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A Qualitative Descriptive Study of Rural Primary Healthcare Professionals' Capacity for Disaster Health Management Pre- and During-COVID-19

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Abstract: *Introduction*: Rural areas face additional challenges in preventing, preparing for, responding to, and recovering from disasters. This study aimed to understand how rural General Practitioners PHCPs perceive their roles, involvement, and capacity in disaster health management. *Methods*: For this qualitative descriptive research, semi-structured interviews were carried out with convenience and purposive samples of rural PHCPs before and during the COVID pandemic. Open, axial, and selective coding were employed to analyse the data inductively. *Results*: five interviews were conducted pre-COVID and ten interviews during the second and third waves of COVID. Identified themes were similar between the two periods. Rural PHCPs were underutilised due to a lack of awareness of their capacity and a lack of infrastructure and support for greater involvement. *Conclusion:* Rural PHCPs can be better integrated and supported in readiness for a whole of system response to future disasters.

Keywords: disaster health management; rural health; general practitioners; COVID-19; primary healthcare

1. Introduction

Disaster management in rural and remote primary healthcare settings is a crucial component of public health that tackles particular challenges communities face in geographically remote areas [1,2]. Rural and remote regions usually face additional challenges in responding to and recovering from disasters, unlike larger centres, where resources and infrastructure are often more readily available [3,4]. Among these difficulties may be the scant population, limited transportation and communication infrastructure, and restricted access to healthcare facilities [5-9]. The term "disaster" lacks a commonly agreed-upon formal definition, but recurring themes highlight the extent to which severe events affect humanity and their capacity to deplete already limited resources [10,11]. Landesman (2005) defines a disaster as a situation of particular scale and breadth that causes harm to people or assets, injury, illness, or death, and that cannot be sufficiently controlled with the help of resources or established processes. Natural, man-made, and hybrid disasters are the three primary classifications into which types of disasters are frequently divided [12]. Earthquakes, floods, bushfires, landslides, tsunamis, storms, and other extreme weather phenomena are examples of natural disasters. Man-made disasters involve transportation or industrial incidents as well as terrorist attacks, explosives, chemicals, toxins, or nuclear substances [13]. Pandemic-related events, such as viruses, pose a threat to public health and fall under the last category of disasters [14]. The

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Prevention, Preparedness, Response, and Recovery (PPRR) model is a comprehensive framework for managing disasters [15]. Every disaster goes through three cycle phases: the pre-, during-, and post-disaster. Pre-disaster phases comprise preparedness and prevention; during-disaster phases are referred to as reaction phases; and post-disaster phases are recognised as recovery[15].

Disasters can inflict severe harm on communities, leaving a trail of destruction that impacts lives, livelihoods, and infrastructure. For instance, the 2022 report lists 387 natural hazards and disasters that were reported by the Emergency Events Database (EM-DAT). These disasters claimed 30.704 lives, impacted 185 million people, and caused $223.8 billion in economic damages [16]. The harm caused by disasters extends beyond immediate physical damage.[17] Communities may experience disruptions to essential services such as healthcare, education, and transportation, exacerbating existing vulnerabilities. The loss of homes, livelihoods, and critical community assets can have long-lasting social and economic repercussions [18]. Additionally, the psychological toll on individuals, families, and communities can be profound, leading to increased stress, trauma, and mental health challenges [19].

Maintaining and delivering healthcare services during and after disasters is a complex undertaking that requires a multifaceted and adaptive approach [20]. Disasters, whether natural or human-made, can disrupt healthcare infrastructure, strain resources, and increase the demand for medical services [21]. In disaster management, healthcare services during and after disasters are crucial for mitigating the impact on communities [22]. This requires a comprehensive and integrated approach that takes into account the specific needs and constraints of rural and remote areas [1,23].

This study seeks to fill a knowledge gap about the role of primary healthcare professionals (PHCPs) in disaster management in rural areas, which needs more attention. This study aims to assess and enhance disaster management in rural primary healthcare settings, highlighting the importance of the PHCPs in health disaster management.

2. Methods

Theoretical Framework

The study utilised the Capacity building theory, which provides a framework that emphasises the importance of building and sustaining the skills, systems, resources, and adherence needed to enhance health in the health sector along interconnected sectors [24,25]. In other words, capacity building refers to the behind-the-scenes efforts of healthcare professionals to promote and sustain good healthcare in a changing world [24,26]. Three aspects of health capacity building are health infrastructure or service development; program maintenance and sustainability; and problem-solving capability of organizations and communities [24]. Health infrastructure or service development is the process of establishing minimum standards in the health sector's structures, organizations, skills, and resources. Program maintenance and sustainability emphasizes the ability to carry out a specific program over time through an organization's network. Problem-solving capability of organisations and communities refers to the ability to recognize health problems and formulate suitable decisions by drawing on past experiences or actions [24]. Applying a capacity-building framework in healthcare, especially during disasters, improves the ability of healthcare systems, professionals, and communities to attend adequately to health crises. This study employed the capacity-building framework to understand the importance of ongoing professional training and education; resource allocation and distribution; community engagement; strengthening healthcare infrastructure; data collection and analysis to assist decision-makers; and developing disaster management policies and guidelines. Moreover, Capacity building works to build responsive systems which involves a focus on the processes that support change within and between organisations. leading to systems that value critical problem-solving and leadership across organisations and address health challenges during disasters [24].

Study Design and Setting

A qualitative descriptive study was undertaken to understand the different experiences of rural PHCPs with disaster health management. This methodology is well-established and specifically selected to recognise the subjective nature of the different experiences and applications in informing health services [8,9]. Semi-structured interviews informed by key themes from the preceding scoping review [1,8] were conducted in two trenches: 2015 (pre-COVID; P1-P5) and 2020 (second and third waves of COVID; P6-P15). Interviews were conducted by three investigators in person and via videoconference. Interviews were recorded with permission and transcribed verbatim, with identifiable and re-identifiable data removed before being sent back to participants for member checking to ensure the credibility of this qualitative research. Interviews lasted on average 30-45 minutes and were conducted at the participants' convenience.

Study Participants and Sample

A convenience and purposive sample of rural vocationally registered Australian PHCPs in Modified Monash Model 2 (regional centres) to 5 (small rural towns) geographical areas, whom had experience with disaster health management, were recruited via GP Partners (2015), Snowball recruiting runs through university websites and the Rural Doctors Workforce Association. Prior to performing the study, formal ethics approval was obtained ((2015: 1500000901) and (2020: SBREC 8285)).

Data Analysis

The authors utilised inductive data analysis first, comparing across groups pre- and during COVID-19, before moving to deductive analysis using the capacity-building framework. Four investigators independently read and coded the interviews inductively using open coding, axial coding, and selective coding [2]. This iterative process allowed for the examination of emergent themes and patterns within the data. This methodological approach is flexible yet able to harness the strength of "multiple realities [and] … diverse perspectives" [27] while fostering the understanding and construction of theory, in how rural PHCPs could be better integrated and/or utilised in disaster health management. Multiple coding, establishing audit trails, and validation by independent researchers were utilised to improve the dependability of the qualitative research rigour. Reflective journals were kept by the researchers, and fortnightly investigators/ supervisory meetings were held to extend the confirmability of the research [28].

3. Results

Fifteen PHCPs (coded 01-15) were interviewed across Queensland and South Australia. As outlined in Table 1, This study deliberately included participants from various professions, career stages, and geographical locations.

Table 1. The characteristics of study participants.

TABLE 1: *Characteristics of study participants (n = 15)*	
n (%)	
Location	
Queensland	5 (33.3)
South Australia	10 (66.6)
Primary Healthcare Role Category	
General practice	9(60.0)
General practice management	2 (13.3)
Paramedicine	2 (13.3)
Pharmacy	1 (6.6)
Psychology	1 (6.6)
Work Experience During COVID-19 Pandemic	
Yes	10 (66.6)

No	5 (33.3)
Have a disaster plan in place	
Yes	10(66.6)
No	2 (13.3)
Not specify	3(20.0)
Received training in disaster management	
Yes	8(53.3)
No	2 (13.3)
Not specify	5(33.3)
Having a disaster communication protocol	
Yes	13 (86.6)
Not specify	2 (13.3)

All the participants had experienced disasters other than COVID-19. The diverse disasters encountered by participants are shown in Figure 1. Natural (thunderstorms, flash flooding, bushfires), mass-casualty catastrophes, and infectious (measles, swine flu) were the most significant disasters experienced.

Themes

Five overarching themes emerged from data deductive analysis: the role of PHCPs in rural disaster health management; the participation of PHCPs in decision-making during rural health disaster; the internal and external enablers to PHCPs involvement in disaster management; internal and external barriers to PHCPs involvement in disaster management; and the addition impact of COVID-19 in PHCPs experience

Role of PHCPs in Rural Disaster Health Management

Monitoring role: The monitoring approach emphasises the need for flexibility and agility in disaster management while acknowledging the complexity and uncertainty of disaster scenarios. Monitoring the disaster approach involves a systematic procedure used to pinpoint and weigh potential dangers or risks related to accidents, infectious diseases, and natural disasters. In the case of infectious diseases, for instance, PHCPs need to decide the likelihood that frontline employees may contract the flu.

"… anybody with swine flu is seen completely away from the risk of patients and staff." (P2).

"if the patient is aware that they or we are aware that they are infectious they can wear the mask on, they can be asked to sit in a separate room" (P4).

Adopting role: Applying the existing disaster management plans as a part of the adopting approach. Based on the data gathered, PHCPs adopt the current disaster management plans and strategies to address the shifting conditions of new disasters.

"We just follow the protocols for patient management" (P4).

"You're a frontline worker in that role so you take command from   the command centre" (P9).

"We've got our own disaster plan and we've picked key areas on how it may affect the business and how it runs." (P6).

Disaster coordination role: The disaster coordination involves the collaborative efforts of various organizations, agencies, and stakeholders to effectively respond to and manage all aspects of a disaster or emergency. coordinating disaster include command and control; communication management; resource management; and logistics and supply chain management. building the command structures to oversee and guide response actions, such as identifying incident commanders, emergency operations centres, and ground staff, it is attainable to command and control the disaster. For instance, in a natural disaster, PHCPs guided the nearest rural help (paramedics, firefighters, rescue) to the most required location.

"that helps them triage and integrate with emergency services: police, fire brigade, emergency services." (P5).

"I would speak to my colleagues at work or my colleagues in other practices" (P10).

"when it comes to how other agencies and services run their mass casualties and disaster scenarios, it's helpful to practice with them" (P11).

In communication management, PHCPs coordinated communication systems to make sure that all stakeholders were informed. For instance, in the event of mass casualty occurrences, PHCPs in remote areas must make sure they notify the closest hospitals of the severity and quantity of casualties.

"The aim might be transfer to a local hospital or transfer into tertiary hospitals" (P7).

"everyone needs to be informed in the similar fashion" (P13).

"and then having open communication with people that provide essential services in the whole state." (P13).

Resource management involves coordinating the allocation and distribution of resources such as personnel, equipment, medical supplies, food, water, and shelter to meet the immediate needs of affected populations.

"make you think about how to best allocate staff and resources" (P6).

"… thinking about process, thinking about resources" (P7).

The Participation of PHCPs in Decision-Making During Rural Health Disaster

Specifically, during COVID, participants identified two layers of decision-making during rural disaster health management: local or regional decisions made by the rural primary healthcare providers (for example, logistics for setting up vaccination) and decisions made centrally by the health authorities (for example, vaccination schedule). Without being involved in the centralised decision-making process, the rural PHCPs contribution to centralised decision-making was restricted to interpreting the edict to staff, patients, and their local communities. However, rural PHCPs were involved in local workplace safety and human resource management decisions.

"So this politician is making decision on health and what he thinks about is how he has his general practitioner interaction . That is unfortunate because they think they know but they don't" (P7).

"I can see why it takes time to make a decision, then time for the government to allow the decision to happen" (P15).

"You're a frontline worker in that role so you take command from the command centre, from the captain or supervisor or whatever it is, you don't get to decide." (P9).

Internal and External Enablers to PCHP Involvement in Disaster Management

As shown in Table 2: Higher-level guidance; established communication channels; resources for acute disaster response; moral obligation; digital technology facilitating business continuity; and continuity of care emerged as Pre- and during-COVID enablers to PCHPs involvement in disaster management.

Table 2. Internal & external enablers to PCHP involvement in disaster management.

Category	Subcategory	Theme
1. Higher-Level Guidance	1a) External guidance from PHNs & agencies	Provision of disaster management education & training by PHNs & specialised agencies
		Dissemination of disaster management policies by PHNs & agencies during disaster response
		Dissemination of disaster readiness guidelines by PHNs & agencies during disaster-prone seasons

		Mandatory emergency management training as per accreditation process; high standards of work health & safety requirements for accreditation with specialised agencies
	1b) In-service guidance	Individualised practice guidelines regarding disaster screening, detection & management
		Mandated training & education for staff on disaster preparedness and management
		Multidisciplinary training with various PHCP professions to prepare for a cohesive disaster response
2. Established Communication Channels	2a) External communication with PHCPs	Emails or faxes from PHNs regarding updated regulations & guidelines during disaster response
	2b) In-service communication	Regular staff meetings and email correspondence to establish updated policies & guidelines, particularly during disasters and high-risk seasons
		Strong in-service support network for PHCPs to contact regarding any concerns, queries and recommendations regarding disaster management
	2c) Communication between PHCPs & the community	Patient education on disaster prevention & management via phone calls, flyers, brochures & posters
3. Resources for Acute Disaster Response	3a) Material resources	Basic in-service emergency resource supply available for acute emergency response (e.g. PPE)
		Provision of disaster preparedness & management resources from PHNs during disasters
		Increased availability of in-service resources for disaster prevention, screening & management during disaster-prone seasons
	3b) In-service personnel	Flexible working hours to increase workforce during emergency response

		Flexible surge capacity to accommodate for staff sickness or absence during disaster response
		Increase surge capacity during disasters to share patient load with nearby PHCPs to meet increasing demand for primary healthcare during disaster response and recovery
	3c) Knowledge	Access to recommendations, policies, and guidelines from local and international disaster responses to be integrated into pre-existing contingency plans
4. Moral Obligation		Personal accountability to seek and attend additional disaster management courses & upskilling workshops
		Duty of care to maximise preparedness by attending regular disaster readiness training
		Duty of care for PHCP services to maintain supply of emergency resources
5. Digital Technology Facilitating Business Continuity		Transition from paper to electronic data, allowing a safer, more reliable platform to access information
		Automatic backup & restoration of electronic data during power outages
		Back-up power supply to maintain access to computer hardware & monitor vaccine refrigerators at optimal storage temperatures
6. Continuity of Care		Strong patient rapport facilitating the delivery of patient & community education on disaster management (e.g. disaster prevention measures; tackling vaccine hesitancy)
		Community trust in PHCPs facilitating effective decision-making during disaster prevention and response (e.g. vaccinations)
		Strong patient rapport enabling PHCPs to build & use the local knowledge of the community to deliver psychosocial support

Internal and External Barriers to PCHPs Involvement in Disaster Management

As shown in Table 3: A lack of understanding and recognition of the role of PHCPs; Insufficient resources; a lack of interest in managing disasters; a lack of remuneration; and a lack of comfort and self-perceived competence emerged as barriers to PCHPs involvement in disaster management.

Table 3. Internal & external barriers to PCHPs involvement in disaster management.

Category	Subcategory	Theme

1. Lack of understanding & recognition of the role of PHCPs	1a) PHNs	No defined duty, role or response of PHCPs in disaster management guidelines, which outline a predominantly hospital-based response
		Limited involvement of PHCPs in disaster planning & preparation, leading to insufficient use of the full capacity & resources of PHCPs during disaster response
	1b)Community	Limited community understanding of the role of PHCPs in facilitating unneeded presentations to tertiary hospitals during disasters
2. Lack of resources	2a) From governments & agencies	Insufficient governmental funding for material resources for disaster response, particularly in prolonged disasters
		Insufficient federal funding to ensure personal safety for PHCPs during disaster response
		Limited availability of community mental health services due to limited understanding on mental health & prevention measures
	2b) Internal workforce	Lack of staff availability, particularly during recovery stages of disaster
		Conflicting balance between work, training & external commitments during disaster response & recovery
		Resource-intensive to organise regular, hands-on in-service training sessions
3. Lack of interest in disaster management	Lack of foreseeable benefit of disaster preparedness due to the low recurrence of disasters	
	Lack of general awareness of the repercussions of disasters	
	Unfeasibility to be maximally prepared for all types of potential disasters	
	Not following contingency plans from previous disasters	
4. Lack of renumeration	Lack of financial incentives to partake in additional training & education workshops	

	Lack of additional incentives to increase work hours such as financial renumeration of accreditation of training
5. Lack of comfort & self-perceived competence	Lack of previous encounters and experience in disaster management
	Limited clinical training or hands-on exposure for upskilling, and lack of recognition causing diminished confidence for PHCPs to be involved at a higher capacity in disaster management
	Staff hesitation to work due to high-risk to self and personal safety during disaster response

The Additional Impact of COVID-19 on PHCPs Experience

The experience in disaster management of healthcare professionals underwent profound and unprecedented changes before and during the COVID-19 pandemic. Before the pandemic, healthcare professionals operated in a more routine disaster management, with established protocols for patient care and infectious disease management. The focus was primarily on providing routine medical services, preventive care, and addressing common health concerns. However, with the onset of the COVID-19 pandemic, healthcare professionals found themselves at the forefront of an extraordinary public health crisis.

"around Feb-March when we first started to realise that they were in a very difficult situation" (P13).

"since Covid came, there's a lot of confusion and a lot of times you'll see that they say one thing in the morning, and in the afternoon another thing" (P14).

The demands on their expertise, resilience, and adaptability skyrocketed as they faced a surge in critically ill patients, shortages of medical supplies, and the constant risk of exposure to the virus.

"if you mean a pandemic like Covid, then you would have every clinic and everybody involved because you're interested in making the clinic run with all the limitations you have" (P9).

"We had to totally adjust our practice "(P10).

"because of Covid, because waitlists have been so long, by the time that people get to us, people are a lot more unwell." (P12).

The pandemic introduced new challenges, including the need for rapid adoption of telemedicine, increased stress and burnout, and the continuous adaptation to evolving scientific knowledge about the novel coronavirus.

"it was really really difficult for anybody to get any information from anywhere" (P9).

"rather than it being one shock, isolated incident, it's been kind of an underlying level of anxiety" (P12).

The experience of primary healthcare professionals during COVID-19 underscored the importance of flexibility, innovation, and collective resilience in navigating unforeseen and complex healthcare challenges.

"Yes Covid management, or develop a proper guideline – not only medicine, but non-pharmacological guidelines as well" (P14).

"took longer to develop the immunisations and we used novel things for the development." (P15).

4. Discussion

Rural and remote healthcare settings face unique challenges that can significantly impact the accessibility, delivery and continuity of healthcare services [10]. These challenges stem from a combination of geographic, economic, social, and infrastructural vulnerabilities [29]. The rural primary healthcare sector experiences particular difficulties that influence the capacity to effectively

plan, prepare for, react, and respond to a disaster [30]. While primary healthcare has the potential to render immediate frontline support and attenuate the whole healthcare system's surge during a disaster;[1] in our study, rural primary healthcare participants reported having reactive roles in the overall system response, potentially due to the limited understanding of rural primary healthcare capabilities within the healthcare hierarchy and government. There appears to be a sense of disconnect from the disaster planning and preparation processes, and in addition, planning for long-term recovery and restorative actions can be overshadowed by the emphasis on the immediate response.

During disasters, rural PHCPs play active roles in determining the risk to the public, instigating precautionary measures to mitigate risks, providing direct health and medical care while offering regional leadership to effect policies and support a whole-of-system response, and offering continuity of care during recovery from the physical and psychosocial effects of the disaster.

The rural primary healthcare sector has duality in a disaster: whilst it has the potential to reduce disaster damage and disruption and development of community and system resilience; as a critical healthcare infrastructure, rural primary health must also be protected from poor system integration to mitigate against disruption of basic services during a disaster. Australia, as a signatory to the international Sendai Framework for Disaster Risk Reduction 2015-2030, has - arguably - an international public law obligation to invest in rural primary healthcare to ensure that rural PHCPs and rural primary healthcare are effectively integrated into a whole-of-system response to future disasters.

5. Conclusion

Rural PHCPs reported they were underutilised in formal disaster policymaking during COVID. Barriers identified include a lack of understanding by the healthcare hierarchy and government and the limited infrastructure necessary to support greater involvement.

Author Contributions: Author 1: analysis, data curation, writing original. Authors 2 and 3: validation, writing review, supervision. Author 4: formal analysis. Author 5: investigation, formal analysis. Authors 6 and 7: investigation, formal analysis. Author 8: formal analysis, supervision. Author 9: conceptualisation, methods, investigation, formal analysis, writing review, supervision, resources, administration.

Ethical Approval: The research was approved by the Queensland University of Technology (2015: 1500000901) and Flinders University Human Research Ethics Committee (2020: SBREC 8285).

Data Availability: On reasonable request, the corresponding author can provide access to the data used to support the study's findings.

Conflicts of Interest: The authors declare no conflict of interest.

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