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Co-designing the implementation of a rural health systems-strengthening rheumatic heart disease program with remote First Nations Australian communities using Theory of Change

Benjamin Jones^{1,2*}, Alice Mitchell², Emma Haynes³, Natasha J. Howard⁴, Vicki Wade⁵, Chantelle Pears⁶, Bronwyn Rossingh⁷, Jessica Gatti⁸, Seide Ramadan⁸, Emma Corpus⁶, Jennifer Yan², James Marangou², Alex Kaethner², Meghan Bailey², Joshua R Francis², Mike English¹ and Shobhana Nagraj^{1,9,10}

Abstract

Background Rheumatic heart disease (RHD) is highly prevalent and under-detected in remote First Nations Australian communities. Rural communities face severe health workforce shortages that impact negatively on health outcomes. Task-sharing using local healthcare workers, trained to screen for active RHD cases (using handheld ultrasound with remote support from experts), has been proposed as a means of improving early detection whilst also strengthening referral pathways. Implementing new models of care within remote communities, however, requires local knowledge, cultural and operational adaptation, whilst ensuring consistency and quality assurance across multiple sites. This study aimed to co-design local implementation strategies for an RHD active case finding program with five remote communities and explain *how* and *why* the task-sharing program might lead to improved health outcomes.

Methods A qualitative study using a Theory of Change approach and 'yarning' methods, was conducted with five remote First Nations Australian communities. We used a combination of participant observation, extensive field notes over sequential visits to each site, supplemented with document analysis to inform co-design of Theories of Change for each community. Data were curated using NVivo software and analysed using Powell's refined compilation of implementation strategies framework.

Results Through the co-design process, a total of 24 locally tailored implementation strategies were identified. All sites identified the need for a positive implementation environment, including recognition of local healthcare workers through positive messaging and celebratory events for achieving key training milestones. Other key themes included the importance of opportunistic RHD screening, and the integration of local languages during both training and screening. Five locally adapted versions of the Theory of Change were co-designed to include planned outcomes, assumptions, causal mechanisms, and indicators for the program at each community.

Conclusions Our study identified implementation strategies and Theories of Change for the training and screening aspects of a new model of care for RHD screening in five remote First Nation Australian communities. These findings

*Correspondence:

Benjamin Jones

Benjamin.jones@ndm.ox.ac.uk

Full list of author information is available at the end of the article



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will be used to support future program evaluation and exploration the mechanisms by which the RHD screening program achieves its outcomes.

Keywords Co-design, Rheumatic heart disease, Task-sharing, Theory of Change, Complex intervention, Community health workers

Background

Remote First Nations Australian communities face significant health workforce shortages and experience social and cultural barriers when accessing health care [1]. This has necessitated the development of models of care that use existing resources in a novel way to improve health outcomes for conditions that disproportionately affect First Nations Australian communities.

Rheumatic heart disease (RHD) is a potentially life-threatening condition developed during childhood that is under-detected in remote First Nations Australian communities [2]. When diagnosed at first presentation, children may already have considerable heart damage, representing missed opportunities for earlier prevention and or treatment [2]. In response to this need, and to calls from community leaders, who expressed that ‘we know how bad RHD is, and we want to be able to find it ourselves, in our communities, so that children and pregnant women can get the care they need’, a task-sharing active case finding program was developed organically by affected communities, clinic staff, and clinician-researchers.

The program will utilise hand-held ultrasound devices to screen 5–20 year-olds and pregnant women for RHD. Local healthcare workers in high-risk communities (including community health workers, nurses, midwives, general practitioners) will be trained to capture images of the heart using these devices and collaborate with cardiologists (working remotely) who will interpret the images and advise on further care. The ‘task’ of RHD detection will be completed *collaboratively* by healthcare providers with different training [3]. This program has been informed by preliminary diagnostic accuracy studies of this task-sharing approach to RHD detection [4, 5] and is supported by the World Heart Federation guidelines for the echocardiographic diagnosis of rheumatic heart disease, 2023 [6].

The Non-Expert Acquisition and Remote Expert Review of Screening echocardiography images in Child health and AnteNatal clinics (NEARER SCAN) study [7] will evaluate how this RHD active case finding program works in real-world settings across remote First Nations Australian communities. This sub-study focused on co-designing the implementation of this program.

The active case finding program will be standardised across the study sites by ensuring a consistent

implementation of the program’s core *function* with flexibility of the program’s outer *form*. A program’s *function* is the fundamental idea underpinning the program and the theory of how that idea will lead to the program’s aims being achieved. A program’s outer *form* are the program activities which can be adapted for context. This approach allows for locally tailored implementation while upholding the consistency across sites which is critical for robust evaluation [8, 9]. It ensures that a program is specific about its goals, flexible about *how* to reach the goals, and specific about the measurement of the outcomes [10].

Adapting the outer form of the active case finding program for each specific site is important in the challenging context of healthcare delivery in remote First Nations Australian communities. Clinics in these remote settings are often under-resourced, face high staff-turnover, and deliver cross-cultural healthcare in English, which may not be the primary language spoken by the majority of people they serve [1, 11]. The broader context is characterised by communities with high healthcare needs, limited economic opportunities, and relatively limited political power [11]. Uniformly imposed programs are unlikely to be successfully implemented in these settings and contextual adaptation is needed.

Successful program implementation is dependent on the extent to which the dynamic properties of each site’s context can be harnessed in the adaptable outer form of the program, so that the core function can be achieved [12]. Whilst the core functions of the program are detailed in Additional file 1, the specifics of how the program will be implemented at each site, or the adaptable outer forms, had not been developed (Fig. 1).

Implementation of the RHD active case finding program requires further understanding of contextual priorities and locally-tailored program adaptations based on each site. Thus, co-designing the program implementation strategies with each community is essential for future implementation and sustainability of a new model of care. It is also important for assessing the program fidelity, which is the degree to which the program is delivered as intended [13].

Rationale and objectives

We conducted a qualitative study to co-design the local implementation plans of an RHD active case finding

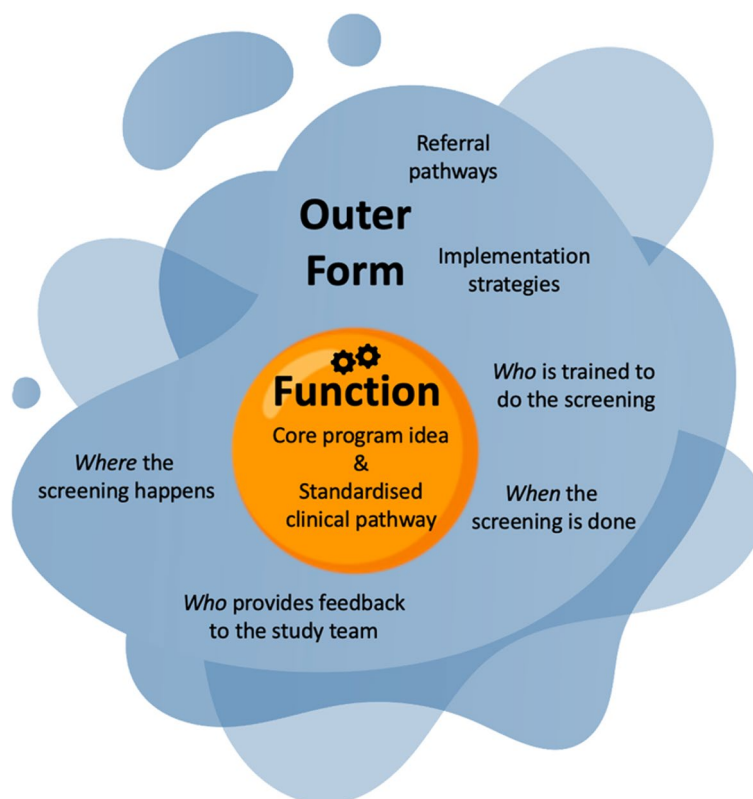


Fig. 1 Function (standardised) and adaptable outer form (co-designed) of the RHD active case finding program

program with five remote communities. The two objectives were to a) identify locally tailored implementation strategies for each site, and b) explain how and why the core function and adapted form (including the implementation strategies) of the active case finding program are expected to improve health outcomes for those living with RHD in each community through use of Theory of Change.

Methods

Study design

A qualitative study was conducted using a Theory of Change approach [14–16]. The *Centre for Theory of Change* guidelines [17, 18] were used to develop local versions of the Theory of Change. To illustrate each Theory of Change as a diagram, the *Centre for Theory of Change* Online software (Theory Of Change Online V3.0) [19] was used.

Study setting

The study was conducted in five remote First Nations Australian communities: Karratha-Roebourne in the West Pilbara region of Western Australia, and Maningrida, Milikapiti, Galiwin'ku, and Yirrkala in the Top End of the Northern Territory (figure 2). Demographic details

for each site and information about the participating primary healthcare clinics are provided in Additional file 2.

Co-design approach

Prioritising the voices of local First Nations community members was central to our co-design approach, as they possess critical insights into what works within their communities. This active prioritisation sought to address inherent power imbalances that exist between the *implementing* team over those the program is *implemented on*. This imbalance is compounded in some First Nations communities as an ongoing impact of colonisation [20, 21].

The co-design process began with community engagement. At certain sites this community engagement had begun several years prior during previous RHD projects. Other sites were identified based on prior conversations with relevant Aboriginal Community Controlled Health Organisations, jurisdictional health departments, and community members. Formally employed community engagement officers visited the sites and held informal discussions with participating clinics, local Elders groups, and local schools/community sites (e.g. pools) where screening events may take place. Follow-up visits and discussions were conducted by principal investigators (JF, JY,

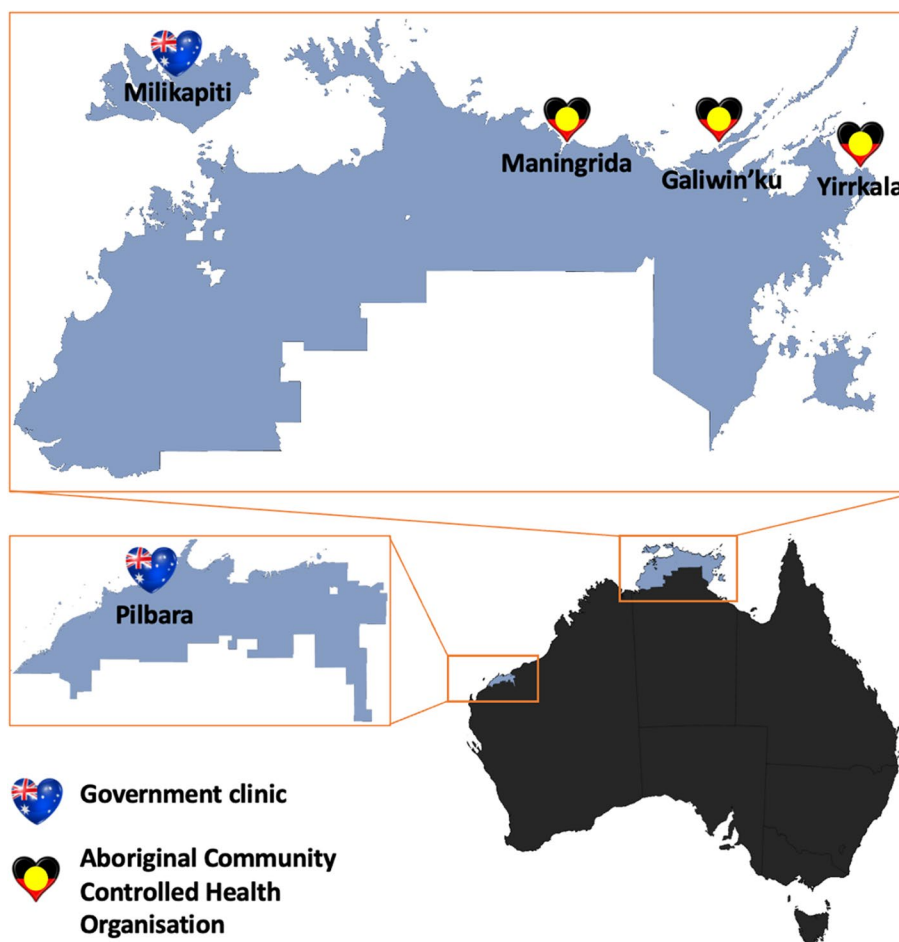


Fig. 2 Map of the NEARER SCAN study sites

JM), qualitative research staff (BJ, AM), and the project coordinator (MB). Each site was visited 2–3 times before the scanning training began. These multiple in-person visits allowed for relationship development and signalled the prioritisation of locally tailored implementation.

Data collection

Data were collected in the form of participant observational field notes and document analysis of key RHD guidelines and policies. This approach was used to show respect and understanding of the local norms of the participants. Contributors engaged at each site included individuals and families with lived experience of RHD, community leaders, local healthcare workers who will undertake the training (First Nations community health workers, nurses, doctors), clinic management, and other community members including staff from the local schools, service delivery organisations, and local government.

Participant observational field notes that informed the Theory of Change development were collected by seven

members of the research team (BJ, AM, JF, JM, AK, JN, MB, CP) across several visits to each site between April – July 2023. Conducting multiple visits during this period aligned with local preferences for sustained engagement from research teams.

A qualitative methodology known as ‘yarning’ was used to facilitate the co-design discussions [22]. Yarning is the “*conversational process that involves the telling and sharing of stories and information* [23].” Yarning was used as it is culturally aligned and centres First Nations worldviews [22, 24]. Discussions included a combination of informal and formal conversations through both group and individual discussions and meetings to formulate a comprehensive Theory of Change. A discussion guide was developed to facilitate these conversations (Additional file 3). Core elements of the Theory of Change including assumptions, rationale, outcomes, and indicators were documented in field notes by members the research team through multiple yarning discussions. Research team members facilitated these discussions and prioritised documenting the Theory of Change components in their

field notes. Field notes were made during discussions were supplemented by further reflection and debrief with the research team after each site visit.

The combination of yarning with participant observational field notes, rather than formal qualitative interviews, was considered an appropriate and ethical data collection approach for the study settings and aims by the authorship team and the Indigenous Advisory Group (a group of First Nations people working on the NEARER SCAN project, or work related to RHD, formed to ensure the study is conducted in accordance with culturally safe practices in research). This decision was guided by their experience in remote First Nations health data collection and lived experience. Building relationships with local community members is crucial when conducting research in First Nations communities. Engaging in informal, unrecorded yarns was viewed as an essential part of this initial relationship-building phase and acknowledged that First Nations people may perceive the process of engaging in research through a different historical and cultural lens.

Document analysis of meeting minutes, program promotional material, and internal primary healthcare clinic workforce strategies was also conducted.

Data analysis

Data were curated using QSR International's NVivo-1.7.1 qualitative analysis software [25]. A framework analysis [26] was used as a recommended method for Theory of Change development across multiple sites [27]. The *Centre for Theory of Change's* components of a Theory of Change framework emerged as the specific framework as it offered an institutionally credible and accessible structure and had an associated software program to assist with mapping the data. Two independent, qualitatively-trained researchers (BJ & AM) were involved in data analysis. An iterative approach using both deductive and inductive elements was used to analyse the data (Additional file 4).

Validity and rigour

Internal validity was strengthened by using formal qualitative data collection and analysis methods, conducting internal team discussions and debriefs following data collection, to triangulate findings, and having multiple researchers with training in qualitative methods. Incorporating a face-to-face contributor validation process of the final adapted Theory of Change diagrams with feedback from the First Nations Advisory Group, the research team, community members from each local site also strengthened internal validity.

External validity was strengthened by using Powell's refined compilation of implementation strategies [28],

the Theory of Change Online software, and the *Centre for Theory of Change* guidelines, discussing the findings through the lens of established implementation theories from the literature, and reporting author positionality. To acknowledge the potential biases that may be introduced each researcher provided a positionality statement for transparency. These internal and external validity measures were followed to enhance the plausibility, acceptability, testability, and feasibility of the Theories of Change.

Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) Code of Ethics for Aboriginal and Torres Strait Islander Research

This study embedded the core principles of the AIATSIS Code of Ethics throughout its design. Indigenous self-determination was supported by prioritising community-led decision-making and ensuring First Nations voices guided all stages of the research. Indigenous leadership was central, with key roles held by First Nations researchers and community representatives who provided oversight and strategic direction. The study aimed to deliver meaningful impact and value by addressing local priorities and generating practical, community-driven solutions for RHD prevention and care. Finally, sustainability and accountability were supported through the local workforce strengthening focus and the establishment of mechanisms for ongoing monitoring, evaluation, and transparent reporting back to the communities involved.

Results

Implementation strategies

Across the five sites, 24 implementation strategies were identified in the co-design process to be locally tailored (Table 1). Fifteen of these implementation strategies were consistent with Powell's refined compilation list [28] and nine emerged inductively from the co-design process. Twelve implementation strategies were included at every site and tailored for local context. The strategies will be implemented as a package in each site (Additional file 5).

The types of locally tailored implementation strategies that emerged during the co-design process can be categorised in three overarching themes.

1. Positive implementation environment

The co-design process identified strategies that may create a positive environment for the implementation of the active case finding program. These strategies include: partnering with local sport teams to conduct screening echocardiography at matches, partnering with professional sport teams popular in the community to promote early detection of RHD, incentivisation schemes

Table 1 Implementation strategies co-designed and tailored for different sites

Implementation strategy	Description of strategy as relevant for implementation of the NEARER SCAN RHD active case finding program	Number of sites where implementation strategy is planned
Assess for readiness and identify barriers and facilitators	Assess various aspects of each site to determine its degree of readiness to implement training and screening activities, barriers that may impede implementation, and strengths that can be used in the implementation effort.	5/5
Audit and provide feedback	Collect and summarise clinical performance data for echocardiographic screening over a specified time period and provide to each site to monitor, evaluate, and modify the active case finding program.	5/5
Build a coalition	Recruit and cultivate relationships with local partners, e.g. schools in the implementation of training and screening activities.	3/5
Celebrate graduation ^a	Celebrate completion of the training course by holding a graduation ceremony.	5/5
Centralise technical assistance	Develop a centralised system (via WhatsApp) to request and deliver technical assistance for echocardiography focused on implementation issues with pathways for hardware and software issues.	5/5
Change physical structure and equipment	Evaluate current configurations and adapt, as needed, the physical structure and/or equipment (e.g., changing the layout of a room, adding the ultrasound devices, storing the devices) to best accommodate incorporating echocardiography into clinical work.	5/5
Conduct educational meetings	Hold meetings targeted toward different contributors groups (e.g., providers, administrators, other organisational contributors, and community, patient/consumer, and family members) to inform them about the active case finding program.	5/5
Conduct educational outreach visit	Have an expert reviewer meet with local providers in their clinic settings to provide information about the active case finding program.	5/5
Conduct local consensus discussions	Conduct discussions with local community members to understand the prioritisation of RHD within the local community health agenda and whether the active case finding program is an appropriate program.	3/5
Conduct ongoing training	Plan for and conduct ongoing training in echocardiography for local healthcare workers.	5/5
Develop promotional material ^a	Develop promotional material pertaining to the active case finding program in the form of posters, flyers, etc.	5/5
Distribute promotional material ^a	Distribute the locally tailored promotional material around the community.	5/5
Identifying piece of clothing ^a	Provide RHD active case finding program shirts for trained local health workers to build identity in clinical role.	5/5
Identify and prepare champions	Identify and prepare individuals who are financially supported to drive the implementation of the active case finding program, overcoming indifference or resistance that the program may provoke in an organisation.	1/5
Inform local opinion leaders	Inform providers identified by colleagues as opinion leaders or “educationally influential” about the active case finding program in the hopes that they will influence colleagues to adopt it.	5/5
Involve executive boards	Involve existing governance structures (e.g., Elders or other community-led boards) in the implementation effort, including the review of data on implementation processes.	1/5
Progress dashboard ^a	Develop and display a dashboard to demonstrate progress of the active case finding program.	4/5
Promote network weaving	Identify and build on existing high-quality working relationships and networks within and outside the clinic and community organisations.	5/5

Table 1 (continued)

Implementation strategy	Description of strategy as relevant for implementation of the NEARER SCAN RHD active case finding program	Number of sites where implementation strategy is planned
Provide bags of goods for participants ^a	Develop and provide gifts as incentives for people having an echocardiogram in the active case finding program.	1/5
Provide clinical supervision	Provide ongoing support for trained local healthcare workers from experts reviewing the images.	5/5
Provide food during screening events ^a	Provide food to participants and community when hosting screening events.	1/5
Provide fun ancillary activities at screening events ^a	Use ancillary fun activities to encourage more participants to attend for echocardiography e.g., basketball games.	1/5
Remind clinicians ^a	Develop a reminder system within local software at clinic to remind healthcare workers of need to conduct echocardiography.	1/5
Use mass media	Use local radio to promote active case finding program.	3/5

^a Strategy that is not on Powell's [28] Expert Recommendations for Implementing Change (ERIC) strategies list and inductively emerged

including 'goody-bags' for participants, friendly competition for staff through the use of a dashboard to monitor number of participants scanned, shirts or aprons for the trained scanners, celebrating graduation from the training as both a celebration informed by local customs and an official presentation of the certificate. The importance of a strengths-based, positive implementation of the program was also inferred from comments such as the suggestion to "avoid framing [the active case finding program] as a health check" and the need to "focus on the strengths" of the local community.

2. Opportunistic implementation

Strategies that supported an opportunistic, more informal, and flexible implementation of the active case finding program were recommended consistently across the sites. For example, the importance of being able to do a screening echocardiogram at any time rather than in a specific consultation type or routine was suggested. Similarly, when commenting on where scanning should occur, at several sites a combination of the clinic, schools, local football matches, and during informal, 'ad hoc' home visits, was preferred. This theme also came from suggestions in multiple communities to opportunistically provide RHD education alongside the active case finding program to bolster general knowledge of RHD across the community.

3. Local languages in implementation

Across the implementation strategies, the importance of using local language in the active case finding program was highlighted. All but one site, suggested developing program promotional material in the local language

of the community. As part of the '*building a coalition*' strategy, multiple sites also specifically suggested a local language organisation to assist in the development of promotional materials. Use of local languages in delivery of training for local healthcare workers was also highlighted.

Theory of change

The second objective of this study was to explain how and why the core function (outlined in the introduction section of this paper) and adapted form (including the implementation strategies identified above) of the RHD active case finding program are expected to improve health outcomes for those living with RHD in each community. Five locally adapted Theory of Change diagrams and tables were developed. The Maningrida Theory of Change narrative (below), table (Additional file 6), and diagram (Additional file 7) are included in this manuscript as an example.

Theory of change narrative

In Maningrida, the program will leverage off long term RHD awareness work (including scanning accuracy studies [4, 5], an RHD health promotion school module in local languages [29]), and a positive relationship between lead researchers and the community). RHD is well supported at the clinic as the only site with a specific RHD building as well as two RHD-specific nurses. Community willingness to engage with external partners and to pursue efforts to tackle RHD have resulted in noticeably open, productive communication and organisation regarding implementation of the program so far.

The program is expected to work in Maningrida by training approximately 10 staff members, including several local community members, some of whom have

previously participated in earlier iterations of the training program as part of diagnostic accuracy studies at this site. Trainings will be conducted in blocks with refresher sessions to aid familiarity with the content and ensure the skill can be meaningfully acquired. The local school and language centre will be engaged with the program to conduct population screening events. This will aid in engaging younger community members and developing promotional material that is more appropriate for the context. It was acknowledged that local staff ownership of the skill will be critical for sustainability and may improve both job satisfaction and broader professional confidence. Ultimately, these factors are expected to lead to an increase in detection of RHD and improved ongoing management.

Discussion

Our study used a novel Theory of Change approach and yarning methods to co-designing implementation strategies and Theories of Change with five remote communities in Australia. Our study findings relating to introduction of a new model of care and technology for RHD screening might be interpreted in light of existing implementation science theories and frameworks including *Normalisation Process Theory (NPT)* [30] and the *Nonadoption, Abandonment, Scale-up, Spread, and Sustainability (NASSS) framework* [31]. The three main areas identified in our study for improving local implementation of a new model of care for RHD case finding included creating a positive implementation environment, supporting opportunistic approaches to case finding, and incorporating local languages in the implementation process.

Strategies that create a positive environment for implementation were consistently suggested across the sites. Implementing a program with both local capacity building and a new technology in rural health services and communities overwhelmed with programs, with a positive implementation package, may enhance staff *cognitive participation* as outlined in NPT [30]. The NASS domain of *value proposition* offered by the program to local staff is in the form of upskilling in a novel technology, especially one that is community-facing, tangible, and technically advanced, may contribute to this positivity. The program also offers clear *differentiation* to current practice, meaning the implementation can build-off the general positivity surrounding the program, engaging staff on a basis of wanting, rather than needing to participate. This may counter perceptions of program imposition and contribute to the NPT principle of coherence.

All sites recommended strategies encouraging opportunistic program implementation, a key factor in both NPT and NASSS. This flexible approach may

complement the unpredictable high activity – low activity workload cycles common in remote clinics. For example, at any time a trained local healthcare worker may be pulled to assist in a medical emergency or asked to be a driver for the clinic. Being able to perform echocardiography around these ad hoc activity bursts is important for *adoption*, a fundamental aspect of the NASSS framework. If the trained healthcare workers feel restricted in when and where they do echocardiography, they may instead opt for more established, familiar tasks and forgo newly introduced tasks, especially those that are complex and different from other tasks performed [32, 33]. This may also risk the task never being a specific priority and something that is done in ‘spare time’. In addition, we believe that for the initial *sense-making process*, highlighting the idea that the program implementation can be moulded to suit the local context, and *adapted over time* based on community feedback, may further assist *adoption* because it provides agency and creates a sense of ownership over the task [34, 35].

Throughout the implementation discussions, the significance of incorporating local languages into the program was underscored which ties into the wider system aspect of NASSS. These findings support the need for a broader discussion about what the Australian health system can do to support the delivery of healthcare in the language spoken by the community [36, 37]. For program implementation, the suggestion to involve local language organisations in the creation of educational promotional materials exemplified a thoughtful approach towards the *wider system* and the fostering of *inter-organisational networks*, highlighted as an important aspect in the NASSS framework.

Implementing the program in a remote primary healthcare system with limited absorptive capacity, potentially resulting in unintended negative outcomes, is referred to as an example of this program’s ‘dark logic’. In this sense, the program could exacerbate the issue of already overburdened rural health services. This may be particularly true during the initial implementation before supporting measures like billing codes are introduced. Evaluation of the program will involve specifically looking for adverse consequences including examining failed patient journeys in the clinical care pathway and observing for incidental role expansion.

Reflections on co-design approach

Resource and regulatory limitations often dictated compromises in the implementation plan. This had the potential to unconsciously favour input from organisations with the most knowledge of these limitations. To counter this, we actively embraced all community suggestions for local adaptations, using a Theory of Change

co-design approach that allowed participants to share insights on any strategies that may assist implementation, without consideration of feasibility. Ideas were only then assessed within resource and regulatory limits, and unfeasible ideas were transparently communicated back to the community.

Dissemination processes were adapted to each contributing group. For community members and healthcare workers this involved face-to-face informal meetings during subsequent visits, highlighting the importance of multiple visits in each study site. These interactions allowed for an open discussion about the rationale behind decisions. In some sites, we also developed diagrams using locally relevant language and symbols with community members to explain the study and its outcomes. For partnering local organisations, we generally used email correspondence and video meetings to share the outcomes of the co-design process. For instance, a proposal to train staff from a local non-health organisation was deemed unfeasible due to concerns about integration with the health system, and this decision was shared with this organisation via email.

The feasibility of using a Theory of Change for this co-design approach is highlighted in the Australian Government's Indigenous Evaluation Strategy [38]. This document suggests that the Theory of Change approach is particularly suited to allowing for First Nations knowledges, perspectives, and world views to be incorporated into a study.

Limitations

Instead of developing diagrams during Theory of Change workshops with all contributors, our study constructed the Theory of Change post-field visits. This decision aimed to prioritise the yarning process which requires full attention on developing interpersonal connections over diagram creation. This approach was deemed particularly effective in establishing rapport, which is essential for ongoing meaningful engagement in First Nations research. The decision to conduct these informal yarns without a formal workshop structure and recording them was deliberate, emphasising the importance of creating a comfortable environment where participants could share their experiences and insights freely, without the pressure of being on record in a formal workshop without first establishing rapport with the research team. This approach not only respected the cultural norms of the communities but also facilitated a more genuine relationship between the researchers who were visitors to the communities and the participants.

A considerable amount of time was needed to develop each site-specific Theory of Change adaption in the absence of dedicated workshops with all contributors in

attendance. This process may have diminished the contributor consensus-building benefit associated with the Theory of Change process [39]. This study captured the thinking of contributors at one point in time. The implementation process, local feedback, and adaptations will continue throughout the length of the study as outlined in the NEARER SCAN study protocol.

In addition, most of the research team were unable to speak the local First Nations languages of the communities involved. Consequently, co-design discussions were conducted in English which may have limited the data collected. However, in one of the sites, one research team member did speak a local First Nations language and was able to conduct these discussions in the local language.

Trust was cultivated through multiple site visits between the research team and local community members. This was demonstrated by the recurring positive feedback about the program in discussions, sustained engagement, and continual feedback. However, it is important to acknowledge the limitation that exists in any setting where there is cross-cultural communication.

Conclusion

In this study we investigated the process of co-designing the implementation plan for a task-sharing RHD active case finding program in five remote First Nations community sites in Australia. Twenty-four locally tailored implementation strategies were identified, and we found that a positive, opportunistic implementation plan with involvement of local languages was supported across the sites. How and why the program's core function and adapted form is expected to improve health outcomes for those living with RHD in Maningrida was also reported as an example Theory of Change.

The initial theories from this study will contribute to the process evaluation of the NEARER SCAN study to determine what implementation strategies work in integrating the RHD active case finding program into routine rural health service practise, under what circumstances, and why.

Abbreviation

RHD	Rheumatic Heart Disease
NEARER SCAN	Non-Expert Acquisition and Remote Expert Review of Screening echocardiography images in Child health and AnteNatal clinics

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12913-025-12255-1>.

Additional file 1. Core function of the program. This figure and description provides information on the core function of the program.

Additional file 2. Demographics of each site. The table summarises the demographics and health service types for the five sites.

Additional file 3. Discussion guide. The document presents the discussion guide used in the study.

Additional file 4. Data analysis process. This figure presents the stepwise data analysis process followed for this study.

Additional file 5. Implementation strategies. This table presents all the different implementation strategies proposed at each site.

Additional file 6. Maningrida Theory of Change table. This table presents the Maningrida Theory of Change in tabulated form.

Additional file 7. Maningrida Theory of Change diagram. This table presents the Maningrida Theory of Change in diagrammatic form.

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Authors' contributions

BJ, AM, EH, VW, NH, JM, JF, JN, SN, and ME conceived the study and led the development of the research design. BJ and AM coordinated the data collection and analysis. BJ, AM, JY, JM, AK, MB, and JF participated in fieldwork and data collection. CP, BR, JG, SR, and EC provided local expertise and guidance for the study sites. All authors reviewed and provided input to the manuscript. All authors read and approved the final manuscript.

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Data availability

The datasets generated and analysed during the current study are not publicly available due to risk of identification of participants but a summary will be available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Ethics approval was obtained by the Human Research Ethics Committee of Northern Territory Health and Menzies School of Health Research (Reference Number: 2022-4479), the WA Aboriginal Health Ethics Committee (Reference Number: HREC1237), and the University of Oxford's Tropical Research Ethics Committee (Reference Number: 519-23). The study followed ethical principles for medical research as set out by the Declaration of Helsinki. Informed oral consent was provided by contributors who participated in discussions. No interviews were conducted with participants, and no identifiable quotes were derived from discussions.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Health Systems Collaborative, Nuffield Department of Medicine, Oxford University, Oxford, UK. ²Global and Tropical Health Division, Menzies School of Health Research, Charles Darwin University, Darwin, Australia. ³School of Population and Global Health, University of Western Australia, Perth, Australia. ⁴Wardliparingga Aboriginal Health Equity, South Australian Health and Medical Research Institute, Adelaide, Australia. ⁵Heart Foundation, Sydney, Australia. ⁶Western Australia Country Health Service, Pilbara, Australia. ⁷Miwatj Health Aboriginal Corporation, Nhulunbuy, Australia. ⁸Mala'la Health, Maningrida, Australia. ⁹Primary Care Unit, Department of Public Health & Primary

Care, University of Cambridge, Cambridge, UK. ¹⁰East London NHS Foundation Trust, London, UK.

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References

- Wakerman J, Humphreys J, Russell D, Guthridge S, Bourke L, Dunbar T, et al. Remote health workforce turnover and retention: what are the policy and practice priorities? *Hum Resour Health*. 2019;17(1):99.
- Francis JR, Fairhurst H, Hardefeldt H, Brown S, Ryan C, Brown K, et al. Hyperendemic rheumatic heart disease in a remote Australian town identified by echocardiographic screening. *Med J Aust*. 2020;213(3):118–23.
- Orkin AM, Rao S, Venugopal J, Kithulegoda N, Wegier P, Ritchie SD, et al. Conceptual framework for task shifting and task sharing: an international Delphi study. *Hum Resour Health*. 2021;19(1):61.
- Francis JR, Whalley GA, Kaethner A, Fairhurst H, Hardefeldt H, Reeves B, et al. Single-View Echocardiography by Nonexpert Practitioners to Detect Rheumatic Heart Disease: A Prospective Study of Diagnostic Accuracy. *Circulation Cardiovascular imaging*. 2021;14(8): e011790.
- Francis JR, Fairhurst H, Yan J, Fernandes Monteiro A, Lee AM, Maurays J, et al. Abbreviated Echocardiographic Screening for Rheumatic Heart Disease by Nonexperts with and without Offsite Expert Review: A Diagnostic Accuracy Study. *J Am Soc Echocardiogr*. 2023.
- Rwebembera J, Marangou J, Mwita JC, Mocumbi AO, Mota C, Okello E, et al. 2023 World Heart Federation guidelines for the echocardiographic diagnosis of rheumatic heart disease. *Nat Rev Cardiol*. 2023.
- Jones B, Marangou J, Yan J, Ralph A, Mitchell A, Kaethner A, et al. NEARER SCAN (LENO BESIK) evaluation of a task-sharing echocardiographic active case finding programme for rheumatic heart disease in Australia and Timor-Leste: protocol for a hybrid type II effectiveness-implementation study. *BMJ Open*. 2024;14(10): e083467.
- Bauman LJ, Stein RE, Ireys HT. Reinventing fidelity: the transfer of social technology among settings. *Am J Community Psychol*. 1991;19(4):619–39.
- Hawe P, Shiell A, Riley T. Complex interventions: how "out of control" can a randomised controlled trial be? *Bmj-Brit Med J*. 2004;328(7455):1561–3.
- Tight-loose-tight Dickens P. A complexity approach to innovation. *Organizational Development Practitioner*. 2016;48:27–31.
- Wakerman J, Bourke L, Humphreys JS, Taylor J. Is remote health different to rural health? *Rural Remote Health*. 2017;17(2).
- Hawe P, Shiell A, Riley T. Theorising interventions as events in systems. *Am J Community Psychol*. 2009;43(3–4):267–76.
- Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, et al. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Adm Policy Ment Health*. 2011;38(2):65–76.
- Anderson AA. The Community Builder's Approach to Theory of Change: A Practical Guide to Theory Development: Aspen Institute Roundtable on Community Change; 2006.
- Center for Theory of Change. What is Theory of Change?. 2021 [Available from: <https://www.theoryofchange.org/what-is-theory-of-change/>].
- De Silva MJ, Breuer E, Lee L, Asher L, Chowdhary N, Lund C, et al. Theory of Change: a theory-driven approach to enhance the Medical Research Council's framework for complex interventions. *Trials*. 2014;15(1):267.
- Taplin D, Clark H. *Theory of Change Basics*. New York: ActKnowledge Centre for Theory of Change; 2012.
- Taplin D, Clark H, Collins E, Colby D. *Technical Papers: A Series of Papers to Support Development of Theories of Change Based on Practice in the Field*. New York: ActKnowledge Centre for Theory of Change; 2013.
- Center for Theory of Change. *Theory of Change Online (TOCO 3.0)*. New York: Center for Theory of Change; 2021.
- Butler T, Gall A, Garvey G, Ngampromwongse K, Hector D, Turnbull S, et al. A Comprehensive Review of Optimal Approaches to Co-Design in Health with First Nations Australians. *Int J Environ Res Public Health*. 2022;19(23).
- Williams O, Sarre S, Papoulias SC, Knowles S, Robert G, Beresford P, et al. Lost in the shadows: reflections on the dark side of co-production. *Health Res Policy Syst*. 2020;18(1):43.

22. Kennedy M, Maddox R, Booth K, Maidment S, Chamberlain C, Bessarab D. Decolonising qualitative research with respectful, reciprocal, and responsible research practice: a narrative review of the application of Yarning method in qualitative Aboriginal and Torres Strait Islander health research. *Int J Equity Health*. 2022;21(1):134.
23. Walker M, Fredericks B, Mills K, Anderson D. "Yarning" as a method for community-based health research with Indigenous women: the Indigenous Women's Wellness Research Program. *Health Care Women Int*. 2014;35(10):1216–26.
24. Dean C. A yarning place in narrative histories. *History of Education Review*. 2010;39(2):6–13.
25. QSR International Pty Ltd. NVivo. 2022.
26. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol*. 2013;13:117.
27. Mills T, Lawton R, Sheard L. Advancing complexity science in health-care research: the logic of logic models. *BMC Med Res Methodol*. 2019;19(1):55.
28. Powell BJ, Waltz TJ, Chinman MJ, Damschroder LJ, Smith JL, Matthieu MM, et al. A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. *Implement Sci*. 2015;10:21.
29. Mitchell AG, Diddo J, James AD, Guraylayla L, Jinmarabynana C, Carter A, et al. Using community-led development to build health communication about rheumatic heart disease in Aboriginal children: a developmental evaluation. *Aust N Z J Public Health*. 2021;45(3):212–9.
30. May C. A rational model for assessing and evaluating complex interventions in health care. *BMC Health Serv Res*. 2006;6:86.
31. Greenhalgh T, Wherton J, Papoutsi C, Lynch J, Hughes G, A'Court C, et al. Beyond Adoption: A New Framework for Theorizing and Evaluating Nonadoption, Abandonment, and Challenges to the Scale-Up, Spread, and Sustainability of Health and Care Technologies. *J Med Internet Res*. 2017;19(11): e367.
32. Sweller J. Cognitive load during problem solving: Effects on learning. *Cognitive Science*. 1988;12(2):257–85.
33. Shiffrin RM, Schneider W. Controlled and automatic human information processing: II. Perceptual learning, automatic attending and a general theory. *Psychological Review*. 1977;84(2):127–90.
34. Denis JL, Hebert Y, Langley A, Lozeau D, Trottier LH. Explaining diffusion patterns for complex health care innovations. *Health Care Manage Rev*. 2002;27(3):60–73.
35. Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in service organizations: systematic review and recommendations. *Millbank Q*. 2004;82(4):581–629.
36. Kerrigan V, McGrath SY, Majoni SW, Walker M, Ahmet M, Lee B, et al. From "stuck" to satisfied: Aboriginal people's experience of culturally safe care with interpreters in a Northern Territory hospital. *BMC Health Serv Res*. 2021;21(1):548.
37. Communicate study group. Improving communication with Aboriginal hospital inpatients: a quasi-experimental interventional study. *Med J Aust*. 2020;213(4):180–1.
38. Australian Government. A Guide to Evaluation under the Indigenous Evaluation Strategy. In: Productivity Commission, editor. Canberra: Australian Government, 2020.
39. Jones B, Paterson A, English M, Nagraj S. Improving child health service interventions through a Theory of Change: A scoping review. *Front Pediatr*. 2023;11:1037890.

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Benjamin Jones DPhil student at the University of Oxford, Australian medical doctor, Murrawarri, First Nations Australian but not from any of the participating communities.

Alice Mitchell PhD using qualitative methods, prior clinician in two sites. Not Indigenous but long-term interaction in two sites,

including 'adoption' into the clan system and capacity to speak the local languages.

Emma Haynes Non-Indigenous qualitative social scientist with substantial experience working with First Nations community and academic researchers.

Natasha J. Howard Non-Indigenous woman who was born, raised and received formal education on Kurna Yerta (Adelaide Plains). With a background in public health equity research and is a program lead in implementation science that conducts applied research in the context of Aboriginal community and health service settings.

Vicki Wade Vicki is a senior Noongar woman with over 40 years' experience in health at state and national levels. She is a National and international leader in RHD advocacy.

Chantelle Pears Director Population Health and Public Health Nurse within WA Country Health Service. Non-Indigenous Australian well integrated in the Pilbara community with strong connections to Ngarluma and Yindjibarndi Elders and families.

Bronwyn Rossingh PhD, qualitative study - Culture Legitimate Accountability. Not Indigenous, adopted into Yolngu families in North-East Arnhem with thirty years experience in respectful community engagement and collaborative and codesign research.

Jessica Gatti Experienced remote Aboriginal Community Controlled Health Organisation manager.

Seide Ramadani Training coordinator at Mala'la Health.

Emma Corpus Aboriginal health worker WA Country Health Service, Aboriginal health trainee Kimberley Aboriginal Medical Service, Martu tribe in the Western Desert, strong cultural ties throughout the Pilbara and Kimberley.

Jennifer Yan Jennifer is a clinician-researcher, working as a general paediatrician and paediatric infectious diseases specialist with ongoing clinical practice in one study site, and hospital-based practice that includes care of children from an additional three sites. Non-Indigenous Australian, who has been fortunate to be adopted into the clan system in one of the study sites.

James Marangou Non-Indigenous Australian, cardiologist and clinician researcher focusing on supporting heart care initiatives for First Nations people living in remote Northern Australia for over 10 years.

Alex Kaethner Non-Indigenous Australian Cardiac Sonographer with over 10 years clinical and research experience across the Northern Territory in sites including, but not exclusive to the study sites.

Meghan Bailey Project Manager coordinating engagement with all sites, MPA with a background in community development, Non-First Nations Australian.

Joshua R. Francis Clinician researcher, with ongoing clinical practice in one site over the past 10 years, and hospital-based specialist practice that includes care of children from an additional three sites. Non-Indigenous Australian, who has been fortunate to be adopted into the clan system in one of the study sites.

Mike English Clinician researcher with a history of work on service delivery in African low-resource settings, based now in UK with no links to Indigenous Australian communities.

Shobhana Nagraj Clinical Researcher at the University of Cambridge, a clinician working in the field of implementation science and the design and evaluation of complex interventions in low resource settings globally.