitative and qualitative analysis of Ukraine's Emergency Medical Services 2020 report from Luhansk and Donetsk Oblasts (administrative regions).

Authors of paper [9] suggest that in LMICs, EMS is viewed as the transportation wing of the healthcare system and there is little focus on the quality of pre-hospital care delivered to patients. An effective emergency medical system should have as its primary purpose to provide emergency care to all who need it regardless of circumstances that may render the patient vulnerable [9]. However, even with the best resources, delivering effective and safe emergency

care is a challenge as the prehospital environment is uncontrolled and unpredictable. There is no direct clinical oversight or supervision and access to patient history and information is often limited [10]. Although no study has specifically investigated the consequences of pre-hospital medical errors [11], emergency care is prone to clinical error given the unpredictable nature of the pre-hospital environment and that those cognitive errors do compromise patient safety and the provision of effective emergency care. Authors of paper [12] suggest that quality improvement measures can reduce diagnostic error in clinical practice.

As part of the literature review, the authors reviewed the WHO report entitled: Emergency Medical Services (EMS) in Ukraine, Current Capacities and Opportunities for Future Development [5] that aimed to improve the overall quality of EMS in Ukraine. A study of the report revealed that EMS in RSA and Ukraine faced similar challenges. Developing a quality improvement framework for EMS in RSA and Ukraine as an Upper-Middle-Income-Country (UMIC) and Low-to-Middle-Income Country (LMIC) respectively, that share common challenges and experiences will likely improve the quality of EMS.

The EMS in Ukraine was based on the German-Franco model, common in Europe, in which ambulances were staffed by physicians [13]. Reforms by the Ministry of Healthcare of Ukraine in 2017/18 aimed to improve emergency medical care by introducing the western-based EMS system with Emergency Medical Technicians and Paramedic qualifications, a central dispatch system and standardized evidence-based guidelines [14]. The unprovoked Russian invasion of Ukraine has led to Ukraine's healthcare system being overburdened in the eastern region of the country as healthcare staff fled the war-torn region to seek safety while the burden on the health system increased as a result of war casualties [15].

Russia's onslaught has seen thousands of civilians and soldiers killed and injured. Many hospitals and other health facilities have been destroyed by Russian missile attacks and seemingly indiscriminate shelling. The medical neutrality that the Geneva convention is meant to safeguard, has been violated adding to physical and mental trauma [16]. There is no sign of the end of war and the immediate priority of the health system is preservation of life and alleviation of suffering for millions of Ukraine's citizens. When the conflict does eventually abate, Ukraine will require international assistance to reconstruct the dam-age done to the health system. The EMS will likely play a pivotal role in facilitating access to the health system. The quality of a post-war EMS must be championed to pre-war conditions or better.

The task of the present study was to critique the public EMS managers' knowledge, attitude, and practices in RSA so as to strengthen the response to the national quality standards for EMS. The task is supported by research undertaken by authors of paper [3], which reported the poor knowledge of organizational specific quality systems and concluded that there was a need for a standardized quality system for EMS in South Africa. Similarly, the SA Lancet Commission stressed that mismanagement contributed to the poor-quality health care and suggested that health management training will help develop quality improvement measures aimed at addressing health care quality [7].

The aim of the study was to potentiate eligibility and compliance with the Department of Health quality standards for EMS. This study intended to recontextualize the quality improvement discourse through strengthening the public service EMS manager's response to the quality standards for EMS. In this paper we propose transferability to a post-war Ukraine.

2. Materials and Methods

A mixed method, convergent research design was applied as it involves the logic inquiry of induction, deduction, and abduction to answer the research questions. The methodological overview in Table 1 describes how both quantitative and qualitative data was collected, analyzed and integrated so as to get a deeper understanding of the research problem [17]. The methods were deliberately integrated in the discussion to draw on the strengths of each.

The mixed methods research approach is presented, followed by a discussion on the research methods for phase one and two, and the study population and sampling strategy methodology. The quantitative and qualitative data collection methods are discussed with an analysis that considers recontextualization for post-trauma contexts such as apartheid and ongoing interpersonal violence in RSA and the Russian invasion of Ukraine.

The quantitative data analysis was done using R® statistical software [18]. The qualitative findings were analyzed using ATLAS.ti® (Ver 23.1.1).

Table 1

Methodological overview

Study Tasks	Research Questions	Population	Methods	Analysis
Facilitate a quality self-audit of EMS Managers	What are the knowledge, attitudes and practices of EMS Managers that are quality champions, in the public EMS organizations in relation to Quality Improvement?	Public EMS managers from jurisdictional ambulance services in South Africa	Survey/Questionnaire	Statistical Analysis using R® statistical software
	What are the factors that motivate and foster Quality Improvement amongst EMS Managers within EMS organizations?			
Document the EMS Manager perspectives	How do EMS Managers perceive, interpret, and understand the OHSC quality standards for EMS?	EMS Workshop Participants	Non-Participant Observation	Qualitative Analysis using ATLAS Ti®
Document the EMS key stakeholder perspectives		Key EMS Stakeholders (knowledge brokers)	Interviews	
Develop Framework for change	What are the benefits and impediments to implementing Quality Improvement in EMS	Transferable beneficence from RSA to Ukraine and other conflict-ridden contexts	Literature Review and evidence appraisal	Guided by Theory, Trauma-informed

Ethical considerations and site approval. Site approval was granted by the South African National Department of Health for access to all nine provinces of South Africa. The research was conducted with due consideration to the Declaration of Helsinki and abided by all the rules and regulations of the Department of Health of South Africa. All primary data was from voluntary and informed consent. Institutional Ethical Approval was granted by the Cape Peninsula University of Technology, reference no.: 2021_FBMSREC 078.

3. Results and Discussion

3.1. Findings

The survey results of EMS managers from all jurisdictional ambulances in the country are presented in relation to User Rights; Clinical Support Services; Leadership and Governance; and Operational Management. Respondents could select the level of agreement from a 5-point Likert scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree.

3.1.1. User rights. User Rights refers to the rights of the patient. Given SA's history of human rights abuses, these rights are non-negotiable in the Batho Pele (meaning people first) principles and the Patient Rights Charter. The user has the right to access care, in a manner that is respectful of the user's dignity and in an environment that is safe. In Fig. 1 the EMS managers rated themselves, their workplace and organization highly in response to the questions under the User Rights domain. When assessing the average response to all four survey questions in this domain, 41.75 % (n=146) of the managers selected the Agree or Strongly Agree option on the five-point Likert scale.

3.1.2. Clinical Support Services. Clinical support is necessary to reduce medical errors, minimize waste and ensure medical equipment is managed effectively. In Fig. 2, on average 50.1 % selected either Agree or Strongly Agree to the three survey questions related to having safety protocols in relation to administration of medicines; efficient stock management processes; and an effective equipment management programme.

3.1.3. Leadership and governance. Leadership and governance are critical to the success of any human resource strategy. In Fig. 3, the response to the survey statement «Where I work, the Pro-

vincial Department of Health or parent company oversees and supports the EMS», 47 % (n=164) selected Agree and 9 % (n=23) said Strongly Agree. The response to the statement «My place of work has a functional governance structure in place», 44 % (n=153) said they Agree and 7 % (n=18) Strongly Agree.

3.1.4. Operational management. Operational management includes effective fleet management, human resources systems, disaster planning processes and response, occupational health and safety systems and a comprehensive safety programme. In Fig. 4, the response to the survey statement: «The vehicles used to transport patients are safe and well maintained», 49 % (n=172) choose Agree and 16 % (n=56) choose Strongly Agree, 20 % (n=70) were Neutral, 10 % (n=34) choose Disagree and 5 % (n=18) Strongly Disagree. The response to having a comprehensive safety programme that ensures the safety of the vehicle crew was negative as 30 % (n=104) were Neutral, 21 % (n=74) choose Disagree and 8 % (n=29) Strongly Disagree.
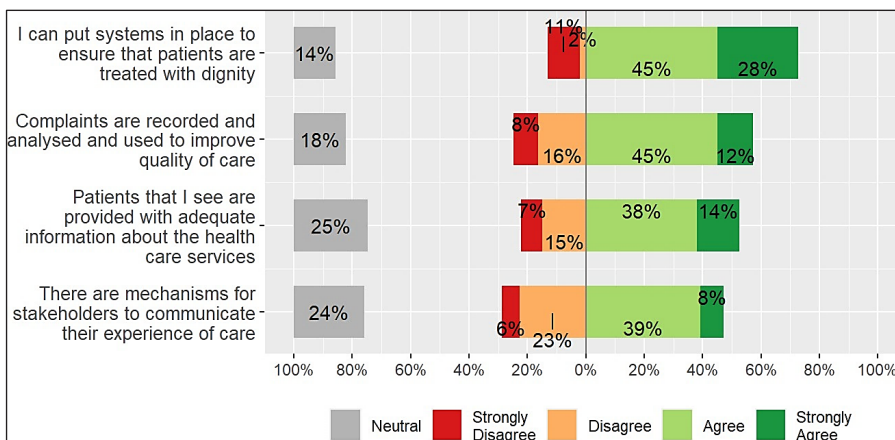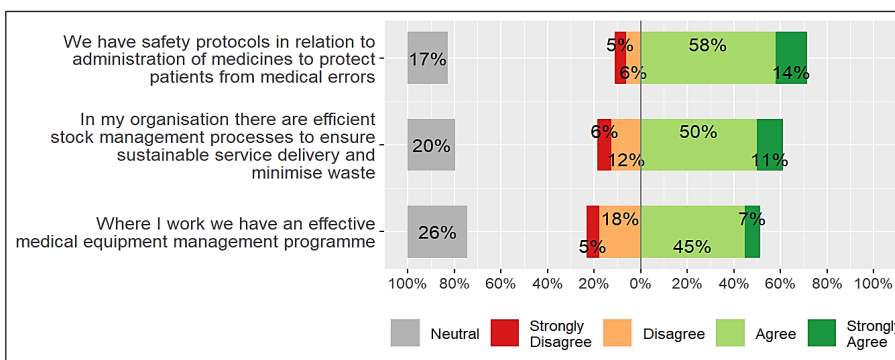

Fig. 1. User rights
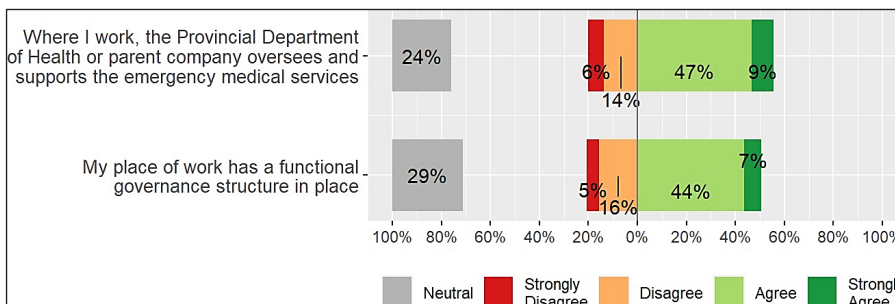

Fig. 2. Clinical support services

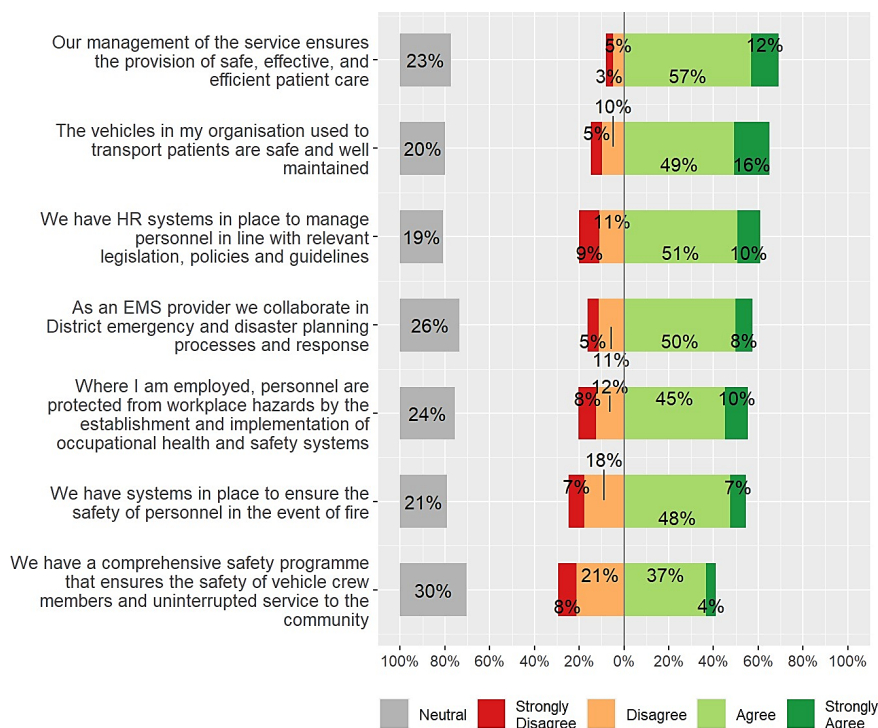**Fig. 3.** Leadership and Governance

Fig. 4. Operational management

The qualitative findings that include key extracts from the non-participant observations and interviews are presented in Table 2. These quotes from the workshops and interview participants add to the depth and meaning of the survey data. The contrast between the EMS in RSA and Ukraine are tabulated in Table 3.

Table 2

Themes the emerge from workshop discussions and interviews

Category	Key Supporting Quote
User Rights: Is EMS meeting their constitutional obligations	«We have an issue with a red zone. We negotiated with the community to have the patients taken to the clinic and set up a green corridor for the ambulance to enter and exit the red zone area. We draw up the agreement with them and will pick up several patients at a time». #W6*
EMS Team factors that influence quality	«The crews below us were very obedient at that time, so we didn't have problems. We didn't have the problems that we face today. So, you know they were on track. They came to work on time. They did what they supposed to do, and they left, you know. So, I think that made it easier for us to supervise the staff». #P3*
Leadership and Governance in the EMS context	«They know nothing, they do nothing, all they care about is how they dress». #W3 «When EMS is working well as a provincial service somehow, they think well it's good let's start talking district and it's one of the worst things that can happen to EMS in the province». #W3 «EMS manages in my province are frustrated because the managers that they were reporting to don't understand the EMS. And so, the managers that they report to don't have an interest in EMS because most of those managers are nurses or whatever and they are more interested in what's happening in the clinic and what's happening in the sub-district hospitals and those type of things». #P2 «The unions have got more power than the managers. Unions have got better access to the top management than the managers themselves». #P2
EMS clinical governance and clinical care	«…there was more focus on quality when I started there, I worked there from 1988 till about 1993, they had clinical governance. They even had a doctor that used to do clinical governance». #P2 «Your treatment had to be according to the protocols. Otherwise, you lost your badge». #P3
Infrastructure, EMS Fleet Management	«You know not having a proper communications tracking monitoring system that alone you know for me is the biggest gap in EMS, the biggest gap is that not having a CAD system». #P3 «…there's a lot of corruption in terms of computer aided dispatching systems, your ECC's, some provinces are spending now for the third time trying to get emergency control centres up and running». #P4 «In some places staff actually breaks this tracking systems and then we know that you know that not right». #W1 «You can wait two hours for an ambulance and it's a norm». #P2 «You speak about use of resources, and we have spare staff, because we don't have vehicles». «Some provinces have so many staff and no vehicles, so they sit or sleep at the station the whole night doing nothing». #W1
Quality improvement through education, training and collaboration	«…some of the provinces didn't share some of the good practices. And I think that they were just trying to hold the intelligence to themselves. And I think that was rather selfish. You know we we've picked up some of those things». #P7 «There is a well-structured partnership with fire department with joint rescue. Our focus now is about community engagement, not on response times. We don't have the budget and resources to provide an ambulance for every street block». #W6

Notes: #W – workshop number; #P – interview participant number

Table 3

Comparison between EMS in SA and Ukraine

Category	EMS South Africa	EMS in Ukraine [5]
User Rights	There is a threat of violence that places the ambulance crew at risk of attack due to crime or service delivery protests. User access to EMS is limited in «Red Zones» that require armed police escort	Access to health care for users in Ukraine has been impacted by the war with 1400 medical facilities damaged, 103 ambulances damaged, 250 destroyed and 125 seized by Russia [19]
The EMS Team	2019 Health Professions Council South Africa (HPCSA) registration statistics revealed that 5.8 % of the practitioners registered with the Professional Board for Emergency Care have Advanced Life Support qualifications. Although there are 56 894 registered EMS personnel in 2019, 76 % are Basic Ambulance Assistants [20]. There has been slow transformation of the EMS sector to address historical racial and gender under-representation. The Occupation Specific Dispensation that determines the salary structure and career path for EMS personnel has not been updated and the structure is outdated and that it refers to qualifications that no longer exist. EMS staff feel marginalized as they continue to be regarded as «ambulance drivers» and not as health professionals	Most (65 %) of EMS crews are feldsher (paramedic) led, usually consisting of two feldshers; 34 % are led by physicians with a feldsher; and 5 % are specialized teams, consisting mainly of cardiologists. The dissatisfaction is due to irrelevant legislation, poor working conditions, lack of safety, low prospects of future improvements and salaries. Concerns relate to low quality of ambulance crews, human factors, and the absence of infrastructure
EMS Education and Training	The National Emergency Care Education and Training (NECET) policy stopped emergency care short courses in 2019 and establishment a three-tiered emergency care qualification structure, on the higher education band, aligned to the National Qualifications Framework [21]. Authors of [22] reported that the migration plan in the NECET policy had not catered for the migration of thousands of short-course qualified EMS personnel who are employed in public and private EMS. The Council for Higher Education approved the provincial EMS colleges of emergency care to offer higher education programmes in emergency care. The colleges will expand the opportunities for in-service public EMS personnel to further their qualifications [20]	The Ministry of Health approved new professional categories for EMS, in accordance with the strategy for the development of EMS, in 2018. These include paramedics, emergency medical technicians (EMTs) and emergency dispatchers. The Ternopil Medical University and Cherkasy Medical Academy enrolled their first students in the three-year bachelor programme in paramedicine in 2018. In 2019, the Ministry of Health established the Feldsher to Paramedic Transition programme, which aims to upscale existing EMS feldshers to newly established paramedic standards of practice
Governance in EMS	Some provinces continue to decentralize EMS to the health districts despite the concerns that there was no sharing of resources within and between districts; ambulances were not permitted to cross the district boundaries to render assistance; different work shift systems were implemented in adjacent districts; EMS was not prioritized in the district budget allocation; and corruption and the abuse of funds was rife in some districts	There are 25 separate EMS, one for each administrative region, and they are governed by their respective regional health administrations
Clinical Governance	The HPCSA determines the capabilities scope of practice and clinical practice guidelines for each registration category of emergency care personnel	The USPCEMDM, which develops national EMS treatment protocols and publishes annual EMS statistics. In 2019, internationally recommended EMS protocols were translated and adopted by the Ministry of Health
Ambulance and EMS equipment	EMS uses the ideal EMS norm of 1 ambulance per 10 000 population to determine the number of ambulances per district, however in 2018 the public EMS had only 1971 vehicles. The demand for EMS far exceeds the supply with the shortage of vehicles impacting directly on the users having timely access to emergency medical care. The non-availability of the fleet included the appointment of incompetent fleet managers; delays in the turnaround times with authorization, maintenance, repair, and servicing of the vehicles; suspicion amongst some managers that there was theft and corruption associated with vehicle maintenance and repairs; and ambulances from rural areas had to be taken hundreds of kilometres to service centres in the city	The EMS fleet in Ukraine before the war consisted of 3118 ambulances (0.7 per 10 000 population), with most (92 %) being Type B (emergency ambulances) and the remaining type C (mobile intensive-care units (ICUs). Prior to the war services suffering most from underfunding are medicines and supplies, medical equipment, ambulance maintenance, human resource salaries, training simulation and logistics (repair of premises and garages). Ambulances and EMS staff are distributed in both oblasts based on population density (one brigade per 10 000 population). There were no national requirements for ambulance maintenance
Dispatching in EMS	Section 10 (2a) in the regulations relating to standards for EMS require EMS to have computer aided dispatch (CAD) or a paper-based system that facilitates vehicle allocation, routing and tracking. There is no standardized CAD system used across the SA. EMS managers complained because they are unable to monitor and track the physical location of the ambulances and the rest of the fleet, they cannot effectively manage and report on the resources	In 2019, only nine regions across Ukraine had some form of centralized, computerized dispatching system. The intention was to improve EMS dispatching and prioritization of calls. There were no algorithms for call prioritization and coding. There is no computer program in Luhansk for evaluating performance in full and no global positioning system (GPS) for ambulances. EMS does have a unified telephone number with an available backup number, but not caller-locater GPS
Response of EMS	It is not unusual for a user to wait two hours for an ambulance. The key factors identified as contributing to poor response times include the high call volume, availability of ambulance, and staff. Some of other contributing factors that are associated include the inappropriate use of EMS by the public, delayed turn-around times at hospitals, fleet unavailable due to maintenance and repairs, human resource capacity and long travel distances in rural areas	The Order of the Cabinet of Ministers of Ukraine #1119 states that the required EMS response time to urgent calls is 10 minutes in urban areas and 20 minutes in rural areas. Official statistics submitted to the Ministry of Health by the regional administrations suggest this requirement is met in 90 % of cases in urban areas and 85 % in rural territories. The absence of computerized dispatch recording systems, however, makes these numbers difficult to validate

3.2. Discussion

The discussion considers both the quantitative survey data and the qualitative findings from non-participant observations at the EMS workshops and interviews with key stakeholders. The WHO report on the Ukraine EMS makes for a dyadic contrast.

3.2.1. User rights. Section 10 of the Constitution of South Africa says: «Everyone has inherent dignity and the right to have their dignity respected and protected» [23]. The RSA Patient's Rights Charter acknowledges the violation of fundamental human rights during apartheid, including the right to health care service. The charter commits the Department of Health to ensuring that everyone's right to receive timely emergency care at any health care facility regardless of their ability to pay [24].

In RSA pick-up points have also become a feature associated with residential areas that are designated as «Red Zones». «Red Zones» are areas where there is a likely threat of violence that places the ambulance crew at risk of attack due to crime or service delivery protests. Author of [25] describes how the user waiting time for ambulances in Red Zones, which are in mainly low-income areas, has increased as the ambulance must wait for an armed police escort before entering the unsafe areas.

Whilst RSA suffers a relative «slow burn», access to health care for users in Ukraine has been impacted by the war with russia. By 2023, 1400 medical facilities in Ukraine were damaged by missiles and bombs. EMS also suffered with 103 ambulances damaged, 250 destroyed and 125 seized by russia [19].

3.2.2. The EMS team. The EMS workforce is arguably the most valuable asset of EMS organizations and therefore fundamental to the quality of the health services rendered. A key contributor to poor quality health care is the lack of appropriately qualified health care workers. In 2021, the Director for Human Resources for Health, reported that there were 22 000 vacancies in the public health sector [26] in RSA. The poor work environment leads to poor mental health, increase absenteeism and sick leave and migration of public health care workers to either the private health care sector or emigration to other countries [27].

In RSA, the low levels of professionalism in EMS led to the 2017 National Emergency Care Education and Training (NECET) policy. In response to NECET, the Health Professional Council of SA (HPCSA) stopped the short course qualifications and closed new entrants to these registers [22]. To replace the short courses, the NECET policy establishment a three-tiered emergency care qualification structure, on the higher education band, aligned to the National Qualifications Framework [21]. The analysis of the 2019 HPCSA registration statistics revealed that only 5.8 % of the practitioners registered with the HPCSA have Advanced Life Support qualifications.

In Ukraine, the Ministry of Health approved new professional categories for EMS in 2018 as is shown in Table 3. These include paramedics, emergency medical technicians (EMTs) and emergency dispatchers. Prior to this the EMS was manned by physicians supported by Feldsher (Russian equivalent to Paramedic). The Ternopil Medical University and Cherkasy Medical Academy enrolled their first paramedic students in the three-year bachelor programme in paramedicine in 2018. In 2019, the Ministry of Health established the Feldsher to Paramedic Transition programme, which aimed to upscale existing EMS feldshers to newly established paramedic standards of practice [14, 28].

3.2.3. EMS governance. Some provinces in RSA devolved EMS to the health districts. The District Health Service (DHS) model is endorsed by the WHO as a health service model to deliver Primary Health Care [29]. In RSA it has been poorly implemented with author of [30] highlighting that the ineffective and incompetent leadership and governance, at all levels of the health system, as the primary reason for the crisis in some health districts. During the workshops and interviews, the decision on decentralizing EMS by senior provincial management angered EMS managers. There was in strong opposition during workshops 2 and 3, and in the interviews with Participants 2, 8, and10 to EMS being fragmented and placed under the control of the DHS management team that had no prior EMS qualifications, knowledge, or experience.

In 2012 the Ukraine Parliament passed a law that restructured EMS. Whereas like in RSA it was fragmented under the local authorities of towns and districts, it is now governed under 25 separate regional health administrations where there is more coordination and overall improvement in the EMS coordination and response [14].

3.2.4. Ambulance and EMS equipment. In RSA the ideal EMS norm of 1 ambulance per 10 000 population determines the ideal number of ambulances per district. There should be approximately 5700 ambulances in the public EMS but in 2018 the number reported was 1971 [31]. EMS staff report for work and sit around doing nothing for the entire shift because there are no vehicles available. EMS managers expressed their frustration as they were held accountable for low number of operational ambulance when the shortage was due to factors outside their direct control.

The EMS fleet in Ukraine before the war consisted of 3118 ambulances (0.7 per 10 000 population), with most (92 %) being Type B (emergency ambulances) and the remaining type C (mobile intensive-care units). Prior to the war services suffering most from underfunding are medical equipment, ambulance maintenance, and repair of premises and garages. Ambulances and EMS staff are distributed in both Oblasts based on population density (one brigade per 10 000 population) [5].

3.2.5. Dispatching in EMS. The Emergency Communication Centre (ECC) is the first point of contact for persons requiring EMS. In developed countries the ECC use advanced Information Communication Technology (ICT), computer aided dispatch (CAD) and vehicle tracking systems to ensure that the right resources are sent to the right incident at the right time [32]. RSA has implemented 112 as the universal emergency telephone number which is the same for Europe.

The response to the survey regarding communications systems facilitating the provision of effective and appropriate emergency care was rated negatively after building infrastructure. Considering that the ECC is the hub of the EMS organization, that is intended to ensure the efficient and effective use of resources, the finding is alarming.

In Ukraine, nine regions have equipped their dispatch centres with central computerized systems. Despite these

improvements, there are no algorithms for call prioritization and coding. There is no computer program in Luhansk for evaluating performance in full and no global positioning system (GPS) for Ambulances. In Ukraine EMS have a unified telephone number with an available backup number, but not caller-locater GPS [5].

3.2.6. EMS response. Section 10 (2c) in the regulations relating to standards for EMS require an EMS to monitor response times for each stage of the call management and dispatch process. In the interviews Participant 9 pointed their approach is that we will send an ambulance when we have one available. Although Participant 9 said that the «Golden Hour» is important, Participant 2 said it is not unusual for a user to wait two hours for an ambulance. (The «Golden Hour» refers to the first hour following an incident within which definitive emergency treatment must be provided. The patient must be transported to a medical facility within the hour and receive definitive care at the facility to decrease the risk of death and disability [33]).

The managers acknowledged that there are various reasons for the poor response times. While it may appear to the lay person that adding more ambulance is the solution, there just is not enough funding and resources to compete with the rest of the world according to Participant 9. The key factors identified as contributing to poor response times include the high call volume, availability of ambulances, and staff. Some of other contributing factors that are associated with poor response times include the inappropriate use of EMS by the public, delayed turn-around times at hospitals, fleet being unavailable due to maintenance and repairs, human resource capacity and long travel distances in rural areas.

The Ukraine report, states that EMS response time to priority calls is 10 minutes in urban areas and 20 minutes in rural territories. Although the official statistics suggest this requirement is met in 90 % of cases in urban areas and 85 % in rural territories, the absence CAD systems, however, makes these numbers difficult to validate [5]. In areas where there is active combat, the expected EMS dysfunction (in terms of normal operations) may prevail.

3.2.7. Practical relevance. The quality systems of EMS organizations in LMICs and UMICs requires standards to measure and improve their effectiveness and efficiency of their services. The factors identified in this study that affect quality systems in EMS centre around healthcare leadership competencies. The transformation to improve quality of EMS organizations in low resource healthcare systems will require EMS managers to develop effective leadership competencies.

3.2.8. Research limitations. While healthcare and EMS systems in RSA face common challenges with the Ukraine health system there are significant differences that were beyond the scope of this study. The Ukraine data was retrieved from the available literature on the EMS organization whilst the findings from RSA was obtained a survey, non-participant observation at workshops and interviews with EMS managers.

3.2.9. Prospects for further research. Further research is required to define, describe, and evaluate the EMS manager competencies required for quality improvement in EMS.

Measuring the EMS performance in relation to the established quality standards is needed to evaluate effectiveness and measure the true value proposition of EMS organizations.

4. Conclusions

The authors set out to critique the public EMS, and the EMS manager's knowledge, attitude, and practices in RSA in response to the national quality standards for EMS. The findings confirm that EMS managers are tasked with coordinating the provision of emergency healthcare services in an austere environment, with war being in the extreme. Delivering the right resources to the right user at the right time is a complex undertaking. Scarce resources and hostile environments compromise the provision of safe, effective, efficient implementation of healthcare services to the users in need of urgent emergency care. The EMS manager requires bespoke leadership competencies to meet the demands of this complex organization. The shared EMS experiences and trauma-informed lessons of both RSA and Ukraine can mutually develop and benefit the EMS in both countries.

Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

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Data availability

The manuscript has no associated data.

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