Preparedness of West Coast for the Alpine Fault rupture: a qualitative exploration

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Background: The West Coast of Aotearoa is classified as rural or remote rural. The Alpine Fault traverses the entirety of the 600km region and has a 75% chance of rupture causing a magnitude 8 earthquake within the next 60 years, codenamed by civil defence as 'AF8'.

Following AF8, it is likely that the West Coast will face numerous challenges, including inaccessibility, infrastructure destruction, displacement, injuries, and limited access to basic necessities. Primary health teams play a significant role in the response; it is vital to understand the perspectives of GPs regarding their preparedness.

Aim: to explore the perspectives of West Coast general practitioners regarding their preparedness for a magnitude 8 earthquake caused by the rupture of the Alpine Fault.

Objectives: The objectives are, within the context of remote and rural general practice and disaster response planning, to:

1) gain some understanding of current rural general practice context on the West Coast
2) consider what general practices may need to prepare or strengthen preparedness for a AF8 rupture

Method: A narrative review of Aotearoa and Australian published literature was undertaken. Qualitative, semi-structured interviewers were conducted with GPs working on the West Coast. A deductive thematic analysis methodology was used. Ethics approval was attained through the UoO. Ngai Tahu Research Committee consultation was undertaken.

Results: Narrative literature review discovered learnings in disaster response and preparation from previous adverse events. These were sorted into the PPRR model (Presentation, Preparation, Response, Recovery), including both medical and non-medical considerations.

Semi-structured interviews covered: the context in which care is delivered, current confidence and concerns, perceived strengths and challenges; and what readiness would look like.

Conclusions: The topography of the West Coast region and proximity to the Alpine Fault makes it vulnerable to devastation following an AF8 event. Findings inform a recognition of the current state of GP preparedness, and consideration of what future step(s) can be taken to strengthen readiness. Recommendations are made to include GP in disaster response discussions, to clarify the role of the GP in disaster response, and to utilise consultations for advancing patient education.

Introduction

The Alpine Fault

The West Coast region of Aotearoa stretches almost 600km and is home to just under 34,000 people, with Māori making up 13.5% of the population (1). The whole region is considered rural or remote rural, R1/R2/R3 based on the geographical classification for health (2). Ngāi Tahu are mana whenua of the West Coast, with two Papatipu Runanga within the region.

The West Coast region's topography makes it vulnerable to the effects of natural disasters (3). The Alpine Fault (AF) is a geological fault line that traverses the entirety of the West Coast region. Geological modelling of the four fault ruptures to have occurred in the prior 2,000

years indicate that the AF has an average 75% chance of rupturing in the next 60 years (4). The fault line can be divided into three general sections, with the southern and central sections between Fiordland to Kaniere (AlpineF2K) being most likely to generate the next fault rupture (5). The median value in the National Seismic Hazard Model for such is rupture is magnitude 8.1 (5), producing the codename "AF8". Of note, the Richter scale is logarithmic, meaning that each whole number represents a 10x increase in the amplitude of seismic waves (compared to the previous whole number). Secondary effects are likely to be vast; these may include landslides, seiches, aggradation and avulsion, liquefaction, landslide dams, tsunami and fire outbreaks (2). The primary and secondary effects of an Alpine Fault rupture are likely to have a significant impact on infrastructure, accessibility and healthcare for the West Coast region.

Following natural disaster, general practice teams have proven to be a crucial component of the response and recovery, providing clinical care for both earthquake related and non-earthquake related matters (6). Rural general practice teams use a multidisciplinary approach, which may provide attributes, knowledge, resources and skills that would be advantageous post AF8 (7). West Coast Health is a PHO not-for-profit community trust that provides, plans, funds and coordinates primary health care for West Coasters (8). West Coast Health is currently formulating a response plan to the expected Alpine Fault rupture, in collaboration with the planning that has been done amongst Te Whatu Ora, Civil Defence and Ngāi Tahu. These discussions consider the vast impact of an AF rupture, including non-medical and an acute hospital response. The perspectives of general practitioners are essential to understand how West Coast Health can help general practices to prepare their personnel, develop skill sets, fund resources and enable in-practice organisation to deliver optimal standard of care post AF8.

Context of care on the West Coast:

There are 14 Primary Care practices across the West Coast: Karamea Health Clinic, Ngakawau Health Clinic, Te Raw Kawakawa (Buller Health Medical Centre), Kawatiri Health, Reefton Health, Lake Brunner Health Centre, Coastal Health Limited, Te Nikau Health Centre, Westland Medical Centre, HariHari Clinic, Whataroa Clinic, Franz Clinic / South Westland Area Practice, Fox Glacier Clinic and Haast Clinic (8). These practices include Te Whatu Ora owned and private-public partnership practices, alongside Poutini Waiora (Māori Health and Social Services). There is one PHO, West Coast Health.

The context of care varies significantly across these different practices, considering differing population size, education/employment rates, family distribution, and geographic spread, including GCH categories of R1, R2 and R3 (2). The largest centre, Greymouth (R1), serves a population of 9,420 (10) through two practices: Coastal Health and Te Nikau Medical Centre. The smallest centre, Haast (R3), serves a population of 100 (10). The population spread also varies greatly, with some practices reporting patients requiring a three-hour round-trip to access the clinic.

Many practices report current staff vacancies. Te Whatu Ora practices are seeking a range of health care professionals, including GPs, rural generalists, psychiatrists, clinical psychologists, Health Care Assistants,

Registered Nurses, District Nurses, Rural Nurse Specialists, Transport Nurses, Oral Health Therapists, Roving Rural Nurse Specialists, Clinic Leader in Nutrition and Dietetics, Occupation Therapists (Mental Health) and Midwives (11). The majority of these vacancies are seen in Greymouth, with staff also required in Westport, Reefton, Buller, Northern areas and South Westland. Many of these advertised vacancies are part time, either to fill shortages, or to facilitate services that are only available on a part-time basis at that location (11). Whilst clinics have permanent healthcare staff, many practices operate with a GP who travels between several practices within a given area (roving). There is also reliance on specialist practitioners travelling from centres outside of the West Coast region for regular clinics. Furthermore, practices may rely on locums to fill current gaps in staff numbers. Telehealth operates in collaboration with in-person GPs to facilitate triaging of afterhours care, with escalating to in-person appointment as needed.

Distance to secondary level health services is a challenge for many clinics across the West Coast. Te Nikau Grey Hospital, based in Greymouth, offers an Emergency Department, GP clinic (planned and urgent care) and secondary birthing unit (12), along with inpatient dementia, geriatric, mental health, children's health, maternity, surgical and medical services (13). Many of the consultants are Rural Hospital Medicine specialists, with several dual rural hospital medicine specialist and general practice doctors who may work across both primary health and secondary care. Access to Te Nikau hospital from primary care practices varies from being on-site, at Te Nikau Health Centre, to 200km (3hrs) by road from Karamea Health Centre. The furthest primary care practice, Haast clinic, is 315km (4.11hrs) by road; however, it is 202km (3hrs) by road to Queenstown hospital, which also offers secondary care services.

The nearest tertiary-level hospital for most West Coast patients is Christchurch Hospital. The closest clinic, Lake Brunner Health Centre, is 209km (2.50hours) by road. The furthest distance, Haast Clinic, is 522km (7hours) from Christchurch Hospital, or 405km (5.15hours) from Dunedin Hospital. Following this, Karamea Health Clinic is 429 (5.45hours) from Christchurch Hospital (14). Distance and estimated travel times by road to secondary or tertiary level centres can be viewed in Table 1.

Table 1: Distance of West Coast Primary Practices to Secondary and Tertiary Centres.

Location	**Clinic(s)**	**Distance to Secondary Care (Greymouth) by road (km)**	**Estimated time to Secondary Care (Greymouth) by road (hr.min)**	**Distance to Tertiary Care (Christchurch) by road (km)**	**Estimated time to Tertiary Care (Christchurch) by road (hr.min)**
Karamea	Karamea	200	3	429	5.45
North Westport	Ngakawau	135	2	365	4.42

Westport	Buller Health, Kawatiri	104	1.36	334	4.20
Reefton	Reefton Health	80	1.02	254	3.22
Moana	Lake Brunner	39	0.34	209	2.50
Greymouth	Coastal Health, Te Nikau	0.550 0	0.08 (walk) 0	238, 238	3.12, 3.13
Hokitika	Westland Medical	39	0.33	244	3.18
HariHari	HariHari Clinic	110	1.22	316	4.04
Whataroa	Whataroa Clinic	141	1.51	346	4.30
Franz Josef	South Westland Area Practice	171	2.18	378 (*Dunedin: 550)	4.55 (*Dunedin: 7.08)
Fox Glacier	Fox Glacier Clinic	194	2.43	401 (*Dunedin: 535)	5.19 (*Dunedin: 6.44)
Haast	Haast Clinic	315 (*Queenstown: 202)	4.11 (*Queenstown: 3)	522 (*Dunedin: 405)	7 (*Dunedin: 5.15)

Access to healthcare facilities is via road (ambulance or self-driving) or air. Canterbury West Coast Air Rescue responds to approximately 1000 missions each year, including accidents (40%), medical conditions (28%), hospital transfers (20%) and Search and Rescue (12%). There are three helicopters which operate from the Christchurch base, and one from the Greymouth base (15). Because of the large 600km geographic spread of the region, air transfer may also utilise resources from Otago or Nelson.

Some clinics are contracted to provide PRIME Responders (Primary Response in Medical Emergencies), an initiative funded by Te Whatu Ora and ACC. Rural GPs and RNs are trained by Hato Hone St John to be first responders to critical medical emergencies and trauma within their local region in lieu of paramedics; therefore, shortening the potential response time to medical intervention by full ambulance teams (16).

The demography of the West Coast varies by location. Demographic data for each of the centres with active health centres can be viewed in Table 2. All demographics have been sourced through NZStats (10), rural classification is sourced through the GCH (2).

Table 2: Demographic data of West Coast Practices (8, 10)

Population data current as of 2025; all other data current as of June 2023.

Location	GCH	Clinic(s)	Population (2025)	Median age (yrs)	Population, Māori	Median age, Māori (yrs)	No. of Families	Median income ($)	Post-school qualification (%)
Karamea	R3	Karamea	940	38.1	99	35.8	222	25,900	47.9
North Westport	R3	Ngakawau	1950	50.9	297	29.8	462	29,300	41.7
Westport	R2	Buller Health, Kawatiri	6,070	50.7	807	29.4	1,563	29,400	44.1
Reefton	R2	Reefton Health	1,050	54	150	31.9	264	29,400	42.4
Moana	R2	Lake Brunner	110	57.2	9	62.1	-	41,100	45.8
Greymouth	R1	Coastal Health, Te Nikau	9,450	45.3	1,125	26.9	1,041	35,800	48.4
Hokitika	R1	Westland Medical	3,420	46.7	696	29.8	873	35,900	47.4
HariHari	R3	HariHari Clinic	250	49.3	30	23	66	26,100	36.9
Whataroa	R3	Whataroa Clinic	650	45.7	93	20.2	171	35,300	36.7
Franz Josef	R3	South Westland Area	440	33.8	30	38.2	51	38,200	62.2
Fox Glacier	R3	Fox Glacier Clinic	220	39	15	23.5	36	35,100	54
Haast	R3	Haast Clinic	100	44.6	18	35.5	18	43,400	53.8

Methods

This research undertook 1. a literature review; 2. qualitative semi-structured interviews and content analysis.

The first stage of the research included a literature review, focussing on Alpine Fault disaster modelling and disaster preparedness or response for rural/remote primary care teams in Australia and New Zealand. Search concepts included iterations and combinations of: disaster preparedness/response, rural/remote, primary health and perspectives. Inclusion criteria included publication from 2010 or more recently, involvement of Australia/New Zealand, and relevance to a rural setting.

Initial search returned 33 papers, of which 11 met the inclusion criteria. This information was compiled to allow insight into the reflections and learnings from previous disaster responses. Major themes and models were also utilised to provide the basis of the introduction for interviews.

The second stage of the research involved semi-structured interviews with current general practitioners operating on the West Coast. Initial goals were to conduct three to five semi-structured interviews, with

recruitment via purposive sampling of specialist GPs employed on the West Coast. Participants were sourced through email to relevant GPs via email addresses available in the public domain, or were disseminated by the practice reception. The initial recruitment email was then followed up with participant information sheets, where the interviewee was invited to ask questions before completing informed consent forms, scheduling the interview and completing a basic demographic questionnaire (age group, gender, ethnicity). The interviews took place via Zoom to enable participant flexibility, with transcription services accessed using Otter AI and returned to the participant for comment or correction. The interview data was anonymised, stored on a university laptop hard drive and University HCS, then deleted following analysis.

The interview schedule included a brief literature presentation of approximately five minutes, followed by a semi-structured interview lasting up to thirty minutes. Two initial questions were presented to the interviewee:

- Can you tell me about where you work and who you work with?; and,
- Given what I've got told you about the Alpine Fault how do you feel about your current disaster readiness?

The interviewee was invited to speak freely in response to these questions. The interviewer considered their discussion in align with the interview schedule, which included four broad areas: the context in which care is delivered, current confidence and concerns, perceived strengths and challenges; and what general practice readiness would look like for the participant. (see Appendix B) Where the categories were not already covered in the participant's response to the open question, the interviewer used prompts to ensure that each area was covered. This was used to maximise the participant's consideration of their disaster preparedness. Interview duration ranged from ten – twenty minutes.

Following the interview, transcripts were checked, anonymised, and were returned to the participants to request amendments as needed. Data was analysed using content analysis; initial data immersion and consideration was followed with extraction of key points and preliminary coding following each interview. Interviews were then compared to form categories from the combined data.

Reflexivity

The researcher is a medical student at the University of Otago. At the time of interviews, she had completed the preclinical years of training and was yet to begin hospital placement at Christchurch hospital. This means that the researcher's lens surrounds the current guidelines and theory of practice, with less insight into the actual workiEngs and daily requirements of rural healthcare. She is also a medic in the New Zealand Army Reserves, which includes pre-hospital training for both point of injury and prolonged care. This is focussed on the initial emergency response and acute exacerbations, rather than the longer-term management of chronic conditions. The researcher grew up in a rural location in the North Island and therefore has some awareness of the challenges of accessibility to services and power/electricity supply, as well as the strength of self-sufficiency.

Ethics approval

Ethics approval was attained through the University of Otago, approval 25/1319. Ngai Tahu Research Committee Consultation was undertaken, valid until 25th May 2027. Informed consent was attained from all participants.

Results

I - Literature Review:

A narrative literature review revealed 33 papers, of which 11 met the inclusion criteria. A summary of the literature search and papers can be found in Appendix A. Key considerations from the literature were established. These considerations were then linked into broader categories.

Currently, research on disaster preparedness for rural general practices have been developed from learnings in previous disaster responses of primary care centres in rural Aotearoa and Australia. Disaster management can be regarded in four key phases: Prevention, Preparedness, Response and Recovery (7) . In the case of an Alpine Fault rupture, aspects of prevention, such as infrastructure safety and stabilisation for secondary hazard risks, are beyond the scope of general practice teams. Preparedness considers the actions that can be done now to place practices in a suitable position for response.

Table 3: key findings from literature review.

PPRR Stage	Category	Considerations
Prevent	Building and infrastructure	*Ensure buildings meet current earthquake requirements*
Prepare	Patient education	*Discussion of patient preparedness in consultant*
		Providing resources and skill training to patients
		Supporting patient vaccination
		Providing education surrounding infection control
		Media dissemination/advocacy
	Personal preparedness	*Disaster training (including mass casualty scenarios system knowledge, psychological first aid)*
		Varied medical response (Acute exacerbations of chronic and non-communicable disease (esp CVD), Pain management, Psychological distress, Loss of medication, Infectious disease outbreaks, Loss of medication)
		Establishing a personal and family response plan
		Consideration of local isolation in disaster
	Coordination and integration	*Disaster management planning within the practice*
		Coordination with stakeholders (including cultural centres)
		Coordination with community response teams
		Coordination with civil defence
Respond	Business continuity	*Power access*

		Alternative communication (amongst staff and to patients)
		Control of media
		Loss of staff (due to access or family situation)
		Accessibility for locums
		Establishing temporary clinics (including in remote areas and shelters)
		Emotional exhaustion and fatigue
		Psychological distress of HCPs
		Variation in patient numbers over time
		Prolonged consult duration
Recover	Psychological distress	*Presentation varies in 'waves'*
		Collaboration with MH providers
		Access to support and time away for HPCs
	Patient interactions	*Prolonged consult times*
		Altered role of GP within the community
		Facilitating financial aid to patients

Prepare:

Within disaster preparedness, GPs have a vital role in educating patients (7, 17, 18, 19). This includes disseminating information through media channels (19), facilitating discussion in consultations (12), and encouraging or providing resources and skills training to patients (17). Survey responses from rural NSW found that the majority of GPs were supportive in their role of advocating general health issues amongst the population, including as it was relevant to extreme weather/disaster events (18). Part of this advocacy could be seen to include supporting vaccination and infection control measures (especially surrounding sanitation) for potential disease outbreaks following disaster (17).

Rural GPs must also consider their personal preparedness; this includes both mental (17) and physical (19, 20) preparedness. The World Medical Association recommends disaster medicine training for medical and postgraduate students, including mass casualty response, current system knowledge, psychological first aid and epidemiology of morbidity (17). Physical preparedness includes a HCP's personal and family response plan, as well as consideration of geographic isolation (19).

Another point of discussion is the coordination and integration of GPs into disaster management. This involves disaster management planning (17) and coordination with stakeholders, including cultural centers (19).

Respond and Recover

Developing understanding of response and recovery following a disaster is important for rural practitioners and organisations to gain an oversight of what may be expected. Rural general practices have been seen to play a pivotal role in the immediate and longer-term response to disaster. This initial response has involved different levels of investment and integration with the community or response teams (17). Previously, a spontaneous response has been required due to minimal integration

with established disaster response teams (20); although, this was found to be more prevalent in Australia compared to New Zealand practices.

Across many disasters, a key priority for rural general practices has been business continuity (20). This considers the nonmedical challenges of keeping clinic doors open, such as loss of power, controlling the community willingness to help, use of alternative communication, control of media, and integration with emergency services (21). The different levels of immediate impact to the practice centre and personal life are unpredictable (6). Centres may also experience loss of staff from personal impact, and the site may become inaccessible for locums (6). In some cases, PHC centres have established temporary clinics in the community, including in remote areas and temporary shelters (6, 20). Another challenge to business continuity is the emotional exhaustion and physical fatigue of HCPs, with an emphasis on the importance of getting away for personal care (6).

The required medical response can also vary following disaster; the majority of the health burden stems from non-communicable diseases (19), with the most commonly dispensed medications being for gastrointestinal distress, pain, and hypertension. In interviews with 38 GPs involved in Australia or New Zealand disaster response, GPs noted higher presentations of psychological distress, acute exacerbations of chronic conditions, lost medication, infectious disease outbreaks, and minor injuries following disaster (20).

Patients have been seen to present with 'waves' of psychological distress, especially as the initial 'heroic' community spirit reaches a trough and secondary stressors come into effect (22). However, the higher rates of persons reporting to PHC providers for support is encouraging and is thought to be likely linked to a reduced stigma of mental health following disaster (22). GPs have provided a key role in psychological distress and reassurance; the All-Right survey saw respondents list GPs in the top five people/groups of their support network (22). This prevalent and lasting effect emphasises the importance of a team-based approach (7) and integration with collaborative mental health providers (23), which may include resources to support the increased workload of GPs (6, 22, 24). Interestingly, disaster response has reported that patients with current mental health conditions may cope better than previously expected, likely due to the established knowledge, coping strategies and community support (22).

Rural general practices tend to experience variations in patient numbers and increased consult duration. Patient numbers vary in both surge and lull periods, due to emergency responder presence, evacuations (19) and voluntary patient departure to stay with family outside of the region (25). Further, there may be disparities in patient demographics, with more females seen to be injured in the primary and secondary shaking (24). Previous disasters have seen high presentation numbers for elderly (21), especially surrounding evacuation and communication difficulties (21), and a profound impact on children (22). Following the disaster, consult duration may be prolonged, with the effect potentially lasting years (20) and an expectation to facilitate financial assistance for patients (6).

The literature provides expectations of the requirements of disaster response for rural

general practices. Given the likelihood of an AF8 rupture, this evidence must be linked to practicing sites to identify the current strengths and gaps in disaster readiness within the West Coast Region.

II - Qualitative semi-structured interviews:

Three virtual semi-structured interviews were undertaken. All three participants were general practitioners, who were currently practising in central Greymouth. One participant also attended weekly clinics in a more remote location. All practices were operated by Te Whatu Ora. Interviewees were designated a participant number (1–3) and were referred to throughout the study by this coding.

Interviews were analysed using content analysis; key findings were sorted into codes. These codes were then further developed into broader categories. The interview results (categories and supportive quotes) can be found in Table 4.

Table 4: key findings of semi-structured interviews using content analysis.

Category	Codes	Quotations
Building and facilities	Confidence in building/infrastructure capability	*"The resilience in the building and the infrastructure has been updated"* *"Moving to this building has been a positive...the possibility of an alpine fault rupture was taken into account."*
	Adaptability of the building layout as a strength	*"We are using a few, like, strategies and scenarios about turning certain part of the hospital to be a triage zone, or an additional zone for casualties."* *"The medical centre and outpatient bit is part of the same building, but it's able to operate separately."*
	Establishing communication will be important within and between centres	*"I'm not likely to be able to get [there] but there will be a rural nurse that I work with closely, and so I guess establishing contact with her quickly and being able to help support her on the ground would be really important."*
Staff preparedness	Staff are capable of responding to various medical presentations	*"The medical staff are also well trained in multiple different specialties...staff members are quite capable at multiple different scenarios."*
	Training has been undertaken for mass casualty scenarios	*"There were a few simulations and training that were done, but that was more for an issue of, like, incidents of mass casualties."*
	Poor access to database may limit knowledge base	*"A lot of the information is not really quite readily... my concern is that, when it comes to disaster, we won't be able to access that kind of knowledge."*

	There is a need for specific AF simulation training	*"I guess, what we lack is probably more simulation training…test our readiness and test where the weaknesses are."*
	Staff availability and access may be compromised	*"It will all depend on…the goodwill of the clinicians coming back to work or…relocation of clinicians to help out with whatever's needed at the time."*
	Increased risk of fatigue, burnout and risky decisions	*"Relying on a very small number of clinicians for any extended period of time probably leads to some sort of risk of burnout, fatigue and risky clinical decision making."*
	People factors and stress may compromise teamwork	*Any sort of emergency, your brain doesn't operate the same way…how people work together can vary."*
	Role of the GP in disaster response lacks clarity	*"Discussion around what roles…each clinician [will] have, and whether or not we have got any sort of roles assigned."* *"Knowing what we're expected to do, and where we're expected to be, and how we can turn up and help out."* *"I know organizationally, there's AF8 discussions, but I don't think that's flowed through to sort of frontline staff."*
	Access to medication may limit response	*"You know, we might not have a pharmacy. People might not have the drugs. That could be big problem."*
Adaptability	A response will require flexibility	*" There will be a little bit figured out as we go….even if you extrapolate from more minor disasters, you don't know how people are going to react until it actually happens."* *"We are quite a small workforce that are quite flexible and we would be able to organize ourselves reasonably quickly."*
Public preparedness	Proximity to larger centres provides access to more resources	*"At least, like the town itself, we've got other resources here, so not as tricky as you know, if we're out in Reefton or something like that."*
	Local West Coast residents are generally resourceful	*"I think the sort of people that come to live on the West Coast are quite resilient, quite resourceful people…"* *"I think the communities here are pretty resilient… those little pockets of people…would band together and help each other out."*
	Public grab bags and emergency precautions are important	*"people are familiar with the concept of, like, a grab bag… generally keep the car fuelled, don't leave stuff at the edge of the worktop…have a certain amount of bottled water…I've got a lot of patients who make a*

		point of having several months of their medication in the cupboard because they know that, like, if this happened, it's going to be quite a while before we get anything like that."
Recovery	Mental health impact will become apparent	*"And the mental health will come out…that's going to be a big thing."*
	Brain drain of clinical staff from the West Coast may be expected	*"And our workforce might change…there's going to be people that just go and they don't want to come back…So that potential brain drain effect is going to be a thing, you know, and it's harder to attract people."*
	Financial implications will be widespread	*"And it'll cost a lot of money…because it's had to be diverted from one pot to another."*

Overall, participants revealed a general sense of not being fully prepared. The key points considered that:

1) GPs were aware that plans for disaster management had been made, but they were unsure of the details and how it may relate to them.
2) GPs sought clarity regarding their role in disaster response.

Key point one: disaster preparedness dissemination

Clinicians recognised strengths in aspects of their work and recognition of disaster management having been undertaken amongst practices; however, they were unsure of how this would apply to them on an individual and team-based level. This message is encapsulated in the statement: *"I know organisationally, there's AF8 discussions, but I don't think that's flowed through to sort of frontline staff."*

Key point two: role clarification

There was discussion around the role and responsibility of the clinician in disaster response. This included where practitioners would be required (i.e. at home vs at clinic vs in the community) and how this would be communicated. One participant mentioned that staffing would be dependent on who was willing and able to assist: "*It will all depend on…the goodwill of the clinicians coming back to work or…relocation of clinicians to help out with whatever's needed at the time."* Participants wanted to know what was expected of them in a disaster response: *"Knowing what we're expected to do, and where we're expected to be, and how we can turn up and help out."*

Whilst there was discussion around the flexibility of small teams as a strength of West Coast practices, there was a desire to have some sort of defined roles: *"Discussion around what roles…each clinician [will] have, and whether or not we have got any sort of roles assigned."*

There was also lack of certainty surrounding what the clinical role of the practitioner may be given limited access to resources. This was particularly relevant when considering the availability and functionality of pharmacies; GPs questioned what they could do without access to medications. A participant stated: *"you know, we might not have a pharmacy. People might not have the drugs. That could be big problem."*

Discussion

Principal findings

This research included a rural literature review and semi-structured interviews to gain an understanding of the context of disaster preparedness, and current attitudes of GPs regarding disaster preparedness, respectively.

Principal findings of semi-structured interviews revealed:

a) Uncertainty regarding dissemination of current disaster plans
b) Lack of GP role clarification

A brief literature review was undertaken to gain understanding of Rural General Practice disaster response from previous relief in Australia and New Zealand. The key findings included:

a) The role of the GP in educating patients about preparedness, particularly in regard to medication access.
b) Establishing staff and personal response plans.
c) Coordination, including both within the organisation and inter-agency.
d) Addressing the practicalities of business continuity.
e) Developing a readiness to response to the various medical conditions/complaints that could be expected.

Comparison

Overall, there were marked similarities between the literature findings and points that GPs raised.

Literature findings regarding business continuity practicalities and inter-agency operability were mentioned in interviews; however, there was an agreement amongst participants that *"GPs generally…don't have much oversight of that."* Participants acknowledged that these plans had been put in place by management or other businesses, such as West Coast Health. However, GPs noted that relaying this information to frontline staff would be beneficial.

Interviewees noted uncertainty regarding staff organisation and their role in disaster response. This was a feature of literature findings, which regarded the importance of establishing staff and personal response plans. Considerations included GP location, communication, role and access to material. Specific concerns regarded the GP's responsibility to the practice versus family, access to clinics, access to out-of-town clinics, and communication plans amongst professionals. This was particularly relevant given the geography and facilities available on the West Coast. For example, interviewees living out of town mentioned poor or no cell phone reception at their primary residence, even when networks are stable.

The literature reveals a variety of medical conditions/responses which can be predicted following large-scale disaster. Interviews did not reveal much consideration into this; although, one participant mentioned a strength in the capability of medical staff being able to treat a wide range of conditions.

There was little mention of the GPs role in educating patients prior to disaster. Literature revealed that patient education regarding medication vaccination, infection control, use of grab bags and access to resources, would be beneficial. Interviews was limited discussion regarding these points; however, there was agreement amongst participants that the West Coast

population is generally resilient, resourceful, and has a strong sense of community. This was a notable strength that was recognised by all participants. One interviewee mentioned that several of their patients kept had medication at home in the case of a disaster.

Limitations

The key limitations of this paper included sample size (n=3) and participant characteristics. All interviews were with GPs based in Greymouth (R1), one of which also did regular clinics at another site. Because the interviews were conducted with practitioners working at the same R1, publicly operated TWO clinic, information may not represent views across the wider West Coast region. Additionally, Greymouth is the largest centre across the West Coast region and has access to secondary level care at the nearby Te Nikau Hospital. Whilst this study focussed on Primary Care Organisations, the accessibility to Te Nikau Hospital and wider resources across Greymouth was noted. Therefore, these findings may not represent the thoughts of General Practitioners working in more rural locations (R2/3).

Whilst literature analysis facilitated the inclusion criteria of "rural/remote," it is important to note that geographical classification of rurality may vary by country and time. Therefore, findings are unlikely to fully represent the unique clinical environment of the West Coast.

Future research

Recommendations from this project would suggest that:

- GPs should be engaged in disaster management plans
- There is a need to define and clarify the role and expectations of GPs in an emergency response
- GPs should be included in community education of their practice population

In stating these recommendations, challenges are acknowledged. These would include the geographic spread along the Coast, large workload of the GP workforce, reliance on locum workforce, ad difficulties in evaluating the extend and results of engagement.

Results from semi-structured interviews have revealed the need for further exploration of what has been undertaken regarding dissemination of disaster preparedness actions to GPs, and role clarification for the GP in disaster. Other research of benefit may include the different attitudes across a MDT, differences in General Practice preparedness across sites/clinics (including those of difference GCH and funding), the role of the GP when there is poor pharmacy access, and further investigation for the specific considerations of rural GPs in disaster preparedness and response.

Conclusion

The rising probability of an Alpine Fault rupture necessitates that disaster preparedness is considered. This is particularly relevant for the West Coast, as the entire region is classified as remote and is likely to experience significant disruption to services.

Analysis of literature considering disaster preparedness/management across general practices in rural Aotearoa and Australia revealed five key themes: building/infrastructure, patient education,

personal preparedness, business continuity, and coordination and integration. Many of these points were mentioned by participants in semi-structured interviews. These revealed a general sense of a need for further disaster preparedness, particularly related to disseminating plans to clinicians, and clarification of the general practitioner's role in disaster.

Appendices

Appendix A: Literature Review Search

Search categories: iterations and combinations of: disaster preparedness/response, rural/remote, primary health and perspectives

Keywords: ("disaster response" OR "disaster preparedness") AND casualties AND ("primary health" OR "general practice" OR "community practice") AND (rural OR remote) AND perspectives

Table 5: search strategy for literature review

CONCEPT 1	CONCEPT 2	CONCEPT 3	CONCEPT 4	CONCEPT 5
Disaster	Preparedness	Primary health	Rural	Opinions
Natural disaster	Planning	General practitioners	Remote	View
Hazard	Management	Family practice	Remote communities	Attitude
Extreme	Response	Community practice	Rural communities	Perspectives
		Community health service	Rural generalists	

Inclusion criteria: publication from 2010 or more recently, involvement of Australia/New Zealand, and relevance to a rural setting.

Table 6: Literature included in the narrative review

Paper Title	Published	Location	Available
General practitioners in the field; A qualitative study of general practitioners' experiences in disaster healthcare	2020	AUS and NZ	General-practitioners-in-the-field.aspx
Disaster Management in Rural and Remote Primary Health Care: A Scoping Review	2021	AUS	https://doi.org/10.1017/S1049023X21000200

Understanding and experience of climate change in rural general practice in Aotearoa—New Zealand	2023	NZ	Understanding and experience of climate change in rural general practice in Aotearoa—New Zealand | Family Practice | Oxford Academic
Where are general practitioners when disaster strikes?	2015	AUS (Tasmania)	https://doi.org/10.5694/mja14.00477
Preparing rural general practitioners and health services for climate change and extreme weather	2014	AUS (NSW)	https://doi.org/10.1111/ajr.12075
Patient Reactions after the Canterbury Earthquakes 2010-11: A Primary Care Perspective	2014	NZ (Christchurch)	https://doi.org/10.1371/currents.dis.4ad3beea9e155dd5038a8d2b895f0df4
Coping with Disaster: General Practitioners' Perspectives on the Impact of the Canterbury Earthquakes	2014	NZ (Christchurch)	https://doi.org/10.1371/currents.dis.cf4c8fa61b9f4535b878c48eca87ed5d
Impacts of the Emergency Mass Evacuation of the Elderly From Residential Care Facilities After the 2011 Christchurch Earthquake	2013	NZ (Christchurch)	https://doi.org/10.1017/dmp.2015.81
A Sex Disparity Among Earthquake Victims	2015	NZ (Christchurch)	https://doi.org/10.1017/dmp.2015.81
Disaster planning in general practice	2024	AUS	https://doi.org/10.31128/ajgp-06-24-7315
Mental Health Response to Disasters: Is There a Role for a Primary Care-Based Clinician?	2022	AUS (Queensland)	https://doi.org/10.1017/S1049023X22001194

Appendix B: Interview Schedule

Interviewer to thank the participant for their time, introduce themselves to the participant and provide an overview for how the interview will run, including estimated timing.

Interviewer provides a brief introduction into the alpine fault, discussing a) what the alpine fault is, and b) what a rupture could look like for the West Coast (severe, isolated, prolonged, devastating).

The participant is invited to ask any questions. The interviewer reconfirms that they are happy to proceed with the interview, including use of audio recording. If consent is confirmed, the transcription service is started.

The interview covers at least the four broad areas:

a) Context in which care is delivered
b) Current confidence and concerns
c) Perceived strengths and challenges
d) What general practise readiness would look like for the participant

Two general, open-ended questions will be asked to enable the participant to speak freely about their opinions.

1. Can you tell me about where you work and who you work with?
2. Given what I've got told you about the Alpine Fault how do you feel about the current disaster readiness for you/your practice?

The interviewer listens to the participant and marks their response against the previously identified four broad areas. If the participant does not cover one or more of these areas, or the interviewer feels that the area is not covered in sufficient detail, the following prompts will be used to encourage them.

a) What are the specific considerations for your work here, compared to other locations where you have operated (including urban centers)?
b) How would you rate your current confidence in the ability for you to respond to an alpine fault rupture? Do you have any concerns about your readiness?
c) What do you think are your strengths and weaknesses?
d) What would absolute readiness look like for you?

The interviewer ends the interview by checking if there is anything that the participant wants to add. Interviewer confirms that they will share the transcript with the participant to allow them to check over it and request amendments if/as desired. The interviewer thanks the participant for their time and participation, ending the online call.

Appendix C: Demographic questionnaire for interviews

Disaster Preparedness on the West Coast

Demographic Questionnaire

Participant ID: _____

Age group:

[ ] under 15 years
[ ] 15 to 29 years
[ ] 30 to 64 years
[ ] 65 years and over.

Gender:

[ ] Male
[ ] Female
[ ] Another gender

Ethnicity:

[ ] European
[ ] NZ European
[ ] Māori
[ ] Pacific Peoples
[ ] Asian
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[ ] Other

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