

be averted with adequate access to surgical obstetrical services.⁹ Higher mortality, lower life expectancy, and reduced indices of health outcomes for those living in rural communities may result, in part, from inadequate access to services.¹⁰ Importantly, the lack of anesthesia services has been identified as a major factor contributing to the shortfalls of surgical and obstetrical care in rural and remote communities.¹¹

RURAL HEALTH STATUS

Rural and remote populations across the world are older, sicker, poorer, and more accident prone than their urban counterparts.^{10,12,13} Nonetheless, the differences in rural and urban health status are not uniform across different countries.¹⁰ A systematic review by Smith et al¹⁰ demonstrated that life expectancy in rural Australia is only slightly less when compared to urban counterparts. However, in Canada, increasing rurality is associated with decreasing life expectancy.¹²

In many countries, including Australia and Canada, a high proportion of the indigenous population lives in remote areas. These communities suffer from a higher incidence of serious comorbidity, including premature ischemic heart disease, rheumatic heart disease, diabetes mellitus, respiratory disease, and kidney failure.^{14–16} They have increased risk of certain infectious diseases related to insufficient access to clean water and poor infrastructure maintenance.¹⁷ Indigenous communities also suffer an increased risk of accidental injury, self-harm secondary to mental illness, and suicide.^{18,19}

Poor health status in rural and remote communities is linked to differences in social determinants, occupational hazards, risk behaviors, and socioeconomic disadvantage. Location and poor access to essential health services, including surgical care, further magnify these differences.¹⁰ Therefore, the effect of rurality on health status is intertwined closely with the ability of the health care system to meet the specific needs of the communities.

The role of bias, discrimination, and racism in the provision of health services has also been cited as a reason for poor health status in rural Canada, Australia, and the United States.^{20–22} In surgical care, the effect of bias and discrimination is closely linked to worsened coordination of care and patient-centered communication.²⁰ In Canada, prominent patient experiences related to the denial of care and involuntary care have been linked to racism.^{20,23–25} Similar evidence is emerging in Australia, including a study demonstrating that indigenous patients are investigated and treated differently than other patients.^{26–28} In response to these findings, national medical organizations have published best practices on mitigating and eliminating the harm that can arise from these systemic and clinical behaviors.^{29,30}

CHALLENGES TO PROVIDING ANESTHESIA AND SURGICAL CARE IN RURAL AND REMOTE COMMUNITIES

The paradigm of anesthesia and procedural care being delivered by the specialist-trained physician work force has been problematic for rural hospitals. The physician population, as a whole, is divided inequitably between urban and rural areas,

and the specialist workforce is overwhelmingly concentrated in urban centers.^{31–33} There are few specialist-trained anesthesiologists, obstetricians, and surgeons who live and practice in rural communities. Rural and remote settings do not provide the volume or complexity of cases required to attract and retain a highly specialized physician workforce. The restriction of complex surgical procedures to high-volume centers is justified by decreased perioperative morbidity and mortality for these cases.^{34,35} Conversely, measuring outcomes and proving safety can be difficult for rural procedural programs. Low volumes of procedures, combined with infrequent adverse events, may result in studies with insufficient power to make satisfactory determinations about quality of care.

In rural and remote communities, small hospitals have historically been a mainstay of secondary care. In the United States, rural hospitals represent more than half of all hospitals, providing essential access to inpatient, outpatient, and emergency medical services. Of the 5534 total registered US hospitals, 3168 have a rural or “critical access hospital” designation. As such, rural hospitals are a critical—and vulnerable—part of the US national health care delivery system.³⁶ Unfortunately, rural hospitals have undergone dramatic diminution in their capacity, their scope for procedural intervention, and their ability to care for seriously ill patients.

The loss of all rural anesthesia and surgical care and operative delivery, including low complexity procedures in low-risk populations, has posed a crisis to rural hospitals. Communities that are deprived of anesthesia and surgically skilled first responders cannot respond effectively to trauma. Hospitals that lack the ability to offer care for trauma or surgical delivery have their scope reduced to the small footprint of outpatient care and a medical transport service. Many smaller hospitals have simply closed, leaving populations without care. The attrition of small-volume rural surgery and maternity care programs has been significant and sustained over the past 25 years, leading to diminished access to health care close to home for rural residents.^{6,31,37}

Policymakers have responded largely through measures aimed at improved transport from rural communities to urban care centers. For trauma patients, this may have contributed to a widening of the gap in morbidity and mortality outcomes between urban and rural populations.^{38,39} Many rural patients simply cannot be delivered to an urban trauma center in a timely manner. Similarly, without an ability to offer local cesarean delivery capability, rural maternity care is largely unsustainable.⁶

It is critically important to emphasize that the obligation to travel for essential services is much more than an inconvenience. It represents a barrier to access to medical care and imposes significant financial burden, particularly for disadvantaged populations who lack resources to access care.¹ It also poses a threat to the cultural safety of indigenous populations.⁴⁰

CURRENT SOLUTIONS: DISTRIBUTED SKILL SETS IN ANESTHESIA AND SURGERY

The World Health Organization has recognized that primary care programs that lack surgical and operative delivery services leave rural populations without essential local services. Their “reset” of primary care has focused

on supporting an expanded skill set for local practitioners and an expanded scope of practice for local or district hospitals.^{1,41} The Lancet Commission on Global Surgery has recommended “task-sharing” of essential skills in anesthesia, surgery, and cesarean delivery between specialists and nonspecialist providers to ensure high-quality surgical outcomes in areas with a deficit of specialty-trained surgeons, anesthesiologists, and obstetricians.^{42,43}

In Australia and Canada, anesthesiologists have led the way with the designation of a skill set for rural family physician anesthesiologists and general practice anesthesiologists.^{44,45} In the United States, the American Society of Anesthesiologists has designated a skill set for certified registered nurse anesthetists.⁴⁶ In Canada, the provision of rural maternity care is provided by family physicians and midwives, supported by obstetricians, particularly in Canada’s more remote regions.⁴⁷ In all of this, the common thread is a commitment for sharing of skill sets between medical professionals to meet community need.

Australia and Canada: Family Physicians Providing Anesthesia Care

Australia and Canada share many similar challenges related to the distribution of health care. Australia’s relatively small population of 25 million is distributed over a vast land mass. While >90% of the population is concentrated in 8 major cities, 9.7% of the population lives in small towns dispersed across the continent.⁴⁸ Physicians are inequitably distributed between cities and remote areas, with 442 full-time equivalent practitioners per 100,000 population in major cities versus 263 full-time equivalent practitioners per 100,000 population in remote areas.⁴⁹ Similarly, in 2012, Canada had a population of >35 million, with 18% (6 million) living in rural and remote communities. While about 50% of the physician workforce are family physicians, only 14% work in rural and remote communities, and only 3.1% of specialists practice in rural settings.^{12,31}

In both Australia and Canada, family physicians who undertake additional training in anesthesia are the main providers of rural anesthesia care.⁵⁰ There are approximately 500 family physician anesthesiologists in each of these countries. The physicians are trained in family medicine anesthesia programs, which are offered at medical schools or tertiary care hospitals. The training is done by both specialty anesthesiologists and family physician anesthesiologists in high-level accredited programs that meet national competency standards. In Canada, graduate family physician anesthesiologists are awarded a Certificate of Added Competence, which verifies their successful completion of training programs. Family physician anesthetists (also referred to as general practice anesthetists) provide the vast majority of rural anesthesia care in these 2 countries.^{51,52}

United States: Anesthesia Care Distributed Among Physicians, Certified Registered Nurse Anesthetists, and Anesthesia Assistants

In the United States, only 3% of the population lives more than an hour from an urban hospital; however, this group represents 9 million people, including many indigenous populations. Anesthesia services in rural communities are

offered by 3 types of providers: physician anesthesiologists, certified registered nurse anesthetists, and anesthesiology assistants. The number of service providers in each group is uncertain. Legislation, state laws, and individual hospital policies primarily determine the anesthesia staffing profiles in rural and remote hospitals.⁵³ In appointed Critical Access Hospitals, a designation given to eligible rural hospitals by Medicaid and Medicare services, certified registered nurse anesthetists may provide anesthesia care without direct supervision by a physician anesthesiologist.

Collectively, these models of surgery, anesthesiology, and operative delivery, distributed across different professional stakeholders, face 3 overarching challenges: (1) how to build and maintain competence in procedural skills when working in a low-volume program; (2) how to build the collaborative relationships required between professions; and (3) how to deliver and assess the quality of care.

ONGOING TRAINING AND CONTINUING PROFESSIONAL DEVELOPMENT FOR RURAL AND REMOTE ANESTHESIA CARE PROVIDERS

Australia

In Australia, the Australian Health Practitioners Regulatory Authority mandates continuing professional development for all medical practitioners, with standards being set for each specialty by the individual medical colleges. The training programs specifically include a required attendance at emergency skills training sessions such as advanced life support, cannot intubate/cannot oxygenate, anaphylaxis, and major hemorrhage. Credentialing and scope of practice are managed at the state level. There is no national standard; however, many credentialing authorities within individual health services require a minimum annual volume of practice, including obstetric anesthesia and pediatric anesthesia. One essential element is that rural general practice anesthetists maintain a close professional link with a referral hospital, which helps them in their continuing professional development and maintenance of competence. However, such links are not always present, and some practitioners remain professionally isolated.⁵²

Canada

In Canada, those with a Certificate of Added Competence in family medicine anesthesia are required to demonstrate relevant continuing professional development. There is a maintenance of competency requirement for family physician anesthesiologists (75 hours required credit within a 5-year cycle).⁵⁴ However, there are no national or provincial funding programs for continuing professional development available for these physicians. Following the Joint Position Paper on Training Rural Family Physicians in Anesthesia (2001), the opportunities for specialist-led continuing professional development increased dramatically. Simulation technology, practice scenarios, and robust continuous quality improvement all aim to improve the management of infrequent but serious events. In the province of British Columbia, the newly created Rural Surgery and Obstetrics Network uses remote presence technology to better facilitate coaching and mentoring relationships between family physician providers and specialists. This program enjoys

wide acceptance by both specialists and rural family physician anesthesiologists.

BUILDING COLLABORATIVE RELATIONSHIPS BETWEEN THE SPECIALIST AND GENERALIST WORKFORCE

Canada

Collaboration between medical professionals is required for the ongoing training and support of rural family physician anesthesiologists. In 1988, the Canadian Medical Association brokered a series of meetings between specialist and family physician anesthesiologists in an effort to resolve disagreements on training and practice of anesthesia.⁴⁵ In 2001, rural family physicians and specialist anesthesiologists met in Kananaskis, Alberta, and undertook negotiations to define a family physician anesthesiologist's skill set. The resulting Joint Position Paper on Training Rural Family Physicians in Anesthesiology was the successful culmination of efforts to resolve professional differences between the specialist and family physician anesthesiologists in Canada.⁴⁵ The Kananaskis Summit proposed an expansion of continuing professional development programs and the establishment of the Collaborative Advisory Group for General and Family Practice Anesthesia for ongoing communication. In Canada, Collaborative Advisory Group for General and Family Practice Anesthesia represents the interests of general and family physician members, with the aim of ensuring discussion and communication about relevant issues within and among the College of Family Physicians of Canada, the Society of Rural Physicians of Canada, the Association of University Departments of Anesthesiology, and the Canadian Anesthesiologists' Society.⁵⁵ These groups are working collaboratively to improve access to anesthesia care.

Australia

In Australia, the Joint Consultative Committee Anesthesia is a well-developed tripartite body of 2 general practice training colleges, the Royal Australian College of General Practitioners and the Australian College of Rural and Remote Medicine, and the sole anesthesia training college in the country, the Australian and New Zealand College of Anaesthetists.⁵⁶ The Joint Consultative Committee Anesthesia provides oversight, training guidelines, supervision opportunities, and continuing professional development for general practitioners seeking additional training in anesthesia. The Joint Consultative Committee Anesthesia is in the process of developing a Diploma of Rural General Practice Anesthesia to address standardization of training and examination and to ensure access to supplemental educational resources. This program is intended to recognize and facilitate the important role general practice anesthesiologists play in providing anesthesia care in rural and remote communities.

United States

In the United States, anesthesia services in rural communities are determined heavily by legislation, state laws, and individual hospital policies. In rural critical access hospitals, care is provided predominately by certified registered nurse

anesthetists, who may provide anesthesia care without any formal relationship with a physician anesthesiologist.⁵³ In the United States, there is no availability of additional formal training in anesthesia for family physicians. This is partly because of the prohibition by the American Board of Medical Specialties in offering board certification as a subspecialty in a domain where a full speciality already exists (Dr Larry Green, MD, Chair of the American Board of Medical Specialties, personal communication, 2018).

STRENGTHENING ACCESS TO ANESTHESIA CARE IN RURAL AND REMOTE REGIONS

Novel strategies are needed to strengthen and stabilize anesthesia care teams that work in rural and remote regions. Innovative approaches including the development of flexible work arrangements, the establishment of formal networks of care, enhanced clinical coaching, and the adoption of telemedicine technologies offer some solutions.

Flexible Work Arrangements

In Australia, flexible work arrangements may support the provision of service in an isolated location by a practitioner who has relocated to a less remote setting but is willing to work occasionally in the remote location. Specialist outreach to work alongside rural practitioners in their home environment promotes mutual understanding of the unique challenges of remote practice and true insight into ways of supporting their continued practice.

Formal Networks of Care

Formal networks of care present a novel means of encouraging interprofessional collaboration between specialist and nonspecialists. In these models, care is regionalized and rural and regional hospitals are linked. Patients should undergo surgery and anesthesia at the center and by the providers that are best equipped to meet their needs. Quality, including outcomes, belongs collectively to the region. Appropriate triage is the instrument, rigorously defined and measured, by which quality is improved.

Clinical Coaching

Clinical coaching is a formalized means of building collaborative interprofessional relationships between specialist physicians and other care providers. Coaching programs link rural surgical and anesthesia care providers to coaches who are located in regional referral hospitals.⁵⁷ Formal clinical coaching programs include means of training coaches and shaping the coaching relationship to better meet the needs of rural providers. Clinical coaching serves at least 2 significant goals: (1) to improve relationships and build trust between care providers; and (2) to encourage practice audits, self-reflection, and guided improvement.⁵⁸

Telemedicine

Established and emerging technology presents an opportunity to facilitate collaborative interprofessional relationships and improve patients' access to care in rural and remote areas. Videoconferencing is already commonly used in preanesthesia assessment clinics to facilitate evaluation of patients who would otherwise need to travel long distances

to hospital in advance of their planned surgery.⁵⁹ The integration of videoconferencing and data sharing between rural and urban partners allows for preoperative consultation with specialist anesthesiologists. This technology can improve planning of patient care pathways before surgery, including the identification of patients who would be better served by care in a large-volume center or who may require higher levels of support for their safe management by providers in rural hospitals.

Remote presence technology presents a means of providing real-time support to staff in the operating room. A consultant anesthesiologist can participate in real-time patient care using an overhead boom camera. The camera can be directed remotely from a laptop with an ability to zoom, scan monitors, and evaluate the patient. There is the opportunity for audio interaction, instant replay, and point and draw functions. As a mentoring or coaching tool, remote presence technology is potentially groundbreaking. In Canada, the Rural Surgery and Obstetrics Networks program is piloting remote presence technology linking all members of the operating team—surgeon, anesthesiologist, and nursing staff—with coaches remotely.⁵⁷

In the near future, virtual reality and augmented virtual reality will enhance the training and real-time decision making for those who work in low-volume environments. For example, it is feasible that a care provider leading a major resuscitation can be coached remotely by simply donning a headset camera that provides a 360° immersive view for a coach who is located in a remote location. Augmented virtual reality allows the coach to literally provide a set of “guiding hands” by presenting holograms in the visual field of the rural care provider. The virtual images can guide interventional procedures or simply offer visual prompts about the next steps of the resuscitation sequence.⁶⁰

CONCLUSIONS

In summary, a shared goal among care providers is to provide timely access to safe anesthesia and surgical care in rural and remote hospitals. Such care is essential as travel requirements represent a barrier to access to medical care, impose significant financial burdens, and threaten the cultural safety of indigenous populations. The World Health Organization and the Lancet Commission have advocated for a reset of primary care, recognizing the strategic relevance of the small or district hospital, its scope of care, and its reliance on essential procedural skill sets and task-sharing between care providers. Enhanced collaborative relationships between professions are required for regionalized networks of distributed care. The provision of anesthesia and surgical services in rural and remote areas can be supported through the development of formal networks of care, enhanced clinical coaching and mentorship relationships between specialist and generalist providers, and the strategic use of telemedicine technologies to facilitate collaboration, support, and guidance. ■■

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