

REVIEW ARTICLE

A systematic review and qualitative analysis of geriatric models of care for rural and remote populations

AUTHORS



Katherine E Krause¹ MSc, MD, Geriatrician



Kristina Marie Kokorelias² PhD, Senior Academic Program Coordinator



Samir K Sinha³ MD, DPhil, Professor of Medicine *

CORRESPONDENCE

*Prof Samir K Sinha samir.sinha@sinaihealth.ca

AFFILIATIONS

¹ Division of Geriatric Medicine, Peterborough Regional Health Centre, 1 Hospital Drive, Peterborough, ON K9J 7C6, Canada

² Division of Geriatric Medicine, Department of Medicine, Sinai Health System and University Health Network, 475-600 University Avenue, Toronto, ON M5G 1X5, Canada

³ Division of Geriatric Medicine, Department of Medicine, Sinai Health System and University Health Network, 475-600 University Avenue, Toronto, ON M5G 1X5, Canada; Division of Geriatric Medicine, Department of Medicine, University of Toronto, Medical Sciences Building, 1 King's College Cir, Toronto, ON M5S 1A8, Canada; and Institute of Health Policy, Management and Evaluation, University of Toronto, 425-155 College St, Toronto, ON M5T 1P8, Canada

PUBLISHED

30 August 2022 Volume 22 Issue 3

HISTORY

RECEIVED: 23 February 2022

REVISED: 14 June 2022

ACCEPTED: 17 June 2022

CITATION

Krause KE, Kokorelias KM, Sinha SK. A systematic review and qualitative analysis of geriatric models of care for rural and remote populations. *Rural and Remote Health* 2022; 22: 7486. <https://doi.org/10.22605/RRH7486>

ETHICS APPROVAL

As this was a systematic review, ethics was not required.

This work is licensed under a [Creative Commons Attribution 4.0 International Licence](https://creativecommons.org/licenses/by/4.0/)

ABSTRACT:

Introduction: Much is known about the healthcare needs of rural and remote communities; however, understanding how to best deliver geriatric models of care in these settings has received less attention. The purpose of this systematic review was to identify necessary key components of existing models of geriatric care

serving rural or remote populations.

Methods: A systematic literature review was conducted using MEDLINE, CINAHL and EMBASE databases to identify articles that described models of geriatric care serving rural or remote populations. A qualitative case study and key component analysis

approach was used to identify necessary model components.

Results: Eight articles were included. We identified eight distinct components that may improve the successful delivery of models of geriatric care serving rural or remote populations. Environmental assessments were done in six of eight models. Model integration with the local healthcare system, local provider leadership, and local provider education in geriatrics were present in five of eight models. Three of eight models used high-risk screening principles

Keywords:

geriatrics, models of care, older adults, qualitative, systematic review.

FULL ARTICLE:

Introduction

The number of older adults (ie adults aged ≥ 65) worldwide is expected to double over the coming two decades¹. As a result, we can expect to see a growing number of older patients living with increasingly more complex and often interrelated health (eg comorbid conditions) and social issues (eg loneliness) that can threaten their independence and wellbeing^{2,3}. All older adults, but especially those experiencing complexity, can benefit from a geriatric care professional's medical expertise and their knowledge of resources to better support healthy aging^{4,5}.

Many older adults live in rural and remote communities that are experiencing population aging at a faster rate than more urban communities. This is largely owing to the increasing out-migration of younger individuals to urban communities, often for economic and social reasons⁶. Furthermore, these communities often experience higher rates of chronic diseases compared to their non-remote counterparts, which adversely affects later-life function, independence, and overall life expectancy⁷⁻¹⁰. There is no standard definition of rural and remote communities¹¹. For this review, we define these communities as localities with populations under 25 000 persons¹¹. Existing literature reviews have highlighted the benefits seen by older adults living in rural communities when an emphasis is placed on better meeting their individualized care needs¹². These needs are often met best by those who specialize in the care of older adults; however, this workforce is shrinking⁵. Currently, Canada has approximately 376 certified geriatricians (representing $\sim 0.004\%$ of its overall physician workforce) and 1800 certified geriatric nurses (representing $\sim 0.0055\%$ of its registered nurses)¹³⁻¹⁵. Only a small proportion of these specialists work in its more rural and remote areas¹⁴. Similar findings have been noted worldwide¹⁶, including in the USA⁵ and Israel¹⁷. Some geriatric virtual care models have been found to assist with capacity limitations in rural communities, allowing specialists to see a greater volume (number) of patients, resulting in improved patient care^{18,19}. This is just one example of an attempt to adapt to the challenges of providing geriatric care in rural and remote settings, but little is known about other models of care, particularly those in remote communities without the technological infrastructure to support virtual care²⁰.

The best models of care for older patients in rural and remote settings have not been defined. Existing reviews do not highlight the unique components of geriatric models of care that can be implemented widely across rural and remote settings. Therefore, identification of the components that make up current geriatric models of care must occur. To inform the development of a geriatrics outreach model of care for remote or rural populations, we conducted a systematic review of the existing geriatric models

and included geriatrician consultation. One model described active community engagement, and one used telemedicine.

Conclusion: Future geriatric care delivery models designed to serve rural or remote populations are encouraged to use an evidence-based framework based on eight distinct model characteristics found in the literature that aim to support the ideal provision of effective and accessible geriatric medical care.

of care literature to identify key operational components that should serve as the basis for the development of future evidence-based outreach models in these communities.

Methods

Design

The purpose of this systematic review was to identify key operational components that could inform future geriatric models of care serving rural or remote populations. A systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria^{21,22}. This study was also guided by qualitative case study methodology as it allows researchers to conduct an in-depth exploration of models of care within the specific context of rural settings²³. For the purposes of this article, we broadly defined a model of care as the implicit structural processes that make up healthcare service provision²⁴. As with other health service reviews, we did not rely on a single definition of 'rural' and/or 'remote', and thus accepted the range of definitions used in the literature, to avoid limiting our literature search to particular regions²⁵. Ethics clearance for this study was not sought, as this research did not involve human participants. A protocol has been registered (osf.io/fnr2u). No amendments were made to the protocol.

Data sources and search strategy

This study identified English-language, peer-reviewed research articles that describe a geriatric model of care for remote or rural populations. Searches for articles were identified through MEDLINE, CINAHL and EMBASE from 1994 until 2022. We limited our searches to 1994, as we identified this period to be when seminal work in geriatric models of care began to emerge^{26,27}. Medical Subject Headings (MeSH) and subject terms or keywords related to geriatrics were used in combination with 'model(s) of care', 'delivery of care', 'health service', 'delivery of healthcare', as well as 'rural' and 'remote'. To ensure a comprehensive search and ensure we did not unintentionally miss any articles, MeSH terms for 'implementation' and 'components' were not used in the search. Lastly, the reference lists of all articles that met the inclusion criteria outlined below were reviewed to identify any missed relevant articles. The full list of search terms can be found in **Supplementary material 1**. All search strategies were developed by the authors in collaboration with a medical information specialist. Two medical information specialists ran the searches and removed duplicates using the Bramer method in EndNote software²⁸.

The search strategy for grey literature (reports and information not published commercially) was done in consultation between the

research team and a medical information specialist. Searches for grey literature included the websites of rural city-specific ministries of health, by searching the Dissertations and Theses database as well as searching for relevant abstracts from conference proceedings via the Conference Papers Index. We last updated searches of the peer-reviewed and grey literature on 24 January 2022.

Study selection

Articles were included if they described an implemented model of care (for any duration) for adults aged 65 years and older in rural or remote settings. To encompass the spectrum of models of care, articles reporting on models of care could, but were not limited to, preventative care, disease management, rehabilitation and palliation models, as long as medical care was described (ie care provided by a physician). Models of care could range from community- and home-based models to primary, secondary, and tertiary facility-based models. Articles were excluded if they were published before 1994, in languages other than English, or solely described a conceptual model of care (ie a hypothetical model such as those in commentaries, opinion pieces or study protocols). Articles were also excluded if they did not have enough information on the model to extract components (eg conference abstracts that lacked a full publication) or if they included a target population not exclusively adults aged 65 years or more. Finally, we excluded articles that did not include a medical assessment (eg occupational therapist-led models of care).

Citations were downloaded from the databases into EndNote, a citation management tool, and duplicates were removed²⁸. Two reviewers (KK and KMK) screened abstracts to identify potentially relevant articles (level 1 screening). If the reviewers could not determine whether to include or exclude an article based upon title and abstract alone, it was included for full-text reading. Discrepancies were resolved by consensus with a third reviewer (SS). Next, the authors reviewed a subset of the same articles (75%), until an agreement was reached. An agreement was evaluated by kappa scores (the kappa score for inter-rater agreement was 0.92). Next, the same two reviewers reviewed the rest of the full-text articles (KK and KMK) and consulted a third reviewer (SS) if unsure of inclusion or exclusion.

Data extraction

Data were extracted independently from all included articles by two authors (KK and KMK) using an Excel spreadsheet that contained the following data variables: their authors, country, year of publication, patient inclusion and exclusion criteria, model of care design (including key findings according to the conceptual framework domains), and any objective results and subjective observations (eg patient intermediate clinical outcomes). A third author (SS) reviewed the extraction of a random sample ($n=4$ articles, 50%) of the final selected articles for quality control purposes.

Risk of bias screening

Two reviewers (KK and KMK) independently assessed the risk of bias using the Downs and Black Checklist, a validated and reliable generic risk of bias tool²⁹. Qualitative studies were appraised using the validated Quality Assessment for Qualitative Research Reports (QAQRR) tool. The scale assesses 24 items related to the risk of bias in qualitative studies³⁰. The level of agreement between the

two reviewers was estimated with Cohen's kappa and was determined to have good agreement³¹. Discussion with one other reviewer (SS) helped to evaluate individual domains within the respective tool used, assign an overall risk-of-bias judgement, and determine inclusion. Articles with a low risk of bias were included in our final synthesis.

Analysis

To describe and compare diverse models of care, a systematic qualitative case study analytical approach, modeled by Baxter and Jack²³ and Huberman and Miles³², was further used to identify the core operational components constituting each model of care to establish an objective method of comparing the various models. A qualitative case study analysis approach considers individual cases (eg articles, models of care) to capture the complexity of the description of that case³³. This involves considering how each case is unique as well as how various cases are similar through an analysis of the various components of the models being examined³³. First, two authors reviewed each article (KK and KMK), identifying the core organizational (eg leadership), structural (eg processes of care delivery), and clinical process (eg details on provider-patient encounters) components of their described design and clinical interventions. This approach starts with listing every possible model component identified within each design, then determining whether individual articles were using the same terms to describe different components or different terms to describe the same components. This process ultimately enabled a set of categories (eg 'high-risk screening' or 'local provider leadership') to be conceptualized by the research team³².

After a comprehensive list of identified components had been determined, each model was reviewed again by the first author (KK) and identified as either adhering to or not adhering to each component, through a process known as component adherence. This adherence analysis was done by incorporating methodological rules for evaluating criteria adherence described by Sinha et al³⁴ and others³⁵⁻³⁷. Adherence was largely determined by whether written evidence of such adherence existed. For example, a study that alluded to the selection of higher risk older patients as being important but did not specify a screening procedure used within their model would have been listed as non-adherent to using a 'high-risk screening' selection process. Any uncertainty was arbitrated through a discussion among all the investigators.

As component adherence served as the basis of our qualitative analysis, we attempted contact with all eight principal investigators (PIs) to assess their level of agreement with our interpretations of their study's component analysis. They were also invited to list other distinct model components they believed to be included in their model that we may not have considered or overlooked. Of the eight PIs we contacted, 3 ($n=3/8$, 37.5%) responded. All three PIs agreed with our interpretations.

Results

Our database search yielded a total of 2323 citations, from which 1794 were selected for further examination by title and abstract review. A total of 43 full-text articles were subsequently reviewed. Overall, eight articles describing unique geriatric models of care serving rural or remote populations were included in the final analysis³⁸⁻⁴⁵. Figure 1 displays the process involved in study selection.

The eight included articles involved patients aged greater or equal to 65 years from three countries: the USA ($n=5$, 62.5%), Australia ($n=2$, 25%), and Canada ($n=1$, 12.5%). Our analysis identified three staffing models and eight operational components across the included models of care. Findings are presented below using a modified version of the template for intervention description and replication (TIDieR) checklist as a guide (eg description of providers, modes of delivery, components essential to the interventions)⁴⁶. Two models looked at populations over 75 years of age^{42,43}. All models served rural geriatric populations ranging from 995 to 12 250 people over a geographical distance ranging

from 80 km to 2800 km. The number of patients served ranged from 51 patients over 13 months to 660 patients over an undifferentiated number of years. Of those who reported gender, the majority had largely female cohorts between 63.8% and 78%, except one model among older veterans that consisted of 99.8% male patients⁴². All models provided initial patient characteristics such as age, sex, and reason for referral. Five of the eight articles ($n=5/8$, 62.5%) described some form of initial patient description or intervention data, which included the number of or types of recommendations, referrals made for patients, or services recommended^{38,40-43}.

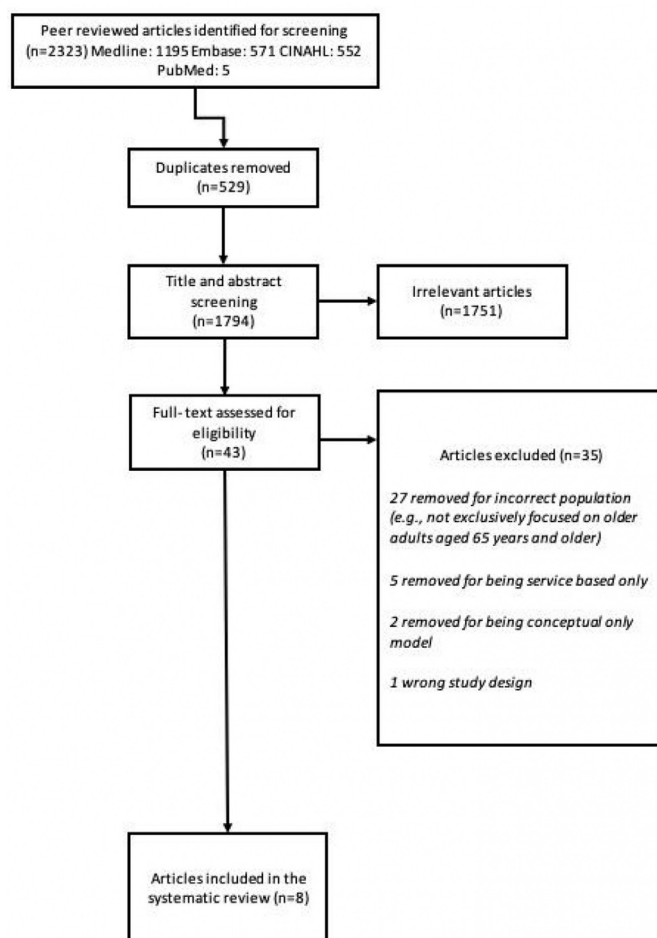


Figure 1: PRISMA diagram for study selection.

Interprofessional staffing models

Within the eight articles, three main staffing models were identified, and are described below. Three articles^{38,39,45} ($n=3/8$, 37.5%) had geriatricians directly involved in conducting the assessment of the older patients being served (model 1: geriatrician-led assessment \pm nursing and allied health support). The form of this assessment varied between articles. Two models^{38,45} described all patients being assessed by a geriatrician regardless of their level of complexity. One of these models involved telemedicine to connect older adults with dementia to geriatric behavioral supports⁴⁵. The third model³⁹ described a process whereby a specialist geriatrics nurse practitioner (SGNP), who worked under the direction of a geriatrician, saw all patients and determined whether there was a need for a full assessment by the geriatrician. The second model design (model 2: nurse-led assessment with peripheral geriatrician consultation \pm allied health

support) was identified in three articles ($n=3/8$, 37.5%)^{40,42,43} and described having either an SGNP or general practice nurse (GPN) having exclusive contact with patients, but having access to a remotely located geriatrician to review all or some of the patients via teleconferencing or in-person meetings. While two of these models used a SGNP to conduct comprehensive geriatrics assessments (CGAs)^{40,43}, one model used a GPN to conduct the primary CGAs⁴². Finally, the third model design (model 3: geriatrician-independent nurse-led assessment \pm allied health support) identified in two of the articles ($n=2/8$, 25%) used GPNs to independently manage older patients^{41,44} with no additional geriatrician support.

Key operational components of geriatric models of care

Our qualitative case study analysis identified eight distinct operational components across geriatric models of care that help facilitate their goals of providing care to older adults. These

components encompassed:

- local provider leadership
- local provider education in geriatrics
- community engagement
- model integration into the existing local healthcare system
- high-risk screening principles and methods
- home and environmental assessments
- longitudinal care and support
- direct geriatrician consultation.

Figure 2 provides a graphical overview of the key operational components of models of care.

A synthesis of study characteristics and model characteristics, including adherence of each described intervention to the eight identified characteristic components, is presented in Table 1. These model components are narratively described below.

Table 1: Overview of study characters and key operational component characteristics of identified rural and remote geriatric models of care³⁸⁻⁴⁵

Author, year, country	Sample size, time period	Model population	Primary consultant	Intervention	Core characteristic component adherence																	
					Community engagement	Local provider leadership	Local provider education in geriatrics	Local provider system	Model integration into the existing local healthcare system	Model integration principles and methods	High-risk screening assessments	Home and environmental assessments	Longitudinal care and support	Direct geriatrician consultation								
Model design 1: geriatrician-led assessment ± nursing and allied health support																						
Mykita and English 2002 [ref. 38] Australia Low risk of bias	n=170 1999–2000	Age ≥65 years thought to be 'at risk' by PCP, registered nurse, SW	Geriatrician	Geriatrician travels to five rural areas throughout the year to complete all CGAs on patients in acute care settings, clinic, or through home visits. All patients receive CGA despite reason for referral.	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes								
Prasad et al. 2014 [ref. 39] Canada Low risk of bias	n=110 2007–2012	Age ≥ 65 years referred by PCP or family health team	SGNP ± geriatrician	SGNP does CGA, creates care plan, works with PCP, attends multidisciplinary team meetings. SGNP reviews patients with geriatrician monthly. Geriatrician sees some patients at request of SGNP through in clinic, acute care and/or home visits.	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes								
Tso et al. 2016 [ref. 45] Australia Low risk of bias	n=90 2007–2014	Age ≥65 years with dementia	Geriatrician + neuropsychologist, behavioral neurologist and case manager	Patients are referred by PCPs, general neurologists, or the Alzheimer's Association or join without a referral. Team-based care is offered to meet patient and family needs from diagnosis to treatment/support. Patients access behavioral neurology by telemedicine.	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes								
Model design 2: Nurse-led assessment with peripheral geriatrician consultation ± allied health support																						
Whitehead et al. 2006 [ref. 40] Australia Low risk of bias	n=115 2003–2004	Age ≥65 years referred by PCP	SGNP	SGNP conducts bi-weekly CGAs, arranges referrals, attends multidisciplinary team meetings for patients admitted to acute care to assist discharge planning. Geriatrician reviews cases with SGNP. Geriatrician writes recommendations to PCP after SGNP CGA completed.	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No								
Cravens et al. 2005 [ref. 43] USA Low risk of bias	n=51 1998–1999	Age ≥75 years referred by PCP	GPN	CGAs are completed by GPN in patient's home. SW telephones patients and family. Weekly teleconference with GPN/SW and geriatrician. Geriatrician writes letter to PCP with recommendations. GPN/SW do follow-ups.	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No								
Ritchie et al. 2002 [ref. 42] USA Low risk of bias	n=238 Unspecified time period	Veterans ≥75 years and FRA-Plus risk questionnaire threshold ≥0.35 (moderate to high risk)	GPN	GPN/SW team performs initial and follow-up CGAs every 4–6 months. Health problems are identified using a structured assessment tool (MDS-HC), care plans are developed, referrals made, and resolution of identified problems are tracked. GPN/SW team teleconferences with Geriatrician when required.	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No								
Model design 3: Geriatrician-independent nurse-led assessment ± allied health support																						
Shelton et al. 1994 [ref. 41] USA Low risk of bias	n=660 Unspecified time period	Age ≥65 years referred by PCP	GPN, general practitioner	GPN does home visits and CGAs, leads care planning coordination of services and case management, follow-up, monitoring, acute care discharge planning, and delivers patient–caregiver education. Written assessment summaries are forwarded to the patient's PCP who supports the program and problem solves with the team.	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No								
Alexy and Elnitshy 1998 [ref. 44] USA Low risk of bias	n=222 Unspecified time period	Age ≥65 years referred by local services or community agency	SGNP, GPN	Mobile unit with SGNP/GPN performs geriatric assessment through a variety of standardised scales (Activities of Daily Living/Instrumental Activities of Daily Living screen, Katz, IOWA self-assessment inventory, Nutrition Screening, Geriatric Depression Scale). Follow-up visits, referrals made when necessary.	No	No	No	No	No	Yes	Yes	Yes	No	No								

CGA, comprehensive geriatric assessment. GPN, general practice nurse. PCP, primary care practitioner. SGNP, specialist geriatrics nurse practitioner. SW, social worker.

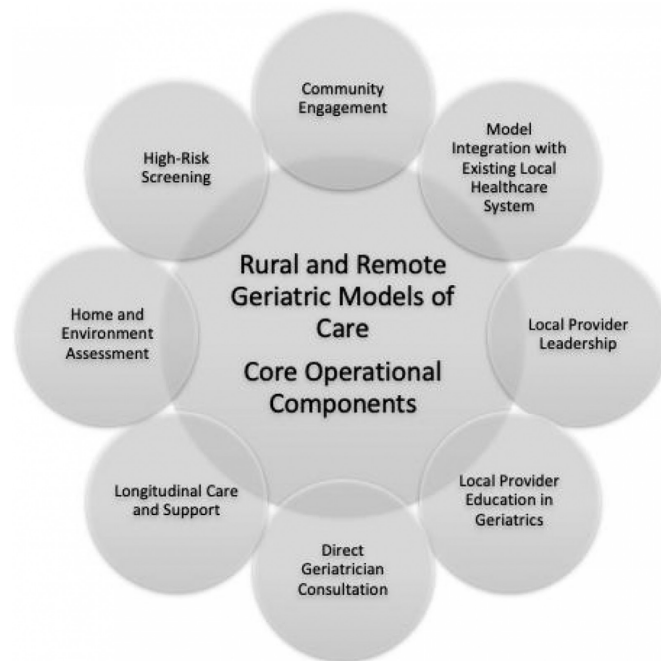


Figure 2: Proposed framework for a geriatric model of care serving rural and remote populations.

1. Local provider leadership: In line with community engagement and understanding of local needs, five studies ($n=5/8$, 62.5%) emphasized the importance of having local provider leadership³⁹⁻⁴³. It was identified that new models of care that are championed by a trusted local provider that can liaise between the community itself, local community providers, and the geriatric outreach model personnel can help to maintain fluid and productive connections. Local provider leadership also appeared to be vital towards creating local ownership of the model itself³⁹. While local leaders can come from any professional background, leaders were frequently a local SGNP or GPN as they were familiar with community dynamics and their patients^{41,42}. The SGNP or GPN could act both independently and in tandem with physicians, effectively streamlining communication between services^{41,42}.

2. Local provider education in geriatrics: Gaps in knowledge around caring for older patients can result in misdiagnosis and missed opportunities to improve the care of the target population. Local provider education was perceived as being able to greatly improve knowledge, skills, attitudes, and overall confidence in caring for complex older patients in five of the models³⁹⁻⁴³. It was noted that local providers who had a solid base of geriatric knowledge better identified the specialized needs of their older patients and initiated appropriate care practices faster⁴⁰. In addition, the provision of continued educational support to local healthcare teams was seen as facilitating ongoing long-term, high-quality care⁴².

3. Community engagement: Only one model incorporated active community engagement into its design⁴⁰. Community engagement was defined as specific outreach activities including meetings with local healthcare providers, community leaders, and invested parties to discuss a proposed model of care before its initiation. The creators of one model of care employed local healthcare providers to help develop a model that best supported their local practices⁴⁰. The engagement activities focused on providing familiarity with the proposed model's goals, adapting feedback on the model from local parties, and obtaining 'buy-in' from local healthcare providers and the community at large⁴⁰. One

article ($n=1/8$, 12.5%) noted that distrust in a new model of care is common, but once the community is engaged or if a previous therapeutic relationship exists, a new model can exist more easily³⁹.

4. Model integration into the existing local healthcare system: New models will not succeed if they operate independently of the existing healthcare delivery framework³⁹⁻⁴³. Thus, an understanding of how a model can be implemented, but not place additional strain on established healthcare services, needs to be considered. Prasad et al highlighted their use of an 'ecosystem approach' in the development of their model, which valued a local SGNP as the 'glue' between the consulting team, local primary care, and other healthcare providers, allowing for integration into the local healthcare environment. We identified six articles ($n=6/8$, 75%) that aimed to integrate their model of care into the existing local healthcare system^{39-43,45}.

5. High-risk screening principles and methods: Regarding appropriate care delivery, three models utilized high-risk screening principles and methods to target their interventions to those with the greatest need^{38,39,42}. Given the clinical heterogeneity of older patients, high-risk screening can allow the most ill patients to be identified and triaged for assessment and intervention first. This is especially important in rural and remote communities given the limited staffing and resources available⁴². Universal screening mechanisms can further ensure that the most ill patients are not overlooked³⁸.

6. Home and environmental assessments: Five articles ($n=5/8$, 62.5%) described the importance of home and environmental assessments³⁹⁻⁴³. Knowing about a patient's environment is key to being able to assess how well an older patient is functioning in the community³⁹. Understanding home and environmental experiences are crucial when deciding if an individual is appropriately equipped to live independently or if the individual requires additional support that can allow the person to function more independently⁴².

7. Longitudinal care and support: All models described

longitudinal care and support. As the issues of complex older patients often evolve, having access to ongoing care and support can aid in the development of a more meaningful patient–provider relationship and allow more successful interventions to be implemented⁴⁵.

8. Direct geriatrician consultation: Three articles (37.5%) included direct geriatrician consultation^{38,39,45}. This model component specifically refers to patient consultations that are done directly by a trained geriatrician with expertise working in multidisciplinary teams. Geriatricians have the capacity to address the intersection of social, functional, and medical issues with patients, particularly those with dementia⁴⁵. Direct geriatrician consultation could be facilitated through telemedicine. The use of telemedicine may be particularly helpful in rural settings where geriatricians may not often be practicing⁴⁵. It is worth noting that three other articles ($n=3/8$, 37.5%) did offer indirect geriatrician support^{40,42,43}.

Discussion

Our systematic review of the literature revealed eight articles describing geriatric models of care serving a multitude of rural and remote populations. The identified models came from three countries: the USA⁴¹⁻⁴⁵, Australia^{38,40} and Canada³⁹. This was not seen as a shortcoming, but rather a reasonable jurisdictional representation for this review, as these countries represent large geographical areas in the English-speaking world with numerous rural and remote populations, having limited access to care, particularly geriatric care.

Three articles ($n=3/8$, 37.5%) (all from the USA) specifically characterized their populations as lower income, from ethnic minorities, or living with multiple chronic health issues⁴¹⁻⁴⁴. To date, many rural and remote communities described in the geriatric literature have older adults with more limited financial means^{4,47}, living with higher than average rates of chronic disease, frequently with limited access to consistent healthcare providers⁴⁸⁻⁵⁰. Gaps in patient care for those with multiple chronic medical and social issues make them particularly vulnerable to system overuse⁵¹. Gaps in patient care may result in more serious care challenges for the ‘oldest-old’ (ie older adults aged 85 years and older), who are most likely to need healthcare, financial, and physical support due to complex age-related needs⁵²⁻⁵⁴. As time-intensive geriatric care interventions have been often shown to be most valuable in frail older adults with the capacity to benefit from additional support⁵⁵, future models of geriatric care must allow for the appropriate time to provide these services. Similarly, long-term follow-up of older patients by a multidisciplinary team has been shown to improve health perception and aid in the sustained improved social and psychological wellbeing⁵⁶⁻⁵⁹.

In line with community engagement and understanding local needs, many of our articles ($n=5/8$, 62.5%) emphasized the importance of having local provider leadership (component 1), providing training for local providers in geriatric care principles and practices (component 2), as well as integrating the new model of geriatric care into the existing local healthcare system (component 4) as important components to best serve their rural and remote populations^{38-44,60,61}. Outreach care models can be sustained by appointing local provider leadership (component 1), which can ensure the contributions of more itinerant providers of care can be understood and supported. For example, having local

provider ‘champions’ (eg nurses⁶²) with an established relationship with other resident health providers and patients can ensure novel models of care are not only understood but facilitated and integrated at the local level⁶³⁻⁶⁷. While local leaders can come from any professional background, we identified that a local SGNP or GPN frequently took on this role as they were familiar with local community dynamics and could act both independently and in tandem with peripheral physicians, effectively streamlining communication between services⁴¹. Too often the creation of different models creates additional ‘silos’ of care that remain minimally integrated, hence becoming additional barriers to the delivery of quality care³⁹. To help support champions, our review highlighted the need to train local providers in geriatric care principles and practices (component 2). Cochrane reviews have highlighted the importance of providing local education to improve health outcomes and provide more efficient use of services^{55,68}.

Future research

In addition to model design, more research is needed to determine the best person to provide specialist geriatric care and support in rural communities. While two models did not involve geriatricians or those with expertise in geriatrics^{41,44}, the remainder provided either direct geriatrician consultations (component 8)^{38,39,45}, or indirect geriatrician support^{40,42,43}. While there is insufficient data from this review to determine which type of provider is most effective, there is a growing body of evidence to support that the active involvement of a geriatrician is more likely to result in better health outcomes (eg improved overall functional status) and reduced hospital admissions and institutionalization^{57,69-71}. Conversely, there is insufficient evidence to suggest that nurse-led programs are less effective. This is important to consider when limited resources may only permit the creation of an intervention using the peripheral support of a geriatrician or a purely nurse-led design.

Finally, as active community engagement was only described in one article included in this review⁴⁰, future research is needed to explore how to foster active community engagement so that it leads to the development of more locally effective models of geriatric care. The Program of All-Inclusive Care of the Elderly (PACE) model in the USA⁶⁰ was established at the PACE Summit, where the groundwork for understanding what services were needed and how best to deliver them took place⁶⁰. This summit included representatives from local community organizations, healthcare providers, and policymakers who were invited to discuss adaptations required of the original PACE service delivery model to enhance its effectiveness for rural populations being served⁶¹. Our review found that employing local healthcare providers can help develop a model that supports their local practices and actively engages healthcare communities in rural settings⁴⁰. Prasad et al also note that distrust in a new system is common, but once the community is engaged, or if a previous therapeutic relationship exists, a new model can exist with less effort³⁹. Thus, policymakers and researchers looking to adopt new models of care are encouraged to engage local communities and healthcare providers in their implementation strategies. Furthermore, the identification of best-practice strategies for fostering community engagement in the context of older adults and rural communities is encouraged.

Limitations

Our study must be considered in the context of its limitations. As with any literature review, publication bias and the potential for incomplete identification of relevant articles are considerations. Only English-language peer-reviewed articles were considered and thus we may have excluded relevant articles published in other languages or those not in journals. Our search strategy was potentially limited by the selection of key terms utilized in our review. For example, we did not utilize terms such as 'interprofessional' and 'community', which may have resulted in us excluding some clinical models of geriatric care. Further, 'third sector' services (eg those provided by charitable organizations) and residential care services run by social care providers that meet the needs of rural older adults would likely have been excluded, although these were not necessarily the intended focus of this review. In our review, we performed a qualitative analysis and drew inferences about the applicability of these models to all rural and remote communities assuming some form of homogeneity. This is arguably an oversimplification of what may be a very diverse

population. We tried not to make inappropriate value assumptions based on the frequency with which a core component was found within articles. Previous studies have used similar methodologies to inform the development of clinical models and health services interventions^{34,65}.

Conclusion

This review proposes that any future geriatric care delivery model designed to serve rural or remote populations utilize an evidence-based framework based on the eight distinct model characteristics we identified through this review that aim to support the ideal provision of effective and accessible geriatric medical care. This review can inform future research to better serve these populations. We also hope the development of this evidence-based care framework will lead to broader information dissemination and refinement efforts, especially because an increasing recognition is finally occurring around the need to better support these rapidly aging rural and remote communities.

REFERENCES:

- 1 Wastesson JW, Morin L, Tan ECK, Johnell K. An update on the clinical consequences of polypharmacy in older adults: a narrative review. *Expert Opinion on Drug Safety* 2018; **17(12)**: 1185-1196. DOI link, PMid:30540223
- 2 Palmer K, Marengoni A, Forjaz MJ, Jureviciene E, Laatikainen T, Mammarella F, et al. Multimorbidity care model: recommendations from the consensus meeting of the joint action on chronic diseases and promoting healthy ageing across the life cycle (JA-CHRODIS). *Health Policy* 2018; **122(1)**: 4-11. DOI link, PMid:28967492
- 3 National Academies of Sciences, Engineering, and Medicine. *Social isolation and loneliness in older adults: opportunities for the health care system*. Washington, DC: National Academies Press, 2020. DOI link, PMid:32919873
- 4 Reading CL, Wien F. *Health inequalities and social determinants of Aboriginal peoples' health*. Prince George, BC: National Collaborating Centre for Aboriginal Health, 2009. DOI link, PMid:25326177
- 5 Lester PE, Dharmarajan T, Weinstein E. The looming geriatrician shortage: ramifications and solutions. *Journal of Aging and Health* 2020; **32(9)**: 1052-1062. DOI link, PMid:31583940
- 6 Fischl C, Lindelöf N, Lindgren H, Nilsson I. Older adults' perceptions of contexts surrounding their social participation in a digitalized society – an exploration in rural communities in Northern Sweden. *European Journal of Ageing* 2020; 1-10. DOI link, PMid:32904866
- 7 Sinha SK. Why the elderly could bankrupt Canada and how demographic imperatives will force the redesign of acute care service delivery. *HealthcarePapers* 2011; **11(1)**: 46-51, discussion 86. DOI link, PMid:21464628
- 8 Mactaggart F, McDermott L, Tynan A, Gericke C. Examining health and well-being outcomes associated with mining activity in rural communities of high-income countries: a systematic review. *Australian Journal of Rural Health* 2016; **24(4)**: 230-237. DOI link, PMid:27086770
- 9 Harrington RA, Califf RM, Balamurugan A, Benjamin RM, Braund WE, et al. Call to action: rural health: a presidential advisory from the American Heart Association and American Stroke Association. *Circulation* 2020; **141(10)**: e615-e644. DOI link
- 10 Zahnd WE, James AS, Jenkins WD, Izadi SR, Fogleman AJ, Steward DE, et al. Rural-urban differences in cancer incidence and trends in the United States. *American Association for Cancer Research* 2018; **27**: 1265-1274. DOI link, PMid:28751476
- 11 Campo M, Tayton S. *Domestic and family violence in regional, rural and remote communities*. Melbourne: Australian Institute of Family Studies, 2015.
- 12 Hintenach A, Raphael O, Hung WW. Training programs on geriatrics in rural areas: a review. *Current Geriatrics Reports* 2019; **8(2)**: 117-122. DOI link, PMid:31435495
- 13 Canadian Institute for Health Information. *Physicians in Canada*. 2016. Available: [web link](#) (Accessed 6 June 2022).
- 14 Basu M, Cooper T, Kay K, Hogan DB, Morais JA, Molnar F, et al. Updated inventory and projected requirements for specialist physicians in geriatrics. *Canadian Geriatrics Journal* 2021; **24(3)**: 200. DOI link, PMid:34484503
- 15 Miller R. *Gerontological nursing*. Available: [web link](#) (Accessed 6 June 2022).
- 16 Merchant RA, Chen M, Ng S, Sandrasageran S, Wong B. The role of a geriatrician has become even more important in an academic institution during COVID-19. *The Journal of Nutrition, Health & Aging* 2020; **1**. DOI link, PMid:32510123
- 17 Press Y, Clarfield MA. Estimating the need for geriatricians in Israel: 2000-2020. *Harefuah* 2008; **147(2)**: 120-124, 183. PMid:18357667
- 18 Lillcrap L, Hunter C, Goldswain P. Improving geriatric care and reducing hospitalisations in regional and remote areas: the benefits of telehealth. *Journal of Telemedicine and Telecare* 2021; **27(7)**: 397-408. DOI link, PMid:31645171
- 19 Sekhon H, Sekhon K, Launay C, Afililo M, Innocente N, Vahia I, et al. Telemedicine and the rural dementia population: a systematic review. *Maturitas* 2020. DOI link, PMid:33308615
- 20 Kronenfeld JP, Penedo FJ. Novel coronavirus (COVID-19): telemedicine and remote care delivery in a time of medical crisis, implementation, and challenges. *Translational Behavioral Medicine*

2021; **11(2)**: 659-663. DOI link, PMID:33098426

21 Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Journal of Clinical Epidemiology* 2009; **62(10)**: e1-e34. DOI link, PMID:19723669

22 Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *International Journal of Surgery* 2010; **8(5)**: 336-341. DOI link, PMID:20171303

23 Baxter P, Jack S. Qualitative case study methodology: study design and implementation for novice researchers. *The Qualitative Report* 2008; **13(4)**: 544-559. DOI link

24 Davidson P, Hickman L, Graham B, Halcomb E, Phillips J. Beyond the rhetoric: what do we mean by a 'model of care'? *Australian Journal of Advanced Nursing* 2006; **23(3)**: 47-55.

25 Wilson N, Couper I, De Vries E, Reid S, Fish T, Marais B. A critical review of interventions to redress the inequitable distribution of healthcare professionals to rural and remote areas. *Rural and Remote Health* 2009; 1060. DOI link, PMID:19530891

26 NICHE Project Faculty. Currents in practice: geriatric models of care: which one's right for your institution? *The American Journal of Nursing* 1994; 21-23. DOI link

27 Goodwin M, Morley JE. Geriatric research, education and clinical centers: their impact in the development of American geriatrics. *Journal of the American Geriatrics Society* 1994; **42(9)**: 1012-1019. DOI link

28 Bramer WM, Giustini D, de Jonge GB, Holland L, Bekhuis T. De-duplication of database search results for systematic reviews in EndNote. *Journal of the Medical Library Association* 2016; **104(3)**: 240. DOI link, PMID:27366130

29 Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *Journal of Epidemiology & Community Health* 1998; **52(6)**: 377-384. DOI link, PMID:9764259

30 Pritchard SA, Blackstock FC, Nestel D, Keating JL. Simulated patients in physical therapy education: systematic review and meta-analysis. *Physical Therapy* 2016; **96(9)**: 1342-1353. DOI link, PMID:26939603

31 Altman DG. *Practical statistics for medical research*. London: Chapman and Hall, 1990. DOI link

32 Huberman M, Miles A. Research utilization: the state of the art. *Knowledge and Policy* 1994; **7(4)**: 13-33. DOI link

33 Baskarada S. Qualitative case study guidelines. *The Qualitative Report* 2014; **19(40)**: 1-25. DOI link

34 Sinha SK, Bessman ES, Flomenbaum N, Leff B. A systematic review and qualitative analysis to inform the development of a new emergency department-based geriatric case management model. *Annals of Emergency Medicine* 2011; **57(6)**: 672-682. DOI link, PMID:21621093

35 Stall N, Nowaczynski M, Sinha SK. Systematic review of outcomes from home-based primary care programs for homebound older adults. *Journal of the American Geriatrics Society* 2014; **62(12)**: 2243-2251. DOI link, PMID:25371236

36 Hedrick SC, Inui TS. The effectiveness and cost of home care: an

information synthesis. *Health Services Research* 1986; **20(6 Pt 2)**: 851.

37 Elf M, Nordin S, Wijk H, Mckee KJ. A systematic review of the psychometric properties of instruments for assessing the quality of the physical environment in healthcare. *Journal of Advanced Nursing* 2017; **73(12)**: 2796-2816. DOI link, PMID:28207946

38 Mykyta L, English J. Geriatric assessment-lessons from personal experience. *Australian Health Review* 2002; **25(3)**: 83-90. DOI link, PMID:12136570

39 Prasad S, Dunn W, Hillier LM, McAiney CA, Warren R, Rutherford P. Rural geriatric glue: a nurse practitioner-led model of care for enhancing primary care for frail older adults within an ecosystem approach. *Journal of the American Geriatrics Society* 2014; **62(9)**: 1772-1780. DOI link, PMID:25243682

40 Whitehead C, Giles L, Crotty M. Establishment of and first 20 months of operating an outreach geriatric clinic in a regional centre. *Rural and Remote Health* 2006; **444**. DOI link, PMID:16563051

41 Shelton P, Schraeder C, Britt T, Kirby R. A generalist physician-based model for a rural geriatric collaborative practice. *Journal of Case Management* 1994; **3(3)**: 98-104. PMID:7735081

42 Ritchie C, Wieland D, Tully C, Rowe J, Sims R, Bodner E. Coordination and Advocacy for Rural Elders (CARE). A model of rural case management with veterans. *The Gerontologist* 2002; **42(3)**: 399-405. DOI link, PMID:12040143

43 Cravens DD, Mehr DR, Campbell JD, Armer J, Kruse RL, Rubenstein LZ. Home-based Comprehensive Assessment of Rural Elderly Persons: The CARE Project. *The Journal of Rural Health* 2005; **21(4)**: 322-328. DOI link, PMID:16294655

44 Alexy BB, Elnitsky C. Rural mobile health unit: outcomes. *Public Health Nursing* 1998; **15(1)**: 3-11. DOI link, PMID:9503947

45 Tso JV, Farinpour R, Chui HC, Liu CY. A multidisciplinary model of dementia care in an underserved retirement community, made possible by telemedicine. *Frontiers in Neurology* 2016; **7**: 225. DOI link, PMID:28066313

46 Hoffmann TC, Glasziou PP, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ* 2014; **348**. DOI link, PMID:24609605

47 Henning-Smith C. The unique impact of COVID-19 on older adults in rural areas. *Journal of Aging & Social Policy* 2020; **32(4-5)**: 396-402. DOI link, PMID:24609605

48 Bramley D, Hebert P, Jackson R, Chassin M. Indigenous disparities in disease-specific mortality, a cross-country comparison: New Zealand, Australia, Canada, and the United States. *The New Zealand Medical Journal* 2004; **117**: 1207. DOI link, PMID:15855464

49 Procter NG. Parasuicide, self-harm and suicide in Aboriginal people in rural Australia: a review of the literature with implications for mental health nursing practice. *International Journal of Nursing Practice* 2005; **11(5)**: 237-241. DOI link, PMID:16109048

50 Pan C-W, Cong X-L, Zhou H-J, Wang XZ, Sun HP, Xu Y, et al. Evaluating health-related quality of life impact of chronic conditions among older adults from a rural town in Suzhou, China. *Archives of Gerontology and Geriatrics* 2018; **76**: 6-11. DOI link, PMID:29407731

51 Mitton C, Dionne F, Masucci L, Wong S, Law S. Innovations in

health service organization and delivery in northern rural and remote regions: a review of the literature. *International Journal of Circumpolar Health* 2011; **70(5)**: 460-472. DOI link, PMID:22030009

52 Wedgeworth M, LaRocca MA, Chaplin WF, Scogin F. The role of interpersonal sensitivity, social support, and quality of life in rural older adults. *Geriatric Nursing* 2017; **38(1)**: 22-26. DOI link, PMID:27480313

53 Ness TM, Hellzen O, Enmarker I. 'Embracing the present and fearing the future': the meaning of being an oldest old woman in a rural area. *International Journal of Qualitative Studies on Health and Well-Being* 2014; **9(1)**: 25217. DOI link, PMID:25361532

54 Mentsen Ness T, Hellzen O, Enmarker I. The experience of nurses providing home nursing care to oldest old persons living alone in rural areas – an interview study. *Open Journal of Nursing* 2015; **5(4)**: 336-344. DOI link

55 Gruen R, Weeramanthri T, Knight S, Bailie R. Specialist outreach clinics in primary care and rural hospital settings (Cochrane Review). *Community Eye Health* 2006; **19(58)**: 31.

56 Burns R, Nichols LO, Martindale-Adams J, Graney MJ. Interdisciplinary geriatric primary care evaluation and management: two-year outcomes. *Journal of the American Geriatrics Society* 2000; **48(1)**: 8-13. DOI link, PMID:10642014

57 Beswick AD, Rees K, Dieppe P, Ayis S, Gooberman-Hill R, Horwood J, et al. Complex interventions to improve physical function and maintain independent living in elderly people: a systematic review and meta-analysis. *The Lancet* 2008; **371(9614)**: 725-735. DOI link

58 Zucchella C, Sinforiani E, Tamburin S, Federico A, Mantovani E, Bernini S, et al. The multidisciplinary approach to Alzheimer's disease and dementia. A narrative review of non-pharmacological treatment. *Frontiers in Neurology* 2018; **9**: 1058. DOI link, PMID:30619031

59 Spoorenberg SLW, Wynia K, Uittenbroek RJ, Kremer HPH, Reijneveld SA. Effects of a population-based, person-centred and integrated care service on health, wellbeing and self-management of community-living older adults: a randomised controlled trial on Embrace. *PLoS ONE* 2018; **13(1)**: e0190751. DOI link

60 Eng C, Pedulla J, Eleazer GP, McCann R, Fox N. Program of All-inclusive Care for the Elderly (PACE): an innovative model of

integrated geriatric care and financing. *Journal of the American Geriatrics Society* 1997; **45(2)**: 223-232. DOI link, PMID:9033525

61 Fitzgerald P, Morgan A, Morris T. Rural policy development: an NRHA and PACE association collaborative model. *The Journal of Rural Health* 2004; **20(1)**: 92-96. DOI link, PMID:14964933

62 Lupu DE, Murphy E. Models for operationalizing supportive care in kidney care. *Palliative Care in Nephrology* 2020; **36**. DOI link

63 Mudge AM, McRae P, Cruickshank M. Eat walk engage: an interdisciplinary collaborative model to improve care of hospitalized elders. *American Journal of Medical Quality* 2015; **30(1)**: 5-13. DOI link, PMID:24270172

64 Palamara K, Poplau S, Rusten C, Walter ML, Smith CD, Sipler C, et al. Feasibility of a 'Network of Champions' in implementing a program to address physician well-being. *Journal of Wellness* 2021; **3(3)**: 2. DOI link

65 Christianson J, Moscovice I. Health care reform and rural health networks. *Health Affairs* 1993; **12(3)**: 58-75. DOI link, PMID:8244247

66 Hicks LL, Bopp KD. Integrated pathways for managing rural health services. *Health Care Management Review* 1996; 65-72. DOI link, PMID:8647692

67 Vogenberg FR, Santilli J. Healthcare trends for 2018. *American Health & Drug Benefits* 2018; **11(1)**: 48.

68 Gruen RL, Weeramanthri TS, Knight SS, Bailie RS. Specialist outreach clinics in primary care and rural hospital settings. *Cochrane Database of Systematic Reviews* 2003; **4**: CD003798. DOI link, PMID:14974038

69 Totten A, Carson S, Peterson K, Low A, Christensen V, Tiwari A. Evidence brief: effect of geriatricians on outcomes of inpatient and outpatient care. *VA Evidence Synthesis Program Evidence Briefs* 2012. Available: [web link](#) (Accessed 3 July 2022).

70 Sinvani L, Carney M, Kozikowski A, Smilios C, Patel V, Qiu G, et al. The role of geriatrician-hospitalists in the care of older adults: a retrospective cohort study. *Archives of Gerontology and Geriatrics* 2018; **77**: 31-37. DOI link, PMID:29631172

71 Garrard JW, Cox NJ, Dodds RM, Roberts HC, Sayer AA. Comprehensive geriatric assessment in primary care: a systematic review. *Aging Clinical and Experimental Research* 2020; **32(2)**: 197-205. DOI link, PMID:30968287

Supplementary material is available on the live site <https://www.rrh.org.au/journal/article/7486/#supplementary>