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FACTORS THAT INFLUENCE MEDICAL RETRIEVAL DECISIONS IN REMOTE CENTRAL AUSTRALIA: A QUALITATIVE STUDY

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ABSTRACT

Introduction: Medical retrieval services play a key role in the transportation of unwell patients from remote communities across Australia. Decision to retrieve a patient from a remote community is dependent on unique characteristics of remote locations and thus different to urban and rural retrievals. The study aims to explore various factors that affect medical practitioner decisions to retrieve patients from remote central Australian communities.

Methods: Semi-structured interviews were conducted with 36 staff involved in medical retrieval processes in central Australia. The data collection and analyses were part of a broader study evaluating a newly implemented medical retrieval model in central Australia. All interviews were recorded and transcribed. Transcripts were co-coded inductively by two researchers using NVivo software. Similar codes were grouped into themes, one of which related to the range of factors that affect decisions to retrieve a patient or request a retrieval, which is the focus of this paper.

Results: Decision-making about who, when, and how to retrieve patients was complex and involved trade-offs. The severity of patient illness, resource availability (e.g., transport infrastructure, remote area staff workload, and fatigue), the skills, experience, and relationships of primary health care and medical retrieval staff with the community, the strength of primary health care systems in remote communities, specific primary health care and retrieval policies, and innovations in disease prevention and management influenced medical retrieval decisions.

Conclusion: It is critical to understand that both general and contextual factors unique to remote communities affect medical retrieval decisions. Decisions are highly complex and necessitate trade-offs, frequently related to resource scarcity, which are somewhat different from those of urban retrieval services. Resource allocation in the context of providing retrieval services for remote populations must account for differences in burden of disease, cultural requirements, workforce characteristics, and overall access to health care compared to urban populations.

INTRODUCTION

Compared to their urban counterparts, remote residents in Australia have poorer health and limited access to many health services, which in part are a result of health workforce shortages and maldistribution, as well as geographical isolation (Humphreys et al., 2008; Hussain et al., 2015). Medical retrieval services play a key role in the transportation of acutely unwell patients from remote communities, patient repatriation back to their country following hospital admissions and inter-hospital transfer for those requiring a higher level of care. Retrieval decisions (who to retrieve, when to retrieve, and how to retrieve) have been linked to referrer factors (referrer's skill in diagnosis and resuscitation, and resources available within the referring facility); patient factors (urgency of transfer, socio-economic and cultural factors and willingness to be retrieved, weight and mobility of the patient); characteristics of the retrieval team (skilled human resources and equipment available); characteristics of the retrieving hospital (capacity to manage referral); aviation factors (distance, weather, terrain); and logistical factors (competing demand on resources, availability of fixed wing or rotary aircraft or ground transport, safe working hours for retrieval crew) (Danne, 2003; Ramadas et al., 2016). However, the geographical scope of this body of literature is general in nature, applying largely to rural and urban retrievals in Australia. The extant literature, therefore, lacks detail about how factors affecting decision-making in a remote retrieval context may differ from those in rural and urban areas.

Recent reviews have highlighted a dearth of literature describing the effectiveness of structures and processes of remote medical retrieval systems in producing desired outcomes (Edwards et al., 2021; Mathew et al., 2022). In this study, we hypothesize that the context from which remote patients are being retrieved will influence decisions about who, when, and how to retrieve these patients. We contend that remote central Australia presents a markedly different context for medical retrievals compared to rural and urban locations due to –

- its vast size, geographical remoteness, and sparsity of populations (only 2% of the Australian population reside in remote and very remote areas, with population densities of only 0.07 people per km2 in remote regions such as central Australia compared to 33,500 people per km2 in urban centers such as Melbourne CBD (Australian Bureau of Statistics, 2023));
- the proportionally large First Nations population (First Nations people represent more than 60% of the population that live in remote or very remote areas (Australian Institute of Health and Welfare, 2014)) and their high health needs (First Nations Australians experience a burden of disease that is 2.3 times the rate of non-Indigenous Australians (Australian Institute of Health and Welfare, 2016));
- extremely high health workforce turnover (Annual turnover rates of nurses working in remote clinics were found to be 148% (Wakerman et al., 2019)); and
- the importance and necessity of ensuring culturally safe health services (De Zilva et al., 2021). A lack of attention in the retrieval literature to the cultural factors can be inferred from the absence of staff cultural awareness training indicators amongst the entire body of literature reporting outcome measures related to the quality of air ambulance services. (Edwards et al., 2021) Affirming this gap is further evidenced by recent empirical research from central Australia exploring

> patients' retrieval journeys, which highlighted the need for improved patient satisfaction and cultural safety practices. (Lankin et al., 2023a)

In light of the stark differences between remote and urban/rural contexts for health service delivery, it is pertinent to address identified gaps in the available literature related to retrieval from remote First Nations settings, taking into account the unique circumstances of remote Australia that are likely to affect medical practitioners' decisions to retrieve patients. This paper aims to explore the key influences on medical retrieval decision-making (i.e. who to retrieve, when to retrieve, and how to retrieve) in remote central Australia.

METHODS

Setting

The Central Australian retrieval service provides emergency retrieval services to more than fifty remote communities covering a multi-jurisdictional region and a population of almost 50,000 people dispersed across an area of 1.4 million km2, roughly the size of France and Germany combined. The retrieval service undertakes around 2000 retrievals per year, the majority (>80%) of which are First Nations people (Johnson et al., 2022). The service retrieves patients largely from remote communities and cattle stations that are scattered around radii ranging from 10 to 500km from two regional hospitals. Inter-hospital transfers are also provided between regional and urban tertiary hospitals. Accessibility of some remote communities is difficult due to large sections of unsealed roads, seasonal road closures, limited transport services, and limited availability of telecommunication services (Infrastructure Partnerships Australia, 2022). Remote communities have primary health care (PHC) centers (remote clinics) usually managed by remote area nurses (RANs). Remote Health staff can seek real-time professional support via a telehealth support system that includes a medical retrieval and consultation center (MRaCC) for emergency calls (staffed around the clock by doctors with advanced critical care skills) and a remote outreach consultation center (ROCC) for PHC support (staffed by general practitioner's (GPs) during usual weekday business hours and after hours by MRaCC consultants) (Russell et al., 2023).

Recruitment of Participants

Most participants were recruited through an online survey conducted as part of a broader study evaluating the new MRaCC/ROCC retrieval service model implemented in central Australia in 2018 (Green et al., 2022). Electronic links to this survey were distributed via usual electronic communication channels used by the central Australian government and non-government health services. Survey participants who registered their interest for a follow-up interview were contacted by one of the research team members and invited to an interview. Additionally, four participants were recruited using a snowballing approach, whereby other participants recommended the study to them. Participants included - air and ground medical transport staff, specialists from the Central Australian hospitals, medical retrieval consultants, RANs, and GPs who provided PHC advice to RANs working in the remote clinics of Central Australia.

Data and Analysis

Semi-structured interviews were conducted between April and August 2020, during which period there was an Australia-wide lockdown to reduce COVID-19 transmission. All interviews, except three, were conducted via telephone. Of those three, two were completed via Zoom, and one was completed face-to-face. The average interview length was 45 minutes. Interviews (n=36) were conducted till data saturation was reached. With the permission of each participant, all interviews were audio recorded. Audio recordings of the interviews were professionally transcribed verbatim. All transcriptions were analyzed thematically, using reflective induction to identify themes and subthemes (Braun & Clarke, 2006). Coding was done using NVivo-12 software. Three co-authors coded three transcripts each and independently created an initial set of themes and sub-themes, which were then discussed to ensure agreement on the initial themes. The remaining interviews were co-coded by two researchers. Subsequent discussions among the two coding researchers clarified minor points of difference and allowed for agreement to be reached on the final labeling of themes and sub-themes. The interview protocol covered questions designed for the broader study evaluating the efficiency, timeliness, cost and cost-effectiveness of the new MRaCC/ROCC model implemented in central Australia compared to the previous retrieval model. Participants were asked to describe the new and previous retrieval models, how they worked, and differences between them, and instances where retrievals didn't go smoothly. In addition to the content related to the new retrieval model's effectiveness, timeliness, and benefits, which has been published elsewhere, (Fitts et al., 2024 forthcoming; Green et al., 2022; Russell et al., 2023) participant responses also included content related to the key factors that affect decisions to retrieve a patient or request a retrieval, which is the focus of this paper.

Ethics Approval

The project was approved by the Central Australian Human Research Ethics Committee (CA-19-3320).

RESULTS

Five themes emerged, which were related to the key factors that affect retrieval decision making in the remote Australian context (see thematic diagram Figure 1):

Physical Infrastructure Available

This theme refers to how the availability of transport infrastructure, telehealth facilities and capability, as well as patients' access to the necessary infrastructure to care for themselves in the community influences a retrieval consultant's decisions to retrieve a patient.

Transport Infrastructure

Retrieval staff perceived the allocation of transport infrastructure to be more challenging than in urban settings. For instance, staff highlighted that the central Australian medical retrieval service does not have a medical retrieval helicopter and a limited number of fixed wing assets. Staff often had to consider trade-offs between having aeromedical transport assets engaged in planned long distance tasks such as inter-hospital transfers and ensuring aeromedical transport assets were available to respond to new or existing emergencies arising in very remote communities.

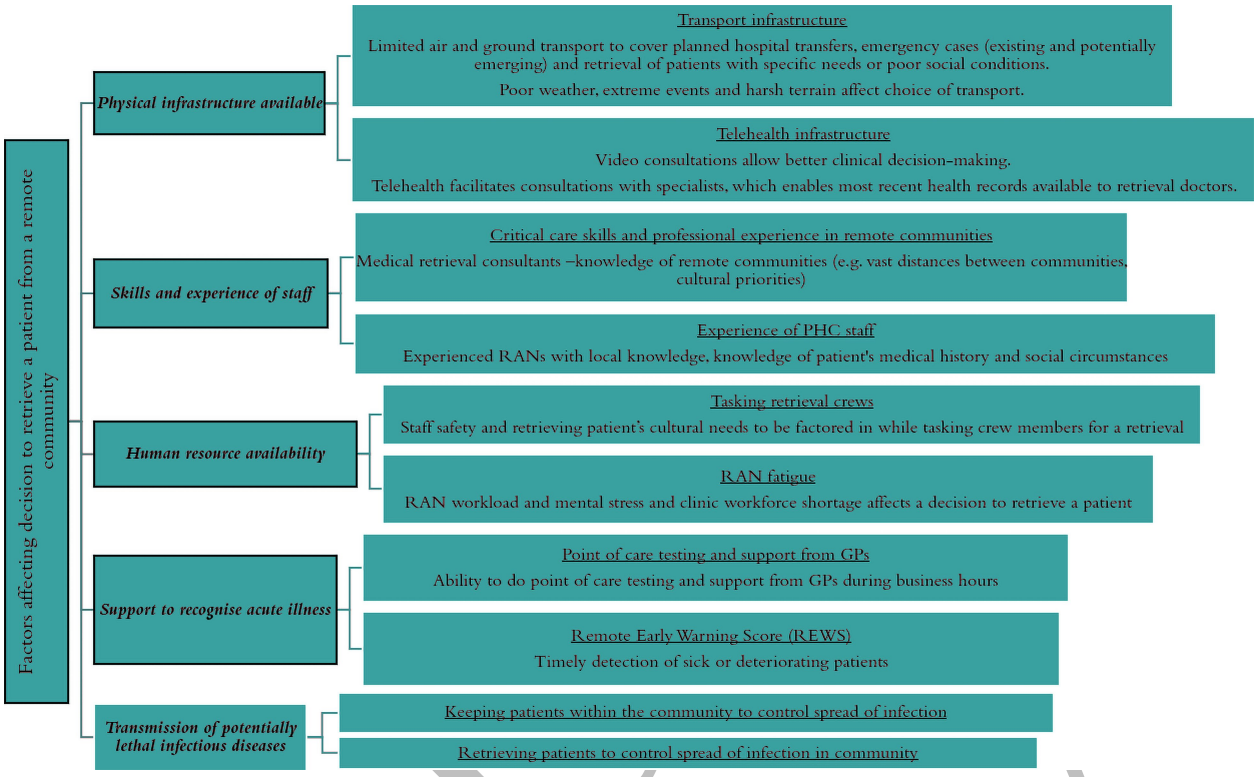

Figure 1: Diagram describing themes.

> *"For places …that are reasonably close [to a hospital]… tasking a plane … should try and avoid it, because I would rather keep the plane ... for somewhere more distant, too." (MRaCC/ROCC staff member)*

This included the need to monitor cases that could potentially worsen (e.g., potential cases of preterm labor reported by clinic staff) or to respond to anticipated emergencies (e.g., a major sporting or community event happening in a community).

> *"… [If I] know that something significant is going on, and I know that the plane is about to take off to do some sort of lower acuity task, I will ring comms (in charge of plane tasking) and say, hold the plane at the hangar, we may have something much more urgent coming through, just don't send it, just wait." (MRaCC/ROCC staff member)*

Other transport infrastructure considered important for influencing retrieval decision making included road accessibility (e.g. road surface and condition), availability of an airstrip in the community, and airstrip infrastructure such as airstrip lighting (e.g., suitability for nighttime landing).

Weather and environmental conditions were also perceived as important considerations in decisions about retrieving a patient. Poor weather and occurrences of extreme environmental events such as bushfires created hazards that often prevented plans for landing and successful retrieval. In these instances, decisions to retrieve patients either later or earlier would ideally be informed by weather or environmental warnings:

> *"There's been a situation about three or four months ago, when a night evacuation [was required], a plane flew out, circled around, visibility was too poor because of smoke and so they had to leave." (RAN)*

Telehealth Infrastructure

Many, though not all, remote PHC clinics in Central Australia have video cameras that MRaCC consultants use to visually examine patients during emergencies. Retrieval and remote clinic staff perceived telehealth (with video) as providing additional useful information to inform decisions about whether a patient needed to be retrieved. Cameras that could be controlled by MRaCC staff – for example, to zoom in on different parts of a patient's body – were considered especially useful. In specific examples mentioned, both retrieval and remote clinic staff perceived that the use of video cameras for pediatric consultations enabled MRaCC consultants to make a more informed clinical judgment about how sick a child was, and the additional clinical information influenced retrieval staff decisions regarding retrieval:

> *"You will be on the fence as to whether a child needs to be retrieved or not, and then from the description you're getting over the phone, and then you put the job on tele-health and you're like, oh wow, this kid's actually a lot ... like from what the ... you know, they're a lot different to how, either better or worse" (MRaCC/ROCC staff member)*

Retrieval decisions were also influenced by how recently patients had seen a health professional (face to face or via telehealth) and what level of information was available about patients' medical conditions and accessible in their medical records. The availability of high level, recent data informed the consultants' decision not to retrieve certain patients:

> *"It was really useful to know that they [patient referred for retrieval] had just had a specialist consult three days earlier. I feel like those are the sort of things that are enabling less retrievals to occur." (MRaCC/ROCC staff member)*

Human Resource Availability

This theme discusses how the availability of staff – PHC staff in remote clinics and retrieval crews – affects medical retrieval decisions regarding patients in remote areas.

RAN Fatigue

Staff who worked in both urban and remote retrieval services pointed out that decisions about retrieving remote patients were not only based on the severity of patients' illnesses but also needed to consider remote PHC human resourcing capacity and capability to care for unwell patients in their community. Participants, particularly those working in remote communities, described limitations in the capacity of staff working in remote PHC clinics to care for and monitor acutely unwell patients, especially overnight, including when awaiting a night retrieval:

> *"…if the nurses are exhausted and working short-staffed, you're risking patient care … you might be risking a community." (RAN)*

The necessity to limit 'RAN fatigue' was perceived as an important factor affecting retrieval consultants' decisions to retrieve patients from remote communities.

Tasking Retrieval Crews

Some retrievals from remote communities have specific crew requirements. For example, requiring crew members of a particular gender for cultural safety reasons. Accommodating such retrieval crew requirements could depend on the availability of a culturally

appropriate retrieval crew within an acceptable time frame relative to the patient's condition:

> *"… it might be a cultural issue where they only want to have a female crew. That's like, all right, cool, I'll get this crew back from their job and then you can have them to go see this patient." (MRaCC/ROCC staff member)*

Another factor to consider when tasking retrievals is ensuring that retrievals are completed within rostered shifts and in accordance with the aviation industry's safety protocols for air medical retrieval crews. Staff from road and air medical retrieval participant groups both provided specific examples of where low acuity retrievals were requested shortly before a retrieval team's shift ended. In such cases, low acuity retrievals were scheduled for the next shift with a fresh retrieval crew:

> *"…a case comes in for a low acuity retrieval at four in the morning, which is two hours before the end of a 12-hour shift for crew, so it's considered a moderate risk for us to go ahead and do that retrieval. So a conversation with the MRaCC would be to hold that off until six when a fresh crew starts and send them out on a retrieval." (Staff member from road/air retrieval service)*

Support to Recognize Acute Illness

This theme relates to how the tools used and processes followed in PHC settings support staff in recognizing when patients are acutely unwell and how these factors guide retrieval decision-making.

Point of Care Testing and Support From GPs

From a remote clinic staff member's perspective, the presence of a strong PHC delivery system with clear processes and guidelines for determining the severity of patient illnesses assists with communicating the severity of patient conditions to retrieval consultants. RANs acknowledged the importance of ongoing and strong support from GPs (face-to-face or via ROCC's telehealth unit) in subacute cases where staff weren't certain about a patient's health condition. GP support, particularly face-to-face consultations in the community was perceived as medical education opportunities, which contributed to improved medical skills of RANs, equipping them to decide when to seek medical retrieval support from MRaCC.

> *"There are educational opportunities, you know so while the GP's are out there [in the community], they are teaching the RANs, every person they see together is a teaching opportunity and a teachable moment." (Hospital staff)*

The use of point of care Testing (PoCT e.g., i-STAT testing) to test blood gases and cardiac troponin and having ready access to specific medical equipment (e.g., electrocardiogram machines) also informs diagnoses and means that better information is available to support decision-making about managing and retrieving patients. This may include confirming or excluding the presence of potentially life-threatening conditions:

> *"We've got the i-STAT machine and we can do troponins. So when someone has chest [pain] or high abdominal pain, we can exclude cardiac contributions." (RAN)*

Remote Early Warning Score (REWS)

The REW score, which is calculated by measuring temperature, pulse, respiratory rate, blood pressure, and oxygen saturation (Remote Primary Health Care Manuals, 2017) and used for the early detection of sick or deteriorating patients, supported remote clinic staff members to assess disease severity, and provided guidelines for the most appropriate referral pathway (emergency or PHC support) for further management according to the score. REW scores were described by both retrieval and remote PHC staff as being an important tool for informing timely decision-making about medical retrievals.

Skills and Experience of Staff

This theme describes the skills and experience levels of remote clinicians initiating emergency calls and the person/s receiving those calls.

Critical Care Skills snd Professional Experience in Remote Communities

Remote clinic staff and retrieval staff both emphasized that it was particularly important that the first point of contact during emergencies were experienced and had a high level of critical care skills as these facilitated timely and appropriate decisions about whether an air medical retrieval was necessary or whether a patient could be safely managed in the community.

> *"I think that having people with lots of emergency experience in MRaCC taking that initial call, where they're getting good initial management, so maybe they can be treated before they deteriorate. I think our comfort level – for a lot of us – in managing things in the community, at least giving them a try for a day or two before flying people in, is possibly higher than clinicians that don't have as much emergency care experience." (MRaCC/ROCC staff member)*

Participants considered it important that MRaCC consultants had good knowledge of the context in which health care is provided in remote communities to inform appropriate medical retrieval decision making. Important contextual knowledge included how remote clinics operate (e.g., operating hours and staffing profile), characteristics of patients (e.g., multiple chronic conditions), cultural requirements of patients and characteristics of specific remote locations (e.g. air strip availability). Retrieval staff who had professional experience working in remote communities were perceived to be better decision-makers than staff who weren't as familiar with remote communities.

> *"The MRaCC staff that struggle more, probably have spent less time in community." (MRaCC/ROCC staff member)*

> *"…we're not a 24-hour overnight service. You know that we can't sit in the clinic and wait eight hours for a plane." (RAN)*

Consistent with this, participants observed that locum staff who came from interstate to work in the medical retrieval center sometimes made sub-optimal retrieval decisions because they were unfamiliar with the remote context.

> *".. locums, particularly people who just arrived from interstate, weren't in a position that they knew how to do that, so very often they would make a call on people who probably didn't need to be admitted." (Hospital staff member)*

Experience of PHC Staff

Similarly, participants observed that the skills and experience of staff working in remote clinics also impacted retrieval decisions:

> *"The constant rotation of staff [remote area nurses] that may or may not have worked in community before and may or may not know the specifics of a certain community, sometimes that might cause some, or has caused some issues" (MRaCC/ROCC staff member)*

Factors such as limited remote health experience of some nursing agency staff (short-term staff sourced from recruitment agencies), perceptions about the strength of relationships between remote staff and their patients, presence of many new remote clinic staff, and retrieval staff member's confidence in the ability of remote clinic staff members to manage situations affect medical retrieval decisions. Retrieval and remote clinic staff particularly stressed the importance of established relationships between patients and remote clinicians because knowledge of patients' individual health histories and social circumstances (e.g., family support available, housing and overcrowding issues in the community) were often important factors in determining whether a patient needed to be retrieved.

> *"You could always get [more information] from a nurse that's been with the community for 15 years and who knows the patients and the families and the social challenges that exist in that community…. If something was to happen, they would just know the different strategies to greatly assist us, so easiest to deal with someone who knows the talk, rather than [from staff who are on their] first day." (MRaCC/ROCC staff member)*

Transmission of Potentially Lethal Infectious Diseases

Seasonal variations in disease epidemiology and the availability of innovative therapies or measures to prevent and manage disease were linked by participants to different medical retrieval decisions.

Keeping Patients Within the Community to Control the Spread of Infection

In the early phase of the COVID-19 pandemic, noting the high disease burden and poor socio-economic situations prevalent in remote Australia, health services and other service providers worked to keep remote Aboriginal populations safe from COVID-19. (Parliament of Australia, 2020) As illustrated by the quote below, most participants (pre-COVID-19 vaccine period) mentioned that there was an increased imperative to manage patients in remote communities where possible rather than evacuating them to hospitals, which increased the risk of hospital-acquired COVID-19 infection:

> *".. if we can manage someone in a remote community you shouldn't be bringing them to [town name] and exposing them to [COVID-19] risk." (MRaCC/ROCC staff member)*

Retrieving Patients to Control the Spread of Infection in the Community

Participants recollected specific policies or health initiatives introduced in relation to managing infectious diseases that also affected retrieval decisions. For example, following a 2017 meningococcal outbreak in central Australia (Department of Health, 2017), a policy was introduced requiring that all febrile children were retrieved during the

outbreak because of the seriousness of the condition for children and the overcrowding in the community and associated risks of rapid spread.

DISCUSSION

This is the first time to the authors' knowledge that the factors influencing medical retrieval decisions in the context of sparsely populated remote locations have been published in peer reviewed literature. These findings are, therefore, an important contribution to the extant retrieval literature, addressing significant gaps identified in two recently published literature reviews (Edwards et al., 2021; Mathew et al., 2022).

The study revealed that remote medical retrieval decisions are influenced by a range of referrer, patient, retrieval and transport factors, some of which they have in common with retrievals undertaken in other settings and others of which are likely to be different and may be most relevant for the remote Australian context of this study, as outlined in Table 1.

The study underscores the importance of having retrieval team members with high-level critical care skills (Russell et al., 2023), as well as contextual knowledge and experience in remote health service delivery. Remote Australia experiences extreme health professional shortages and turnover (Russell et al., 2017), which makes remote medical retrieval services dependent on interstate or international locums or agency nurses who may not have adequate contextual knowledge of specific remote communities, cultural and social circumstances of patients, the constrained environments in which remote clinics operate or the impacts of allocating specific retrieval infrastructure, all of which can affect appropriate medical retrieval decision-making. For example, a contextual factor influencing experienced remote consultants' retrieval decisions is whether the referring remote PHC centers have the human resources and skills to care for a patient within the community. Reliance on RANs employed in a short-term (temporary) capacity (Wakerman et al., 2019) is sometimes associated with sub-optimal clinical and cultural skills and low confidence in managing patients in the relative professional and geographic isolation in which they find themselves (Dunbar et al., 2019). For experienced RANs, heavy workloads limit their ability to care for seriously ill patients within a community while waiting for medical retrievals to occur. In these circumstances, some medical retrieval decisions may be completely different from what otherwise might occur in urban and rural contexts. Workforce instability and heavy workloads, including amongst MRaCC, ROCC, and remote health staff, can thus make a considerable contribution to the number of avoidable retrievals and also affect the appropriateness of retrievals in remote Australia. Strong professional relationships, developed over time between longer-term retrieval and remote PHC staff, provide opportunities for each health professional to better know each other's abilities and resource constraints (e.g., RAN fatigue), which can more readily be considered when making retrieval decisions. Solutions to remote PHC workforce instability, presented in more detail elsewhere, include strengthening remote health training pathways, ensuring a supportive and adequately resourced work experience, and providing appropriate personal and professional support (refs e.g. Wakerman et al. 2019; Russell et al. 2021).

Another key finding was that the decision to retrieve a patient at a particular time depended on the availability of scarce retrieval transport resources – these being retriev-

Type of factor	General factors	Important contextual factors in remote Central Australia	Relevant themes that describe contextual factors
Referrer factors	Referrers' skill and resources available	• Usually the referrer is a Remote Area Nurse (RAN) and a doctor is not physically present with the patient. • Emergency and PHC professional support for referrers are accessed via separate telehealth referral systems (MRaCC and ROCC, respectively). • Telehealth audiovisual infrastructure and connectivity is variable between clinics and often unreliable, especially across different jurisdictions. • Limited workforce capacity within PHC clinics to provide after-hours care for sick patients without compromising functioning of clinics during the day. • Access to advanced medical equipment and Point of Care Testing capability are limited in some remote communities. • Workforce instability is extremely high, which impact on referrer's relationships with community, relevant clinical skills and organizational knowledge.	• Experienced PHC staff • Point of care testing and support from GPs • Telehealth infrastructure • RAN fatigue • Remote Early Warning Score
Patient factors	Socio-economic & cultural factors	• Greater hesitancy to seek health care and hence greater need to develop trusting relationships between patients and health professionals. • Frequently high levels of poverty with limited access to basic personal health care infrastructure (eg. Smartphone, refrigerator, running water). • Cultural determinants of health including holistic view of health and wellbeing, preferences to be treated by same sex health professionals, role of family in decision making and meeting cultural obligations. • Overcrowding of houses and inadequate housing and implications for care.	• Critical care skills and professional experience in remote communities • Experience of PHC staff • Keeping patients within the community to control spread of infection • Retrieving patients to control spread of infection in community
Retrieval team	Skilled human resources	• Dependence on short term staff in remote clinics means staff may not have established relationships with a patient. • Retrieval team members require contextual knowledge of how remote clinics operate and cultural aspects of health service utilization. • Tasking of assets accounts for longer duration of tasks due to distances involved and duration of crew shifts.	• Experience of PHC staf
Retrieval hospital	Clinical capability	• Two regional hospitals with limited subspecialty services. Patients may require transfer to a tertiary hospital 1500km away for definitive care	• Transport infrastructure
Retrieval transport factors	Distance	• Distances impact on optimal transport mode. Communities are located 10-500km away from the regional hospitals.	• Transport infrastructure • Tasking retrieval crews
	Weather	• Extreme weather events eg. floods, dust storms, smoke affect mode of transport and timing of retrieval.	• Transport infrastructure
	Aviation infrastructure available	• Aviation and ground infrastructure (e.g. night landing strips, unsealed roads requiring 4WD ambulance). • No rotary assets available for medical retrieval in central Australia. • Small number of fixed wing assets which cover vast geographical areas and provide a range of different functions (emergency transport, repatriations, interhospital transfers).	• Transport infrastructure
	Road infrastructure	• Condition of roads including safety for night-time driving with wildlife and road surface	• Transport infrastructure

Table 1. General and contextual factors influencing medical retrieval.

al aircraft or ambulances (Danne, 2003) and appropriate human resources making up the retrieval teams. While resourcing can be a challenge for urban medical retrievals, it is particularly difficult and different in remote contexts as retrieval services need to balance the utilization of the limited resources with the acuity of cases that emerge in

remote communities, inter hospital transfers and specific social and cultural needs of the patients. Because remote retrievals generally occur over large distances, once resources are allocated, it may be many hours before they are next available. Prioritization of emergency cases by remote medical retrieval services will be at the expense of lower priority patients (Gardiner et al., 2020) who may be experiencing one or more chronic conditions and needing inter-hospital transfers for specialist consultations. Remote communities often experience poor living environments caused by housing crisis, overcrowding issues (Lowell et al., 2018), and energy poverty that restricts people from accessing thermally comfortable houses (Race et al., 2016). These circumstances can affect people's capacity to care for themselves within the community. While a doctor, nurse, or paramedic may be part of a retrieval crew depending on the acuity of the patient (Kennedy et al., 2017), the gender of crew members needs to be factored in some remote retrievals. The social and cultural circumstances of a patient are thus considered in a decision to medically retrieve a patient. The deployment of a dedicated medical helicopter could address additional demand caused by the contextual factors that affect optimal retrieval decision-making for remote communities within a 200 km radius of Alice Springs (Loyd et al., 2023).

In this study, the decision not to retrieve a patient was positively linked to adequate PHC tools, well-staffed remote clinics, and dedicated PHC support for remote area nurses. There is mixed evidence on the impact of access to PHC services, effective chronic disease management, and preventive programs on the need to retrieve patients (Haren et al., 2015; Hussain et al., 2014; Lavoie et al., 2010; Moore & Kirby, 2015; Wieland & Abernethy, 2023; Zhao et al., 2013). Point of Care Testing, availability of medical equipment, and sustained supply of medicines were important in this study. This is consistent with studies that have found that using PoCT devices by RANs changed the triage decision for 41% of patients (Spaeth et al., 2019; Spaeth et al., 2018). In terms of medical retrieval processes, the routine use of REWS allowed the early recognition of sick or deteriorating patients and thus also guided medical retrieval decisions (Remote Primary Health Care Manuals, 2017). Clinical information that was available in real time via video consultation also assisted with retrieval decisions. The effectiveness of video consultations has been linked to the quality and availability of telehealth infrastructure (including appropriate internet speeds) in remote clinics, staff confidence in using the technology, and patient preferences (Mathew et al., 2023), so more telehealth related investments could enable improved retrieval decisions.

The views of a range of staff involved in all aspects of a remote medical retrieval process have been included in this paper. Feedback from remote community members - users of the retrieval services has not been sought. A recent study on patient journeys found that the physical health needs, social, and cultural care needs of health service users in central Australia are often overlooked during medical retrievals (Lankin et al., 2023a). From a provider point of view, it is thus important to provide adequate training for new to remote staff to ensure retrieval decisions do not overburden remote PHC staff, and captures the social and cultural health care requirements of First Nations patients. In terms of future research, this study highlights the need to work with retrieval service users, retrieval staff, and medical professionals to design contextual indicators to monitor and evaluate the effectiveness and efficiency of remote medical retrieval services.

CONCLUSION

A range of workforce and infrastructure characteristics of the remote healthcare system and social and cultural circumstances of remote community patients impact the decisions made by medical retrieval consultants to evacuate patients from remote Australia. The rationale behind retrieval decisions for remote community patients may not always match that for urban patients. The adequacy of medical retrieval services for remote communities should consider the high burden of disease, cultural requirements, workforce characteristics, and poorer access to health care and social circumstances compared to urban populations. The study highlights the need for dedicated investments and adequate workforce training to ensure medical retrieval decisions are acceptable for remote patients and appropriate in remote circumstances. The learnings of this study are potentially translatable to other remote retrieval systems elsewhere in Australia and internationally, which may be servicing culturally and linguistically diverse populations.

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