



Original article

Doctors' contributions to primary care in outpatient clinics in depopulated areas within Hokkaido

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Abstract

Objective: To examine how doctors who work in outpatient clinics in depopulated areas in Hokkaido contribute to the provision of primary care to residents.

Methods: The study adopted a qualitative research design. Six doctors, all of whom were men and in charge of medical clinics located in depopulated areas in Hokkaido, participated in a semi-structured interview. The interviews were recorded using a digital voice recorder. The data were transcribed and classified into codes, subcategories, and categories, and analyzed.

Results: A qualitative analysis yielded the following five superordinate categories: (1) clinical praxis in accordance with residents' lifestyles and life stages; (2) innovative care provision based on residents' conditions; (3) provision of routine care in partnership with other healthcare providers and associated stakeholders; (4) beliefs and feelings of pride associated with working as doctors in clinics in depopulated areas; and (5) difficulties in guaranteeing reliable and continuous operation of clinics in depopulated areas.

Conclusion: This study successfully identified the specific contributions of doctors working in outpatient clinics in depopulated areas to primary care, as well as the related challenges that they face. Moving forward, researchers should continue to examine how the issues faced by clinics in depopulated areas can be addressed using regional medical care plans.

Key words: Hokkaido, depopulated areas, remote clinics, primary care, regional medical plan

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Introduction

Depopulated areas have been defined as regions in which a rapid decline in the number of residents has altered the social foundation of the community, thereby impeding local efforts to maintain preexistent living standards and productivity levels¹. Cities, towns, and villages that the Japanese government designated as depopulated areas (*kasochiiki*) occupy approximately half of the country's land. Official figures for the Hokkaido Prefecture, which is located in Northern Japan, suggest that 149 of the prefecture's 179 municipalities (i.e., >80%) meet the criteria for this status². In addition to the dwindling numbers of residents and in-

dustrial decline, depopulated areas often face a shortage of medical resources. As a result, the government has introduced so-called *remote clinics* (*hekichi shinryōjo*) in certain areas based on their medical administrative status, population, and accessibility, with the objective of guaranteeing the provision of high-quality healthcare services to community residents³. Hokkaido has the largest number of remote clinics in the country⁴ (i.e., 92)³.

With the passage of the *Act for Securing Comprehensive Medical and Long-term Care in the Community* in 2014, all prefectures in Japan are now mandated to prepare so-called *regional medical plans* (*chiiki iryō kōsō*)⁵. This act divides the country into 341 *planning districts* based on secondary medical districts and provides guidelines that can be used to estimate the number of beds that are needed to provide medical services across the four stages of care: highly acute, acute, recovery, and chronic stages⁶. However, amidst this progress in regional medical plans, ensuring that residents of rugged and mountainous regions that have undergone significant depopulation and aging have access to reliable transportation to visit healthcare centers remains a critical challenge⁷. Saijo and colleagues showed that the risk of experiencing a fatal stroke increases as the distance from one's

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nearest primary care facility increases⁸). Regional medical plans are expected to guarantee the provision of healthcare services to residents of mountain villages, outlying islands, and other depopulated areas where private practices may struggle to maintain profitability⁶.

By implementing measures that facilitate better communication of health information to residents, The Ministry of Health, Labor and Welfare aim to provide the same quality of healthcare that is provided in urban settings^{9, 10}. However, Hokkaido's healthcare system and these remote clinics that they subsume have been found to have many problems such as the shortage and uneven deployment of doctors¹¹ and work overload¹². Serious shortages of doctors, population decline, a low birth rate, aging, and other defining characteristics of depopulated areas underscore many more issues that are related to the practice of primary care in such areas¹³. Guaranteeing rural healthcare has also been a point of discussion among members of the Investigative Committee on Physician Work Reform¹⁴. Nonetheless, the day-to-day realities of the practice of primary care, as perceived by individual doctors who work in clinics in depopulated areas, and the issues that they consider to be important remain unexplored. As Japanese prefectures strengthen and promote their regional care plans, it is vital to examine how doctors contribute to primary care in remote clinics and other facilities that are located in depopulated areas as well as the issues that they face.

The objective of the present study was to examine how doctors contribute to primary care at outpatient clinics in depopulated areas in Hokkaido using a qualitative research methodology. Our findings are expected to contribute to future advances in regional care plans and promote primary care practice in depopulated areas in Hokkaido.

Methods

Definitions of key terms

Primary care is defined as the collective medical and welfare-related capabilities of a region to respond to any kind of health issue or disease within its population comprehensively, continuously, and holistically.

Clinic in a depopulated area is defined as the such clinics are remote or are public medical clinics that lack hospitalization facilities (i.e., limited to outpatient care) and are located in a designated depopulated area.

Study design

Our study employed a qualitative research design. Qualitative research methods facilitate the discovery of new aspects of a phenomenon or development of a new theory that is based on empirical data rather than the testing of an *a priori* hypothesis¹⁵. They can also be used to analyze specific examples or cases based on their temporal and geographical

characteristics¹⁶. Expert interviews are particularly useful in this regard because researchers can access the collective wisdom of a variety of professionals, each of whom possesses unique practical knowledge that has been garnered by working in a specific professional domain for many years, and conceptually reorganize their wisdom into new theories that are related to the research topic¹⁷. We adopted a qualitative research methodology to examine how specific practices and beliefs among doctors who work in clinics in depopulated areas in Hokkaido contribute to primary care in such communities.

Participants

Our target population comprised physicians in charge of public medical clinics without hospitalization facilities (i.e., capable of providing only outpatient care) that were managed by small municipalities in Hokkaido. Fifty-one doctors who met this criterion and were serving as the directors of 51 clinics open to the public¹⁸ were invited to participate in the study. Specifically, a sealed envelope, which contained a document that requested their participation and a consent form, was mailed to them. The study sample consisted of six doctors who responded to the invitations by submitting signed consent forms.

Data collection

Each participant was visited at his workplace. They participated in a semi-structured interview that was conducted with the aid of an interview guide that the researchers had developed based on the conventions of past studies^{11, 12}. Questions regarding (a) the characteristics of the communities that they served, visiting patients, and staff who were involved in primary care, (b) current deployment and availability of medical resources, and (c) their own beliefs about their contributions to primary care were posed. Interviews were conducted in a private room to protect their privacy, and their responses were recorded using a digital voice recorder. The durations of the interviews ranged from 24 to 36 minutes ($M = 29.7 \pm 5.0$ minutes). Data were collected from October 2016 to November 2017.

Analysis

The audio recordings were transcribed into textual data, which were then analyzed in accordance with standard methodological conventions for qualitative research¹⁹. First, the researchers carefully read through each participant's transcript, identified content (and surrounding text for context) that appeared to be related to the current state of primary care in clinics in depopulated areas in Hokkaido, and assigned primary codes to these texts to gain an overall understanding of the data.

Next, these primary codes were used to generate secondary codes; care was taken to ensure that semantic content

was not lost during this process. Secondary codes were in turn used to generate a final set of codes that had a high level of abstraction. These final codes were scrutinized for generality and specificity, merged into a final dataset that represented information that had been obtained from all the participants, and further generalized into categories and subcategories.

To improve the credibility of the analytic process and results, the researchers visited all the participants a second time so that they could recheck the results²⁰. Specifically, they were asked to identify any discrepancies between the excerpts and data and what they had said during the interview and verify whether their intended meaning had been correctly captured. All members of the research team participated in the analytic process until no new categories could be generated. Additionally, the suitability of all decisions were scrutinized until a consensus was reached.

Ethical considerations

This study was conducted with approval of the Ethics Committee of Sapporo City University (date of approval: August 29, 2016). Participants were provided with documents that informed them about the study objective and methods and their right to withdraw from the study at any time. They were also assured that their anonymity would be protected. The same information was also provided verbally. Written consent was obtained from all participants.

Results

All the six doctors were men ($M_{\text{age}} = 56.2 \pm 12.3$ years; 30–39 years: $n=1$, 50–59 years: $n=3$, and >60 years: $n=2$). Their mean years of experience in the current position was 8.2 ± 5.0 years (<5 years: $n=1$, 5–9 years: $n=2$, and 10–14 years: $n=3$). Four of them worked in designated rural clinics.

Table 1 presents a list of specific physician practices and beliefs that were found to contribute to primary care in outpatient clinics in depopulated areas in Hokkaido. These practices and beliefs were grouped into 5 superordinate categories and 18 subcategories.

Our analysis revealed that codes pertaining to the praxis of physicians who were working in clinics in depopulated areas in Hokkaido could be classified into five categories.

In the following sections, categories are presented in boldface, subcategories are presented within quotation marks, and codes are italicized.

Clinical praxis in accordance with residents' lifestyles and life stages

This category was constituted by four subcategories.

The doctors lived in the same community in which they practiced; this positionality made them sympathetic to the geographical challenges faced by the community residents.

Accordingly, doctors' comments were consistently indicative of their "sympathy toward community residents because of the geographical difficulties associated with continuing to live in these areas". This subcategory subsumed codes such as the following: *some residents who are older adults leave the area once they are no longer able to handle the difficulties that result from heavy snowfall* and *mobile catering plays a major role in the community's food supply*.

Such experiences had made the doctors acutely aware of the role that a clinic plays in a depopulated area. More specifically, the doctors articulated that they had an "obligation to see patients of all ages who may present with a wide variety of diseases". Moreover, doctors were also "mindful of the health issues that are unique to depopulated areas and are associated with residents' lifestyles and life stages". This finding typified by codes such as seeing adult and older patients for issues unique to rural communities (e.g., salt overconsumption). To fulfill these roles, doctors had adopted innovative approaches in their clinics and sometimes coordinated their provision of care with government agencies to enhance healthcare services and facilitate the diagnosis and treatment of common diseases. More specifically, such a tendency was captured by responses that pertained to doctor's efforts to ensure "enhanced healthcare provision to facilitate the diagnosis and treatment of frequently encountered diseases". This subcategory subsumed codes such as *improved ability to handle many diseases by purchasing medical equipment at one's own expense, enlisting the help of city halls, etc.*

Innovative care provision based on residents' conditions

This category was constituted by four subcategories.

In addition to ensuring the clinics had the equipment and medicines that were needed to treat frequently encountered diseases, doctors were also conscientious about "end-of-life care provision based on the severity of the patients' conditions". They articulated that their mission was to help patients who were in need of end-of-life care as well as patients with dementia who continue to live in their communities during their last days. The doctors' efforts in this regard are exemplified by codes such as *visiting patients at their homes or in other hospitals (i.e., if they were frail or bedridden) to care for them (e.g., provide home oxygen therapy)*.

Moreover, as the following subcategory explicates, doctors had also created innovative methods to help people with dementia by coordinating care provision with social resources in their communities: "care innovations for people with dementia that were developed in coordination with social resources in the community". This subcategory subsumed codes such as a) *dementia care that is determined on a case-by-case basis*, b) *enlisting the ability of residents to help one another*, and c) *using long-term care facilities (among other*

Table 1. Doctors' contributions to primary care in outpatient clinics in depopulated areas within Hokkaido

Category	Subcategory	Representative codes
Clinical praxis in accordance with residents' lifestyles and life stages	Sympathy to geography-related difficulties associated with continuing to live in these areas	Some older adults leave the area once they are no longer able to handle difficulties due to heavy snowfall
		Mobile catering plays a major role in the community's food supply
	Obligation to see patients of all ages for a wide variety of diseases	Practice spans a wide range of patient ages and diseases, including infant health checkups and acting as school doctor
		Diagnosing and treating patients for a wide range of diseases does not differ much from urban practices
Mindfulness of health issues unique to depopulated areas associated with residents' lifestyles and life stages	Seeing adult and older patients for issues unique to rural communities; e.g., due to salt overconsumption	
	Feeling that many patients suffer from hypertension, diabetes, and dyslipidemia; putting them at high risk for stroke and heart disease, especially in the winter	
Enhanced healthcare provision to facilitate the diagnosis and treatment of frequently seen diseases	Improved ability to handle many diseases by purchasing medical equipment at one's own expense, enlisting help of city halls, etc.	
	Many patients with lifestyle, ophthalmic, and orthopedic disease, including many cases of poorly controlled diabetes	
Innovative care provision based on residents' conditions	End-of-life care provision based on patient severity	Selecting what hospitals to refer patients to based on their condition and place of residence
		Visiting patients in home or other hospitals if frail or bedridden, or for home oxygen therapy, etc.
	Care innovations for people with dementia coordinated with social resources in the community	Dementia care decided on a case-by-case basis, enlisting ability of residents to help one another, utilizing long-term care facilities, etc. as warranted by patients' condition
		Recommending patients with severe dementia to enter residential care facilities, while letting those with only mild dementia live at home
Clinic organization and functions adapted to meet the community's medical needs	Arrangements in place to transport patients by helicopter to other centers in the event of an emergency	
	Healthcare has evolved according to the community's medical needs	
Modified practices due to limited workforce and resources	Clinic patients utilize rehabilitation day services at a nearby geriatric health center	
	Running the clinic with limited professional staff and testing equipment	
Routine care in partnership with other healthcare providers and associated stakeholders	Coordination with secondary and core hospitals in situations requiring urgent care or specialist expertise	Refer interested patients to hospitals with specialists on staff in neighboring towns or cities for some conditions
		Provide comprehensive care by coordinating with other medical centers in the region through partnerships with several professionals and secondary hospitals
	Prevention and awareness activities that they had conducted in association with government health authorities	Feeling that the influenza prevention programs that run together with government health authorities are effective
Giving need-based seminars to community residents at the request of government health authorities		
Beliefs and pride associated with working as doctors at clinics in depopulated areas	Belief in the need to scrupulously examine every patient who visits, regardless of their age or disease	Constantly working to scrupulously examine all patients who visit
		Ascribing the utmost importance to the task of interviewing and examining every patient who visits the clinic and regarding it as a fundamental rule
	Pride in abilities as a general practitioner, which is grounded in practical experience	Taking special measures to outsource blood panels, as the town lacks a testing center
		Able to examine and treat patients despite a lack of diagnostic imaging equipment
	Desire to be a familiar and trusted doctor	Glad they were dispatched to their clinic since the foundation of familiarity and trusting relationships with their patients allows them to practice medicine more capably
		Wanting to be a doctor who locals trust, since they must diagnose and treat a wide variety of diseases
Intention to train the next generation of doctors responsible for primary care	Wanting to pass down what they have accomplished to junior physicians, thus training the next generation responsible for primary care	
	Feeling educational support is necessary not only to train new staff capable of providing primary care, but also to encourage them to return to depopulated areas to practice	
Difficulties in guaranteeing the reliable, continuous operation of clinics in depopulated areas	Burden of having to shoulder extensive responsibilities all alone, including dealing with medical device manufacturers	Suspicious of medical device manufacturers who are too quick to recommend expensive new models
		Too few patients seek care at the clinic due to a complex web of factors (e.g., remote location, limited opening hours, etc.)
	Perceived inadequacy when unable to provide residents with sufficient care due to the inherent characteristics of depopulated areas	Previously proposed expanding the public transportation system since the existing bus network is insufficient for patients needing to use it to visit the clinic
		Young doctors are forced to live away from their families because other distant regions offer better educational opportunities
Difficulties experienced managing and running the clinic while trying to lead a normal family life	Currently trying to work at clinics that are a reasonable distance from one's home since continuing to commute long distances every day is stressful and difficult	
	Difficulties experienced securing staff doctors and consistent demands for medical care at the clinic	The survival of a clinic is threatened by the outflow of patients out of the area
		Major issues with ensuring clinics, medical centers, and secondary hospitals have enough doctors on staff

facilities) that are warranted by a patient's condition.

Doctors spoke about (a) how their clinics were organized, (b) how they met the healthcare needs of a community that was spread across a wide physical area, and (c) how they had modified their practices in accordance with limited workforces and resources. Moreover, doctors were also responsible for ensuring that “the organization and functions of the clinic were modified to meet the community's medical needs”. This phenomenon was captured by codes such as *healthcare has evolved in accordance with the community's medical needs* and *arrangements have been made to transport patients by helicopter to other centers in the event of an emergency*.

The subcategory, “modified practices as a result of limited workforce and resources” subsumed codes such as *clinic patients utilize day rehabilitation services at a nearby geriatric health center* and *running the clinic with limited professional staff and equipment*.

Routine care in partnership with other healthcare providers and associated stakeholders

This category comprised two subcategories.

Doctors spoke about their “coordination with secondary and core hospitals in situations that had required urgent care or specialist expertise”. Related subcategories included codes such as *refer interested patients to hospitals with specialists in neighboring towns or cities for some conditions* and *provide comprehensive care by coordinating with other medical centers in the region through partnerships with several professionals and secondary hospitals*.

In addition, the doctors drew attention to the “prevention and awareness activities that they had conducted in association with government health authorities”. Specifically, doctors had collaborated with government health authorities to conduct prevention and educational activities, such as need-based seminars, which they had provided to communities, at their behests, to promote resident health. These subcategories consisted of codes such as *believing that the influenza prevention programs that were conducted in association with government health authorities were effective and conducting need-based seminars among community residents at the behest of government health authorities*.

Beliefs and feelings of pride that are associated with working as doctors in clinics in depopulated areas

This category was constituted by four subcategories.

The doctors' routine practices were rooted in a “belief in the need to scrupulously examine every patient who visits the clinic, irrespective of his or her age or disease”. This subcategory subsumed codes such as *ascribing the utmost importance to the task of interviewing and examining every*

patient who visits the clinic and regarding it as a fundamental rule. Doctors were “proud of their abilities as general practitioners, which were grounded in practical experience”, and this subcategory subsumed codes such as *able to examine and treat patients, despite a lack of diagnostic imaging equipment*.

In addition, the subcategory, “desire to be a familiar and trusted doctor”, made it apparent that doctors valued building close and trusting relationships with their patients. This sentiment was captured by codes such as *wanting to be a doctor whom locals trust because they can diagnose and treat a wide variety of diseases*.

In addition, doctors expressed an “intention to train the next generation of doctors who will be responsible for providing primary care”. This subcategory subsumed codes such as *believing that educational support is necessary to not only train new staff so that they are capable of providing primary care but also encourage them to return to and practice in depopulated areas*.

Difficulties in guaranteeing reliable and continuous operation of clinics in depopulated areas

This category comprised four subcategories.

The doctors spoke about the “burden of having to shoulder extensive responsibilities, including dealing with medical device manufacturers, all by themselves”. This subcategory subsumed codes such as *suspicious of medical device manufacturers who are too quick in recommending new and expensive models*.

In addition, the subcategory, “perceptions of personal inadequacy, when one is unable to provide residents with sufficient care as a result of the inherent characteristics of depopulated areas”, indicated that doctors experienced a sense of inadequacy. The inherent characteristics of depopulated areas, to which the doctors were referring in this context, were captured by codes such as *too few patients seek care at the clinic because of a complex web of factors (e.g., remote location, limited working hours)* and *previously proposed expansion of the public transportation system because the existing bus network was insufficient for use by patients who needed to visit the clinic*.

Younger doctors also spoke about their “difficulties in managing and running the clinic while also trying to lead a normal family life”. This subcategory subsumed codes such as *young doctors are forced to live away from their families because other distant regions offer better educational opportunities and currently trying to work at clinics that are at a reasonable distance from one's home because continuing to commute long distances every day is stressful and difficult*. Citing these reasons, the doctors also underscored their “difficulties in recruiting doctors and the consistent demand for medical care at the clinic”. This subcategory subsumed

codes such as *the survival of a clinic is threatened by the outflow of patients outside the area and major problems in ensuring that clinics, medical centers, and secondary hospitals have enough doctors on staff.*

Discussion

Our analysis revealed that responses pertaining to the praxis of physicians who were working in clinics in depopulated areas in Hokkaido could be classified into five categories. One of these categories was related to issues that they had encountered in the provision of medical care. First, we describe the characteristics of the four categories that were related to doctors' work and subsequently discuss them with reference to the key principles of primary care; finally, we discuss the issues that are currently faced by clinics in depopulated areas in Hokkaido.

Physician praxis in clinics in depopulated areas

The doctors who were surveyed in the present research were sympathetic to the daily difficulties that were faced by residents of depopulated areas, and these feelings were rooted in their own statuses as members of the community. Takeda and her colleagues have noted that any discussion on healthcare provision in depopulated areas must fundamentally examine residents' lifestyles²¹. Our findings suggest that these doctors were cognizant of the relationship between residents' lifestyles and health problems in their provision of treatment and care. This behavior was abstracted into a superordinate category: clinical praxis in accordance with residents' lifestyles and life stages.

Previous studies have shown that specific diseases, including certain orthopedic diseases²², predominantly affect depopulated areas and that there is an association between frailty and pneumonia treatment among older adults²³. These populations also require adequate treatment for a variety of other illnesses such as psychiatric diseases²⁴, diabetes²⁵, and stroke²⁶. Further, the responses of doctors who were surveyed in the present study revealed that there was a need to diagnose and treat a variety of illnesses and injuries, particularly lifestyle diseases.

The participating doctors' praxis was also captured by another category: innovative care provision based on residents' conditions. This category pertained to the following: (a) supplying their clinics with certain equipment and medicines to facilitate the treatment of frequently encountered diseases, (b) being conscientious about helping end-of-life patients and patients with dementia so that they can continue living in their communities during their final days, and (c) utilizing community-based social resources to create innovative ways of providing healthcare.

In addition, our findings revealed that doctors endeavored to refer interested patients to hospitals with specialists

that were located in neighboring towns or cities for the treatment of certain diseases. Takeda and colleagues have noted that discussions on healthcare provision in depopulated areas must pay due attention to human and physical medical resources in neighboring medical care zones²¹. The details of this practice were captured by another category: routine care in partnership with other healthcare providers and associated stakeholders.

Finally, our abstraction of the superordinate category, beliefs and feelings of pride that are associated with working as doctors in clinics in depopulated areas, revealed several psychological and emotional factors that help physicians fulfill their duties in depopulated areas. Horikoshi *et al.* reported that being hospitalized in an institution that is far away from one's home is a major burden to both inpatients and their families²⁷. Other researchers have found that community-based clinics make it easier for healthcare workers to provide holistic care based on the inherent characteristics of and familial relationships within the community²⁸. Moreover, the doctors who participated in our study aimed to provide comprehensive care because they believed that it was important to scrupulously examine every patient who walks through their door as an individual and understand the lifestyles and backgrounds of the residents who had been living in depopulated areas.

Physician praxis in relation to the principles of primary care

In this section, we discuss the broader significance of the four aforementioned categories within the framework of the five key principles of primary care that have been proposed by the Japan Primary Care Association: comprehensiveness, continuity, coordination, accessibility, and accountability¹³.

The category, clinical praxis in accordance with residents' lifestyles and life stages, corresponds to the primary care principle of comprehensiveness, which refers to "medical care from childhood to old age, from prevention to treatment and rehabilitation, with an emphasis on holistic care"¹³. As school doctors, physicians manage the health of infants, young children, and students, and as comprehensive care providers, they conduct prevention and awareness activities that are related to health maintenance and promotion among adults and older adults; further, they diagnose and treat a variety of diseases.

The category, innovative care provision based on residents' conditions, corresponds to the primary care principle of continuity, which refers to "continuous care befitting patients' condition, from cradle to grave, in sickness and in health"¹³. The doctors who participated in this study adopted ingenious approaches to provide their patients who had been living in depopulated areas with continuous care, despite limited medical resources. In addition, they had taken efforts to customize the provision of end-of-life care based

on the severity of a patient's condition; in this manner, they embodied the principle that physicians must provide continuous care "from the cradle to the grave.

The category, routine care in partnership with other healthcare providers and associated stakeholders, corresponds to the primary care principle of coordination, which refers to "close relationships with specialists, coordination with team members and residents, and utilizing social-medical resources"¹³. The doctors who participated in the present study had partnered with support and core hospitals, when their patients had required emergency or specialist treatment.

Finally, the category, beliefs and feelings of pride that are associated with working as doctors in clinics in depopulated areas, corresponds to the primary care principle of accessibility, which refers to "geographical, financial, temporal, and mental proximity"¹³. The ideals of accessibility are also embedded within all the other categories that were identified in this study. Doctors build trusting relationships with patients across repeated visits, and they commonly become a familiar face within the community. The forging of such trusting relationships is motivated by their need to scrupulously examine each patient who visits them, irrespective of their age or presenting problem.

In addition, this category also resonates with the principle of accountability, which refers to the internal audit and lifelong learning processes that doctors must undergo as well as their responsibility to provide their patients with complete explanations about their treatments. The doctors who participated in this study wanted community members to trust them because they are equipped to diagnose and treat a wide variety of diseases. In addition, they expressed a wish to train junior physicians in what they have mastered through their primary care praxis and nurture the next generation of physicians.

Issues facing clinics in depopulated areas in Hokkaido

One practical issue that affects doctors' ability to provide primary care in depopulated areas was captured by the category, difficulties in guaranteeing reliable and continuous operation of clinics in depopulated areas. The doctors had experienced a sense of personal inadequacy when they were unable to provide sufficient care to patients as a result of depopulation-related factors. Further, younger physicians found it difficult to continue to run their clinical practice while also trying to lead a normal family life.

Ozone and colleagues²⁹ have reported that, while community residents feel reassured by the availability of a physician in their local clinic, they are selective about the care behaviors that they consider to be necessary based on their circumstances. Our findings support this notion; specifically, residents of depopulated areas perceive such clinics to be

indispensable but continue to visit other medical facilities within the region depending on their circumstances. This is a serious problem that can adversely affect the steady influx of patients in clinics in depopulated areas. One pertinent contributing factor is the widespread use of the internet, which has made it easier for individuals to make their own decisions about where and how to seek treatment. Moreover, high rates of private car ownership, a robust high-speed intercity bus system, and extensive highway networks make it more convenient for patients to receive medical care from institutions that are located far away from home. These investments in industrial and social infrastructure and changing conventions suggest that living in a depopulated area today means something different than what it did years ago.

Residents of depopulated areas have more treatment options at present than they did in the past, and this allows them to pursue treatment independently without having to visit their local clinic. Future work is needed to determine the patterns that underlie the treatment-seeking behaviors and healthcare needs of these individuals, and researchers should continue to discover ways of partnering with nearby support and specialist hospitals based on their wishes. However, one could also argue that these clinics allow healthcare workers to better customize and refine primary care (e.g., visiting and caring for patients who are confined to their homes).

The results of the Global Burden of Diseases, Injuries, and Risk Factors Study indicated that nonlethal illnesses and injuries that are associated with aging have increased the world's disease burden³⁰. These conditions are already pressing issues in depopulated areas. What types of healthcare are we obligated to provide in depopulated areas? This issue should not be solely addressed by doctors who provide such care; instead, they must address it in collaboration with community residents and government authorities. We hope that our findings serve as a useful reference that shapes the future of rural medicine.

Study limitations

One of the limitations of this study is the small size of the sample that was used. In addition, our sample did not include doctors who work in clinics with hospitalization facilities (i.e., capable of providing inpatient treatment) and private practitioners. Further, our study focused exclusively on depopulated areas in Hokkaido. However, Japan is a large and diverse country with distinct regional characteristics. Its borders stretch across thousands of kilometers that span from the north to the south, it is bounded by the ocean on all sides, and it has many outlying islands. Therefore, future research studies should broaden their definitions of the target demographics to examine the specific ways in which healthcare workers contribute to primary care in clinics in other depopulated areas in Japan.

Conclusion

Our findings delineate the specific ways in which physicians contribute to primary care in outpatient clinics in depopulated areas in Hokkaido. The doctors who participated in this study had innovatively adapted their care practices to meet the unique needs of their patients, and they provided routine care in partnership with other healthcare providers and associated stakeholders. Beliefs and feelings of pride that are associated with working as doctors in clinics in depopulated areas reinforced these behaviors. On the other hand, the findings also underscored physicians' difficulties in ensuring the stable operation of clinics and the need to

focus on issues such as maintaining a sufficient supply of patients in local clinics and training the next generation of physicians. Taken together, our findings delineate doctors' contributions to primary care in clinics in depopulated areas.

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