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Snow Kissed, © 2018
Nancy L. Moore
Acrylic on Canvas, 48" w × 56"
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As an artist I feel incredibly fortunate to be able to paint and draw without boundaries.

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The 'Brokenness' of postgraduate medical education

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There is a disconnection in all Canadian postgraduate programmes, from both the medical school mission and community needs' standpoint. On the one hand, we have Canadian grads not getting matched to a residency programme, and on the other hand, we are training more orthopaedic surgeons than we have OR time to give them. Vacancies in rural practice continue, despite a near doubling of Canadian medical school enrolment to 2836 students.¹ Postgraduate training needs reform. The number of spots needs to better match the number of matriculating students, and the mix needs to better reflect the needs of Canadians. For CaRM ranking, we should stack the deck, and all family medicine programmes should be weighing the undergraduate factors that promote rural careers (especially rural origin which has a prevalence odds ratio of 2.9).²

The medical school variable loading for rural practice is well known. In a recent article³ yet again, rural origin, older age, prior postgraduate training, a rural role model, social orientation, interest in generalism and tolerance for uncertainty were all significantly associated with rural practice. These factors and others have females, francophones and rural and even

indigenous students (12% this year at the Northern Ontario School of Medicine [NOSM] yes!)⁴ admitted in favourable proportions. At NOSM, all of them are exposed to rural communities early in the curriculum and spend their entire 3rd-year training alongside rural generalist physicians in a longitudinal clerkship.

We need more and expanded access to longitudinal rural postgraduate programmes than already exist. Not surprisingly, a longitudinal residency that takes place entirely, or mostly, in rural generalist settings (typically between 4000 and 30,000 population and 150–1000 km distant from a city of over 100,000) is associated with rural practice at an odds ratio of 3.9.²

There is also a need to find new approaches to improve social fairness. Increasing medical school admissions for lower socioeconomic students is important. Innovation such as the proposed rural generalist pathway at NOSM has the potential to increase both the status and rigour of rural training that is 'fit for purpose'.⁴

On his recent tour of Northern Ontario, Dr Denis Lennox, who has been a champion of Rural Generalism in Australia, highlighted the importance of creating a career path that has, as the goal, a rewarding rural generalist and academic career

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'joined up' with other rural generalists in a resilient community of practice. If residents can see an inspiring, supported, rewarding career goal, they will be more likely to enter into rural practice, equipped with the right generalist training.

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La fragmentation de l'éducation médicale de deuxième cycle

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Tous les programmes de deuxième cycle canadiens sont fracturés, tant du point de vue de la mission de l'école de médecine que des besoins communautaires. D'un côté, quelques diplômés canadiens ne sont pas appariés à un programme de résidence et de l'autre, nous formons plus de chirurgiens en orthopédie que le bloc opératoire peut en accepter. Les postes vacants en pratique rurale sont toujours vacants, malgré que deux fois plus d'étudiants, soit 2836, sont inscrits en médecine au Canada.¹ La formation de deuxième cycle doit être réformée. Le nombre de places doit mieux refléter le nombre d'étudiants inscrits, et le mélange doit mieux refléter les besoins des Canadiens et Canadiennes. Pour le classement de CaRMS, nous devons piper les dés, et tous les programmes de médecine familiale doivent tenir compte des facteurs de premier cycle qui encouragent les carrières en milieu rural (surtout l'origine rurale, avec un RC de la prévalence de 2,9).²

La distribution variable des écoles de médecine pour la pratique rurale est reconnue. Dans un article récent³ encore une fois, les facteurs origine rurale, âge avancé, formation antérieure de deuxième cycle, modèle à émuler en région rurale, orientation sociale, intérêt pour le généralisme et tolérance de l'incertitude étaient tous étroitement liés à la pratique rurale. Ces facteurs entre autres permettent aux étudiants de sexe

féminin, francophones, ruraux et même autochtones (12 % cette année à l'École de médecine du Nord de l'Ontario hurra!)⁴ d'être admis dans des proportions favorables. À l'ÉMNO, tous les étudiants sont exposés aux communautés rurales et passent la troisième année entière de formation avec des généralistes en milieu rural dans le cadre d'un stage clinique longitudinal.

Nous devons élargir et multiplier l'accès aux programmes longitudinaux de deuxième cycle en milieu rural. Il n'est pas surprenant d'apprendre qu'une résidence longitudinale qui prend place entièrement, ou presque, dans un milieu généraliste rural (habituellement entre 4000 et 30 000 habitants et à 150-1000 km d'une agglomération de plus de 100 000) est associée à la pratique rurale avec un rapport de cotes de 3,9.²

Il nous faut également trouver de nouvelles approches pour améliorer la justice sociale. Il importe d'augmenter les admissions des étudiants de faible statut socioéconomique à l'école de médecine. L'innovation, tel le cheminement de généraliste rural proposé à l'ÉMNO a le potentiel d'augmenter le statut et la rigueur de la formation rurale pour qu'elle soit « adaptée à l'emploi ».⁴

Dans sa récente tournée du Nord de l'Ontario, le Dr Denis Lennox, qui est un ambassadeur du généralisme rural en Australie, a souligné l'importance de créer un cheminement de carrière qui a pour but de récompenser les généralistes ruraux et les carrières universitaires qui s'associent à d'autres généralistes ruraux pour former une communauté de pratique résiliente.

Si les résidents ont pour vision une carrière satisfaisante et inspirante, ils auront plus tendance à pratiquer en milieu rural, et seront équipés de la bonne formation de généraliste.

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President's Message. Care delayed is care denied

Rural physicians are daily witnesses to the effects of the disparities in social determinants of health on their rural and indigenous patients and communities.

On 6 September 2019, the Canadian Human Rights Tribunal (CHRT) ordered the federal government to compensate thousands of indigenous children who were taken into care unnecessarily. The CHRT said that the Canadian government was 'willful and reckless' in its discrimination against indigenous children living on reserves. One month later, the federal government announced it would appeal the ruling.

Cindy Blackstock, a plenary speaker at the 2015 Society of Rural Physicians of Canada Rural and Remote conference, gave a moving account of the dispute between federal and provincial funders that made it impossible for Jordan Anderson, a child with a chronic terminal illness, to return to his home on a reserve in Manitoba. She emphasised the continuing disparities in funding, documented for nearly 20 years, for indigenous children living on reserve versus children living off reserve. In 2000, a national review concluded that the First Nations Child and Family

Services agencies received 22% less funding per child than the average province. Inadequate funding particularly affects the provision of 'least disruptive measures', those measures that are provided to children at significant risk of maltreatment so that they can remain safely in their homes. Right now in Canada, three times as many First Nations children are separated from their families as were in residential schools.

In 2006, the Assembly of First Nations and the First Nations Child and Family Caring Society of Canada launched a formal human rights complaint. In January 2016, the CHRT ruled that the federal government knowingly underfunded child welfare and medical services for 165,000 First Nations children living on reserves. The Tribunal has subsequently issued eight non-compliance orders because so little action has been taken by the federal government.

The recent Tribunal ruling was a follow-up to the original one and specified monetary compensation for the indigenous children and families that were separated in a context of inadequately funded social services.

On October 6, the federal government launched an appeal to

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the CHRT decision, saying that 'irreparable harm to Canada and the public interest if the stay is not granted exceeds the harm to the Respondents if the stay is granted'. Unfortunately, this means that these disparities will continue for the foreseeable

future, as will their negative health effects. Can Canada do better?

For more information please see <https://fncaringsociety.com/i-am-witness-tribunal-timeline-and-documents>

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Message du Président. Les soins retardés sont des soins refusés

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Les médecins de famille sont quotidiennement témoins des disparités en matière de déterminants sociaux de la santé chez leurs patients et dans les communautés rurales autochtones.

Le 6 septembre 2019, le Tribunal canadien des droits de la personne (TCDP) a ordonné au gouvernement fédéral d'indemniser des milliers d'enfants autochtones ayant été retirés de leur foyer sans raison. Le TCDP a évoqué la discrimination délibérée et téméraire du gouvernement canadien envers les enfants autochtones vivant dans les réserves. Un mois plus tard, le gouvernement fédéral annonçait qu'il porterait la décision en appel.

Cindy Blackstock, une conférencière plénière à la conférence 2015 en région rurale et éloignée de la SRMC a présenté le récit émouvant du différend entre les bailleurs de fonds fédéral et provinciaux qui a empêché à Jordan Anderson, un enfant atteint d'une maladie chronique en phase terminale, de retourner chez lui dans sa réserve du Manitoba. Elle a insisté sur les disparités qui existent toujours, documentées depuis près de 20 ans, en matière de financement des enfants autochtones vivant dans les réserves par rapport aux autres enfants. En 2000, une revue nationale a conclu que les agences des Services à l'enfance et à la

famille des Premières Nations avaient reçu 22% moins de financement par enfant que la moyenne provinciale. L'inadéquation du financement affecte particulièrement l'application des "mesures les moins perturbatrices", ces mesures mêmes qui sont offertes aux enfants à risque significatif de maltraitance pour qu'ils puissent demeurer à la maison en toute sécurité. Pour l'heure au Canada, trois fois plus d'enfants des Premières Nations sont séparés de leur famille comme c'était le cas à l'ère des écoles résidentielles.

En 2006, l'Assemblée des Premières Nations et la Société de soutien à l'enfance et à la famille des Premières Nations du Canada ont déposé une plainte formelle en matière de droits de la personne. En janvier 2016, le TCDP a statué que le gouvernement fédéral avait sciemment sous-financé les services médicaux et de protection de l'enfance offerts à 165 000 enfants des Premières Nations vivant dans les réserves. Le Tribunal a subséquemment rendu huit ordonnances de non-conformité parce que le gouvernement fédéral n'avait presque rien fait pour rectifier la situation.

La récente décision du Tribunal suivait la décision originale et précisait l'indemnité monétaire que les enfants et les familles autochtones ayant été séparés pour cause de sous-financement des services sociaux devaient recevoir.

Le 6 octobre, le gouvernement fédéral en a appelé de la décision du TCDP, en invoquant que "le préjudice irréparable causé au Canada et à

l'intérêt public si l'ajournement n'est pas accordé excède le préjudice causé aux répondants si l'ajournement est accordé". Malheureusement, cela signifie que ces disparités, de même que les effets négatifs sur la santé, se perpétueront dans

un avenir proche. Le Canada ne peut-il pas faire mieux?

Pour plus d'informations, visitez: see <https://fncaringsociety.com/i-am-witness-tribunal-timeline-and-documents>.

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Research funding by the Canadian Institutes of Health Research: More rural needed!

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Canada is a huge country with a large rural population. The health of Canadians living in remote, rural and indigenous communities is substantially worse than the general population. In general, rural Canadians are older, poorer and sicker than their urban counterparts. They face more difficult access to health care and have poorer health care outcomes. As documented by Statistics Canada in May 2019, this includes much higher preventable and treatable mortality.¹

Research should play a vital role in policy and planning in rural health-care delivery. Urban-based health research generally does not reflect an understanding of rural realities and often leads to policies, planning, programs and practices that do not work well in rural communities. The Rural Road Map for Action (RRM) Direction 4 recommends: Institute a national rural research agenda to support rural workforce planning aimed at improving access to patient-centred quality-focused care in rural Canada.²

Since 2002, there have been a series of national reviews such as with the

Standing Senate Committee on Social Affairs, Science and Technology³ and the Ministerial Advisory Council on Rural Health⁴ about the status of rural health-care delivery, including calling for expansion in rural, remote, northern and aboriginal health research. While there are some excellent examples of rural health research that has had an impact over the past 20 years, progress seems to have been limited by poor funding and a lack of coordinated support.

The Canadian Institutes of Health Research (CIHR) is the predominant source of health research funding in Canada and usually unlocks matching provincial and other funding. To achieve its mandate under the CIHR Act to improve the health of Canadians and the health-care system through research, the CIHR must effectively address current, future and emerging health issues and challenges for rural Canadians.

How has the CIHR responded to this identified national need for rural health research? The RRM Implementation Committee (RRMIC*) asked the CIHR to conduct a search of its internal database to find out.

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CIHR-FUNDED APPLICATIONS

CIHR has funded a total of 60,378 applications from April 2000 to August 2019 (19.5 years). A total amount of \$19.5 billion has been spent/promised on these applications, equivalent to approximately \$1 billion/year. The search on funded applications looking for the word 'rural' in the research title, or keywords the applicant supplied, found a total of 403 applications that meet this criterion. A total of \$109,624,919 has been spent/promised funding them or approximately \$5,621,791 annually. This equates to approximately 0.67% of CIHR-funded applications and approximately 0.56% of CIHR application funding.

While it could be reasonably expected that funded research applications that were designed to have a major rural component would have the word 'rural' in the title or keyword, it is possible that some did not.

Discussion

Comparing CIHR-funded applications with the situation, in the US (with a similar proportion of population as rural – World Bank statistics: US, 18% and Canada, 19%), the National Institutes of Health funds approximately USD \$294 million or approximately CAD \$391 million per year on rural health research.⁵ This is more than six times as much funding per rural person. In addition, the Federal Office of Rural Health Policy funds rural health research centres and rural health policy analysis initiatives and has funded individual researchers and other research centres.⁶

Unfortunately, the very low level of CIHR funding for rural health research indicates that rural health has been a very low priority for CIHR. This is a serious problem for rural Canada. The 2019 State of Rural Canada, 'We don't know what we don't measure,' notes that the gaps in existing data represent some of the more pressing issues for rural and remote communities.⁷ The CIHR is currently updating its structure and strategic plan for 2020 and this provides an opportunity for positive change.

RRMIC recommends that governments and CIHR prioritise the development of rural health research to play a crucial role needed for evidence-based health-care policy and planning

by governments and health-care organisations to improve the lives of rural Canadians.

This will require focus and funding to:

1. Build capacity for rural research, including innovative rural community-engaged research
2. Develop and support a pan-Canadian Rural Health Research Network
3. Target annual funding for rural health research studies
4. Provide a rural lens to broader studies to ensure that applicability to Canada's rural populations is included in study design and knowledge translation.

Please see the RRM² and Investing in Rural Health: An Economic Stimulus for Canada⁸ for further information.

Canada needs appropriately funded and coordinated rural health research networks with strength in every province and territory. The time to act is now!

See page 14 for related article

Acknowledgements: Robyn Carson, PHD, Analyst, Funding Policy and Analytics Operations Support Canadian Institutes of Health Research conducted the searches of the CHIR internal database at the request of Dr James Rourke on behalf of the Rural Road Map Implementation Committee (RRMIC).

*The RRMIC was established by the SRPC and the CFPC to address rural health-care policies, planning, programs and practice. The RRMIC is composed of senior leaders in the health, education and research sectors. This includes the Canadian Medical Association, Canadian Nurses Association, Indigenous Physicians Association of Canada, Royal College of Physicians and Surgeons of Canada, HealthCareCAN, Federation of Canadian Municipalities, Association of Faculties of Medicine of Canada, Canadian Association of Emergency Physicians, Canadian Association of Physician Recruiters and Canadian Association for Rural and Remote Nursing.

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Progress made on access to rural healthcare in Canada

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WHY RURAL HEALTHCARE?

Rural* populations in Canada are generally older, less affluent and sicker. Almost one-fifth of Canadians (18%) live in rural communities, but they are served by only 8% of the physicians practising in Canada.^{1,2} These communities face on-going challenges in recruiting and retaining family physicians and other health-care professionals. Major systemic change is needed to improve indigenous health given the persistent inequity and inaction across the health system that the Truth and Reconciliation Commission of Canada identified. People in rural areas face more difficult access to healthcare than their urban counterparts, and when they do access health care, they have poorer outcomes.³

There is little evidence-based rural health-care planning at the national and provincial levels to provide direction. Policy decisions are too often guided by urban health-care models without understanding the potential negative impacts in rural communities. Rural communities need rural-based solutions and to develop regional capacity to innovate, experiment and discover what works. An opportunity exists to narrow

health disparities by providing care closer to home. Rural communities need an effective health-care system with a stable workforce. The time for solutions is now.

RURAL ROAD MAP FOR ACTION

Responding to these disparities, the rural road map (RRM) [Box 1]⁴ was developed by the Advancing Rural Family Medicine: The Canadian Collaborative Taskforce⁵ and released in February 2017. The RRM provides a guiding framework for a pan-Canadian approach to physician rural workforce planning, as well as access to rural healthcare. Its premise is that all stakeholders from different components of the healthcare and education systems must work collaboratively and collectively. While the RRM focuses on the health workforce, it recognises that all stakeholders play an important role in delivering healthcare in rural Canada. By understanding who is responsible for what, the RRM aims to provide a pathway to help support a pan-Canadian, coordinated approach to enhancing rural access to healthcare.

The RRM uses a social accountability approach to sharing

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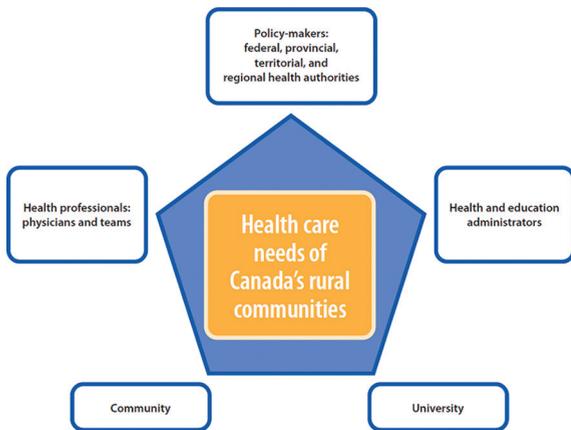


Figure 1: Social accountability framework: the pentagram partners involved in implementing the rural road map for action. Adapted with permission from Boelen C, *Educ Health* 2004;17 (2):223-31.

solutions, and those targeted for action are stakeholders identified as 'pentagram partners' [Figure 1]. Each of the partners has a role to play in the implementation of the RRM.

The RRM addresses indigenous health needs by generating a multi-stakeholder rural health-care strategy that includes the participation of Indigenous people to benefit these communities in rural Canada. Increasing the number of indigenous health-care professionals trained in Canada, improving the retention of health-care professionals within rural indigenous communities, and providing cultural safety training for all health-care professionals are ways to achieve success. The RRM aligns with the commitment to renew relationships with indigenous peoples through respect, cooperation and partnership.

RURAL ROAD MAP IMPLEMENTATION COMMITTEE AS CATALYST

Rural populations still do not have equitable access to health-care services. Rural communities continue to face challenges in recruiting and retaining family physicians and other health-care professionals. Several provincial programmes have attempted to address these issues, but a comprehensive and cohesive pan-Canadian, long-term strategy to support rural physician recruitment and retention is not yet in place. It became clear that a catalyst was needed to push for the needed changes identified in the RRM.

In February 2018, the Rural Road Map Implementation Committee (RRMIC) was formed to support the implementation of the RRM that was launched in February 2017. Co-sponsored by the Canadian Family Physicians of Canada (CFPC) and Society of Rural Physicians of Canada (SRPC), RRMIC is designed to provide a forum whereby members can report and deliberate on how to further advance the RRM in ways that can be scaled and spread locally, provincially and at a pan-Canadian level.

The RRMIC's membership deliberately crosses sectors supporting the RRM's social accountability vision. The committee provides a mechanism to connect with more than 300 individuals and organisations that were involved in the development of the RRM. Committee members [Box 2] are either decision-makers or maintain influential positions as part of the organisations they represent and are chosen based on their knowledge and influence to advance the RRM.

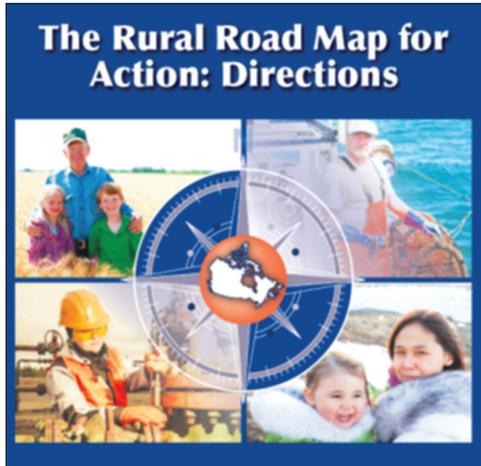
The RRMIC strongly feels that collaboration is important to the successful implementation of the RRM. Stakeholders, including government leaders, have an essential role to play in identifying opportunities to share information about progress made and in providing advice to advance education, policy, practice and research activities related to rural healthcare in Canada. As a result, relationships can be strengthened among rural family physicians, other specialists and other health-care providers and rural communities through the creation of networks of care that improve access and positively influence physician retention.

RRMIC's goal is to enhance access to care for people living in rural Canada. It proposes a pan-Canadian strategy through the RRM to use by provinces and territories, educators, administrative leaders, policy-makers, health-care professionals, all levels of government and communities to enable equitable access to healthcare.

PROGRESS TO DATE

Since its work began, RRMIC has made significant progress raising awareness across Canada about the need for improved access to rural healthcare close to home, as highlighted in the following key priorities.

Box 1: Rural road map for action.⁴



The Rural Road Map for Action (RRM) is a series of 20 recommendations for a renewed approach to rural physician workforce planning. The 20 recommendations fall under four directions that provide a pathway toward developing a comprehensive rural framework for strengthening the rural Canadian physician workforce. Working in team-based environments, it is expected that health care providers will have the competencies and skills to provide high-quality and culturally safe care in rural Canada. The recommendations call for collective action with outcomes that are measurable, sustainable, and impactful.

Rural patient transfer and repatriation (rural road map Action 11)

A national advisory group was established in July 2019 representing the Health Standards Organization, Accreditation Canada, HealthCareCAN, Royal College, Canadian Institute for Health Information, CFPC and the SRPC. The group's focus is developing an approach to improve the rural patient transfers and repatriation between rural and urban centres through enhanced hospital standards and better transport coordination among inter-facilities and across jurisdictions.

Rural and Indigenous health competencies (rural road map Action 3, Action 5)

In July 2018, the CFPC disseminated its approved rural competencies to advance rural education to support the development of family physicians ready to practise in rural Canada.⁶ This resource is a guide to inform rural family medicine curricula and assessment. In April 2019, an invitational symposium was held in Niagara Falls, Ontario with Indigenous health leaders/educators

Box 2: Rural road map implementation committee membership.

Executive

Dr Ruth Wilson (CFPC Co-chair)
Dr James Rourke (SRPC Co-chair)
Dr Margaret Tromp (SRPC president)
Dr Shirley Schipper (CFPC president)
Dr Francine Lemire (CFPC Executive Director and Chief Executive Officer)
Dr Gabe Woollam (SRPC president-elect)

Member (Organizations)

Mr Jean Bartkowiak (HealthCareCAN)
Mr Neil Drimer (Canadian Foundation for Healthcare Improvement)
Dr Rick Fleet (Rural Emergency Medicine, Laval University)
Dr Douglas Hedden (Royal College of Physicians and Surgeons of Canada)
Dr. Brian Geller (Canadian Association of Emergency Physicians)
Dr Alexandra King (CAMECO, Chair, Indigenous Health, University of Saskatchewan)
Dr Roy Kirkpatrick (Rural Specialist, Royal College of Physicians and Surgeons of Canada)
Ms Jennifer Kitts (Canadian Medical Association)
Dr Darlene Kitty (Indigenous Physicians Association of Canada)
Ms Jean Lawson (Federation of Canadian Municipalities)
Mr Bryan MacLean (Canadian Association of Staff Physician Recruiters)
Ms Sarah Nolan (Canadian Nurses Association)
Dr Preston Smith (Association of Faculties of Medicine of Canada)
Dr David Snadden (Chair, Rural Health, University of British Columbia)
Ms Michelle Pavloff (Canadian Association for Rural and Remote Nursing)

across medical schools from across the CFPC, Royal College of Physicians and Surgeons of Canada (RC), Association of Faculties of Medicine of Canada (AFMC) and the Indigenous Physicians Association of Canada (IPAC). The goal of the symposium was to develop an action plan for a collaborative approach towards competencies to enhance Indigenous health in response to the truth and reconciliation commission. Following the symposium, Indigenous health physician leaders convened in the fall of 2019 to develop a work plan and business case based on the symposium report.

RURAL HEALTH RESEARCH (RURAL ROAD MAP DIRECTION 4)

In August 2018, a pre-budget submission⁷ was made to the federal government to enable rural

and remote communities to carry out rural health research through the use of infrastructure funding. In June 2019, the Canadian Institutes of Health Research (CIHR) announced that it is undertaking a strategic planning consultation with input from stakeholders across Canada. As a participant in the consultation process, the RRMIC has corresponded with rural health researchers across Canada in encouraging their participation in the CIHR consultation and to advocate for the need for rural health research funding to reflect the realities of rural healthcare.

RRMIC members are also working on individual activities with key stakeholders on actions that are highlighted in Box 3 which contains a scorecard that describes each of the RRM actions and implementation status as of summer 2019.

Collaborative efforts have been made with the Rural Road Map Implementation Committee

- The Federation of Medical Regulatory Authorities of Canada: will explore ways to reduce barriers to licensure for physicians to practise in rural communities where needed
- The Canadian Medical Association, CFPC and the Royal College: formed a virtual health-care task force in March 2019 to identify the regulatory and administrative changes needed to support virtual care in Canada and to have a set of recommendations ready to present in early 2020
- CFPC, Royal College and specialty organisations: will promote the acquisition of enhanced surgical skills and anaesthesia for rural communities.

While we have made major strides, much work still needs to be done by not only the RRMIC, but by leaders, health-care providers and administrators of health-care institutions and rural communities who work and live with, and provide care for, rural and Indigenous populations.

MOVING AHEAD

Despite the universality and accessibility principles of the Canada Health Act, people who live in rural and remote communities do not have

equitable access to health-care services. A recent Ipsos poll, commissioned by the CFPC, revealed that health care topped the list of issues for last year's federal election, with 50% Canadians ranking it among their top three.⁸ Currently, there is no comprehensive national (or even provincial) rural health-care strategy to address the needs of the rural population. While some rural health research is conducted in Canada, it is limited, poorly funded, not well-coordinated and often fails to be used in informing health policy. As there are gaps in knowledge about how to improve rural health-care access and patient outcomes, rural health research is needed to enhance rural health workforce recruitment and retention and to gather relevant information to influence rural health-care delivery. Engagement is needed through a set of federally, provincially and regionally supported networks that would encourage collaboration across rural Canada among rural practitioners, researchers, policymakers, federal/provincial/territorial leaders, rural and indigenous communities and the rural population. Partnerships that can coalesce, in a focused way, around solving problems together, are needed now.⁹

The RRMIC has been actively engaged in federal government advocacy activities by meeting with senior government leaders and policymakers about the importance of making rural health care a priority for access to healthcare in rural Canada. RRMIC will continue its efforts in engaging with stakeholders in conversation and through a series of consultations about RRM collaborative initiatives and explore opportunities in sustaining the momentum following the conclusion of its mandate in 2020 with a final report.

RURAL CANADIANS DESERVE BETTER

While the RRMIC acknowledges the fiscal constraints that the healthcare and education systems are faced with, it intends not to remain idle and will continue to take a leadership stance. System-wide alignment of education, practice, policy and research is required to revitalise rural health care in Canada and positively influence the entire Canadian health system. Leadership is needed to minimise the health inequities faced

Box 3: Rural road map update

	Status	Already engaged
Direction one: Social accountability		
Action 1. Develop and include criteria that reflect affinity and suitability for rural practice		AFMC
Action 2. Establish and strengthen specific policies and programs to enable successful recruitment of Indigenous and rural students		AFMC IPAC
Action 3. Support extended competency-based generalist training in rural communities to prepare medical graduates		CFPC RC
Action 4. Provide high quality rural clinical and educational experiences to all medical students and family medicine residents		AFMC CFPC
Action 5. Educate medical students and residents about the health and social issues facing Indigenous people and ensure they attain competencies to provide culturally safe care		AFMC IPAC
Action 6. Establish a collaborative to ensure that specialist physicians acquire and maintain specific competencies required to provide healthcare to rural communities		RC
Direction two: Policy interventions		
Action 7. Establish government and university partnerships with rural physicians, rural communities and regional health authorities to strengthen the delivery of medical education in rural communities		F/P/T
Action 8. Establish programs with targeted funding to enable rural family physicians to obtain additional or enhanced skills training		F/P/T
Action 9. Establish contracts for residents working in rural settings that maximise their clinical and educational experiences without compromising patient care or the residents' rights in their collective agreements		CFPC
Action 10. Establish a Canadian rural medicine service to enable the creation of special national locum licence designation		FMRAC, CMA, RC, CFPC
Direction three: Best practice models		
Action 11. Implement standard policies within health service delivery areas that require acceptance of timely transfers and appropriate consultations and support by patient care networks		HealthCareCAN CARRN
Action 12. Develop specific resources, infrastructure and networks of care within local and regional health authorities to improve access		HealthCareCAN CFHI
Action 13. Partner with rural communities and rural health professionals to develop strategies to guide distance technology		CMA, CFPC, RC
Action 14. Engage communities in developing and implementing recruitment and retention strategies		CASPR
Action 15. Encourage the development of formal and informal mentorship relationships		CFPC SRPC
Direction four: Rural research agenda		
Action 16. Create and support a Canadian rural health services research network		SRPC
Action 17. Develop an evidence-informed definition of what constitutes rural training		AFMC CFPC, CaRMS
Action 18. Develop a standardised measurement system, with clear indicators that demonstrate the impact of rural health service delivery		CIHI
Action 19. Develop metrics, based on environmental factors, to identify educate and promote successful recruitment and retention programs		
Action 20. Promote and facilitate the use of rural research-informed evidence		SRPC

CASPR—Canadian Association of Staff Physician Recruiters, CFHI—Canadian Foundation for Healthcare Improvement, CFPC—College of Family Physicians of Canada, CIHI—Canadian Institute for Health Information, CMA—Canadian Medical Association, F/P/T—Federal, provincial, territorial government, FMRAC—Federation of Medical Regulatory Authorities of Canada, IPAC—Indigenous Physicians Association of Canada, RCPSC—Royal College of Physicians and Surgeons of Canada, SRPC—Society of Rural Physicians of Canada. *Green indicates the action is either implemented or in the final stages of implementation, yellow indicates the action is in progress for development, and red indicates no progress.

by rural Canadians. Leadership must come from all stakeholders undertaking a similar journey to reach a common endpoint – improved health outcomes for all Canadians.

See page 11 for related article

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“Well organized conference with relevant-to-rural-practice educational sessions. It was good to see the stream for rural specialists and also the day of sessions for FP ESS. The topics for the keynote speakers were brilliant and the speakers were terrific.” - Anonymous

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A systematic review of reviews: Recruitment and retention of rural family physicians

Abstract

Introduction: The recruitment and retention of family physicians in rural and remote communities has been the topic of many reviews; however, a lack of consensus among them with regard to which factors are most influential makes it difficult for setting priorities. We performed a systematic review of reviews which helped to establish an overall conclusion and provided a set of fundamental influential factors, regardless of the consistency or generalisability of the findings across reviews. This review also identified the knowledge gaps and areas of priority for future research.

Methods: A literature search was conducted to find the review articles discussing the factors of recruitment or retention of rural family physicians. Results were screened by two independent reviewers. The number of times that each factor was mentioned in the literature was counted and ordered in terms of frequency.

Results: The literature search identified 84 systematic reviews. Fourteen met the inclusion criteria, from which 158 specific factors were identified and summarised into 11 categories: personal, health, family, training, practice, work, professional, pay, community, regional and system/legislation. The three categories referenced most often were training, personal and practice. The specific individual factors mentioned most often in the literature were 'medical school characteristics', 'longitudinal rural training' and 'raised in a small town'.

Conclusion: The three most often cited categories resemble three distinct phases of a family physician's life: pre-medical school, medical school and post-medical school. To increase the number of physicians who choose to work in rural practice, strategies must encompass and promote continuity across all three of these phases. The results of this systematic review will allow for the identification of areas of priority that require further attention to develop appropriate strategies to improve the number of family physicians working in rural and remote locations.

Keywords: Family physician, recruitment, retention, rural, systematic review of reviews

Résumé

Introduction: Le recrutement et la rétention des médecins de famille dans les communautés rurales et éloignées ont fait l'objet de nombreuses revues; il est toutefois difficile d'établir les priorités en la matière en raison de l'absence de consensus quant aux facteurs ayant la plus grande influence. Nous avons mené une revue sys-

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tématique des revues qui nous a aidés à tirer une conclusion d'ensemble et à réunir une série de facteurs fondamentaux d'influence, sans égard à l'uniformité des observations des revues ni à la possibilité de les généraliser. Les résultats de cette revue systématique nous permettront de déterminer quels sont les domaines prioritaires auxquels nous devons nous attarder dans le but d'élaborer les stratégies appropriées qui multiplieront le nombre de médecins de famille en région rurale ou éloignée. Cette revue a aussi fait ressortir les lacunes et les domaines prioritaires en recherche.

Méthodologie: La littérature publiée a été recherchée pour trouver les articles de synthèse traitant des facteurs de recrutement ou de rétention des médecins de famille en région rurale. Les résultats ont été dépouillés par deux réviseurs indépendants. Le nombre de fois où chaque facteur était mentionné dans les publications était compté et classé en fonction de la fréquence.

Résultats: La recherche de la littérature a relevé 84 revues systématiques. Quatorze répondaient aux critères d'inclusion; de celles-là, 158 facteurs ont été définis et résumés en 11 catégories: personnel, santé, famille, formation, pratique, travail, professionnel, rémunération, communauté, régional et système/législation. Les trois catégories qui sont revenues le plus souvent étaient formation, personnel et pratique. Les facteurs individuels mentionnés le plus souvent dans la littérature étaient « caractéristiques de l'école de médecine », « formation rurale longitudinale » et « grandi dans un village ».

Conclusion: Les trois catégories citées le plus souvent ressemblent à trois phases distinctes de la vie d'un médecin de famille: avant l'école de médecine, école de médecine et après l'école de médecine. Pour augmenter le nombre de médecins qui choisissent la pratique rurale, les stratégies doivent inclure et favoriser la continuité entre ces trois phases.

Mots-clés: médecin de famille, recrutement, rétention, rural, revue systématique de revues

INTRODUCTION

Recruiting and retaining family physicians in rural and remote practice is challenging.¹ Numerous strategies have been implemented,² but there is still an inadequate number of physicians choosing rural practice.¹

There are several systematic reviews involving rural recruitment and retention factors;³⁻⁵ however, to our knowledge, there is no study to summarise the findings of these reviews for decision-makers. The purpose of this study was to summarise the evidence to date regarding the factors that influence the recruitment and retention of family physicians to rural and remote practice and to identify areas that may benefit most from the strategic implementation of potential solutions.

METHODS

Data sources and search strategy

The literature was reviewed, generating a list of review articles relating to factors that influence family physician recruitment and retention in rural areas. In September 2016, with the assistance of a librarian, electronic databases including EMBASE, MEDLINE via PubMed,

CINAHL, Cochrane and PsycINFO were searched for specific key word search terms as well as MESH terms to identify the articles of relevance [Figure 1]. Review articles were deemed relevant for inclusion in this review if they discussed factors of recruitment or retention of rural family physicians. Articles were not excluded based on language, review type or review quality. Each review article was assessed using the GRADE approach,⁶ which grades systematic reviews based on the level of evidence provided, on a scale of 1-4, with 1 being poor and 4 excellent. Two independent reviewers assessed the quality of each article, and a third reviewer was used to reach a consensus, when necessary.

The list of recruitment and retention factors that were used as a guide for the extraction of data during this systematic review of reviews was taken from the primary author, Asghari *et al.*'s, previously published article.⁷ The 158 specific factors were organised into 11 categories: personal, health, family, training, practice, work, professional, pay, community, regional and system/legislation.

The review team (including the members of the research team, a librarian, members of the College of Family Physicians Canada and Advancing Rural Family Medicine [AFRM]) applied a

(recruit*[tw] OR retention[tw] OR retain*[tw] OR attract*[tw] OR "Personnel Selection"[MeSH] OR "manpower"[sh] OR "supply and distribution"[sh] OR "Training Support/economics"[Mesh] OR "Physician Incentive Plans"[Mesh] OR "Job Satisfaction"[Mesh] OR "Career Choice"[Mesh] OR "Professional Practice Location"[Mesh] OR "Residence Characteristics"[MeSH] OR "School Admission Criteria"[Mesh]) AND ("Physicians"[Mesh] OR physician*[tw] OR doctor*[tw] OR "Education, Medical"[Mesh] OR "Internship and Residency"[Mesh] OR "Students, Medical"[Mesh] OR "Schools, Medical"[Mesh]) AND ("Rural Population"[Mesh] OR "Rural Health Services"[Mesh] OR "Rural Health"[Mesh] OR "Hospitals, Rural"[Mesh] OR "Medically Underserved Area"[Mesh] OR remote[tw] OR rural[tw] OR isolated[tw]) AND (systematic[sb] OR review[pt] OR review[tj])

Figure 1: PubMed search terms used to identify the review articles. Mesh = Medical subject headings.

semi-Delphi method to reach a consensus on the comprehensiveness of the factors and to further divide them into three domains: personal, medical training and the practice.⁷ A more detailed explanation of the semi-Delphi method applied to this research can be found in Asghari *et al.*'s article.⁷

For the purpose of this review, the personal domain included attributes about the person (e.g., age, sex and ethnicity), their rural upbringing, health and family factors. The training domain encompassed all the aspects of medical school and residency. The practice domain included workplace, professional, pay, community, regional and system/legislation factors.

Data extraction and summarising

Factors influencing recruitment or retention were extracted from each systematic review to determine the number of times each factor had been cited throughout the literature. To ensure the same factor from the same reference was not extracted twice, the reference of each factor was tracked. Any identical factors originating from a reference that had already been recorded were excluded from the study. Two reviewers independently extracted the factors from each review article that were later collated. Once all the factors from each systematic review had been extracted, the count of each factor was determined, generating a list of the most frequently cited factors throughout the literature.

RESULTS

A total of 84 review articles were identified; however, 60 were removed at the title and abstract review stage because they did not relate to the factors influencing retention and recruitment of family physicians to rural practice. From this,

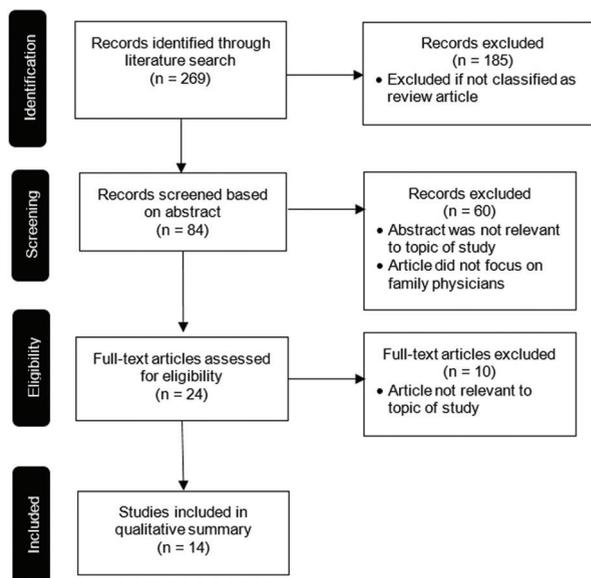


Figure 2: PRISMA diagram of the stepwise exclusion of articles.

a total of 24 full-text papers were screened for eligibility, and 14 review articles were included in the systematic review of reviews [Figure 2]. Table 1 summarises each literature review included in the review process accompanied by a GRADE score of 4, and the individual factor counts are listed in Table 2.

As shown in Table 2, the ten factors cited most frequently in the literature include (1) medical school characteristics (citations = 59); (2) longitudinal rural training in residency or clerkship (citations = 37); (3) rural background (citations = 37); (4) raised in small town (citations = 30); (5) rural rotations (citations = 26); (6) preferential admissions (citations = 26); (7) attitudes about rural practice in medical school (citations = 23); (8) sex/gender (citations = 24); (9) completion of high school in rural area (frequency of report = 18) and (10) choice of residency site (citations = 17).

Table 1: Summary table of each systematic review used in this systematic review of reviews								
First author and year	Title	Search dates	Objective	Type of review	Number of studies	Search Terms Provided	Language of Included Articles	GRADE (1=poor 4=excellent)
Goodfellow, A. 2016 ⁴	Predictors of primary care physician practice location in underserved urban or rural areas in the United States: A systematic literature review	2007-November 2015	To review and analyse the medical literature to determine what factors are most strongly associated with localising primary care physicians in underserved urban or rural areas in the United States	Systematic review	72	Yes	Restricted to English	4
Verma, P. 2016 ⁵	A systematic review of strategies to recruit and retain primary care doctors	Inception-January 2015	To evaluate interventions and strategies used to recruit and retain primary care doctors internationally	Systematic review	51	Yes	No language restriction	4
Myhre, D.L. 2015 ¹⁶	Determinants of an urban-origin student choosing rural practice: A scoping review	January 1970-November 2014	To determine what factors are responsible for rural recruitment and retention of urban-origin students	Scoping Review	17	Yes	Restricted to English	3
Lee, D.M. 2014 ¹¹	Physician recruitment and retention in rural and underserved areas	1997-2014	To identify the challenges when recruiting and retaining rural physicians and to ascertain methods that make rural physician recruitment and retention successful	Literature review	Not reported	Yes	Restricted to English	2
Viscomi, M. 2013 ⁸	Recruitment and retention of general practitioners in rural Canada and Australia: a review of the literature	January 2000-June 2012	Exploration of the factors that attract and retain family practitioners in rural and remote areas of Canada and Australia and highlight similarities and differences between the countries	Literature review	86	Yes	Not reported	4
Ballance, D. 2009 ¹⁰	Factors that influence physicians to practice in rural locations: A review and commentary	1966-2008	To learn what strategies strengthen students' and residents' intentions to practice in rural areas, and how to retain physicians once they are located in such areas	Literature review	Not Reported	Yes	Restricted to English	2

Contd...

Table 1: Contd...

First author and year	Title	Search dates	Objective	Type of review	Number of studies	Search Terms Provided	Language of Included Articles	GRADE (1=poor 4=excellent)
Wilson, N. W. 2009 ¹²	A critical review of interventions to redress the inequitable distribution of health-care professionals to rural and remote areas	Inception to July 2008	To provide a comprehensive overview of the existing evidence regarding the efficacy of various strategies to recruit health-care professionals and retain them in rural communities	Critical review	110	Yes	Restricted to English	4
Ranmuthugala, G. 2007 ¹⁸	Where is the evidence that rural exposure increases uptake of rural medical practice?	Not reported	Examines the concepts of rural exposure and highlights the need to identify which aspects of rural exposure contribute to a positive attitude towards rural practice, thereby influencing students to return to rural areas	Literature review	11	Yes	Not Reported	2
Curran, V. 2004 ⁹	The role of medical education in the recruitment and retention of rural physicians	Not reported	To elaborate on some of the key strategies that have been identified in the literature	Narrative review	Not Reported	Not Reported	Not Reported	3
Hsueh, W. 2004 ¹³	What evidence-based undergraduate interventions promote rural health?	Not reported	The article identifies published reports of medical undergraduate rural programmes from international medical schools and investigates the features making these programmes successful in recruiting and retaining rural physicians	Literature review	59	Yes	Not reported	4
Laven, G. 2003 ³	Rural doctors and rural backgrounds: how strong is the evidence? A systematic review	1973-October 2001	To summarise the evidence for an association between rural background and rural practice by systematically reviewing the national and international published reports	Systematic review	12	Yes	Restricted to English	4

Table 1: Contd...								
First author and year	Title	Search dates	Objective	Type of review	Number of studies	Search Terms Provided	Language of Included Articles	GRADE (1=poor 4=excellent)
Brooks, R.G. 2002 ¹⁴	The roles of nature and nurture in the recruitment of primary care physicians in rural areas: A review of the literature	1990-2000	A systematic review on factors associated with recruitment and retention of primary care physicians in rural areas	Literature review	21	Not reported	Not reported	4
Humphreys, J. 2001 ¹⁷	A critical review of rural medical workforce retention in Australia	1991-April 2001	To identify what constitutes retention in the non-metro medical workforce and how it is best measured; to ascertain the correlates and determinants of non-metro medical workforce retention; to identify overlap and differences between medical workforce recruitment and retention; to outline why a specific research agenda focusing on clearly defined measures and definitions of retention is required and to put forward a conceptual framework around which this research might be conducted	Critical review	28	Yes	Not reported	3
Geyman, J.P. 2000 ¹⁵	Educating generalist physicians for rural practice: How are we doing?	Not reported	Focus on medical education programmes as well as other issues, including the effectiveness of programmes designed to select, recruit and retain generalist physicians in rural practice	Literature review	125	Yes	Not reported	4

In addition, a complete list of all factors extracted from each systematic review article is available from the authors on request.

Factors related to the person

Having a rural background before medical school was the strongest personal factor associated with choosing and remaining in rural practice. This factor was split into rural background (37 citations),^{3,8-12} raised in a small town (30 citations),^{3-5,8-16} completion of high school in rural area (18 citations),^{3,4,8,10,12} spouse from small town (9 citations),^{3,8,12,16} attracted to rural lifestyle (4 citations)^{8,9,11} and friends or family living in the area (3 citations),¹⁰ based on each article's definition. Having one or a combination of these factors was attributed to increased rural recruitment and retention. Another personal factor commonly reported was the person's sex (24 citations).^{3,8,10,12,14,15} Most of the reviewed studies found that males were more likely to choose and remain in rural practice than females; however, four of them found no effect between sex and rural practice.^{3,10,12,14} Another category related to the person was family factors. Although not well cited, a few studies found that spousal satisfaction (13 citations),^{8,10,11,15,17} likelihood of spousal employment (5 citations)^{8,15,17} and long distance from family (7 citations)^{8,15,17} influenced rural recruitment and retention. If the spouse was unable to find employment (2 citations), this deterred family practitioners from choosing that rural area.^{8,15}

Factors related to medical training

In addition to the personal characteristics, training a physician received influenced the likelihood of choosing and remaining in rural practice after completing residency. The most cited training factor was medical school characteristics (59 citations),^{3,4,8-18} as attending a medical school in a rural area with a rurally-focused curriculum increased the likelihood of choosing rural practice. Furthermore, schools that selectively recruited students with rural backgrounds produced more rural physicians than schools with no selective admission criteria (26 citations).^{5,9-11,13-15,18} The positive image of rural practice depicted by medical schools can instil positive attitudes towards rural

practice in medical students and this psychological influence has been cited in a number of articles as having a positive effect on rural physician recruitment (23 citations).^{8-10,11,15,16,17} Another aspect medical schools share is early and frequent exposure to rural rotations. Participating in rural rotations (26 citations)^{3,8-11,13-15} and longitudinal rural training clerkships and residency programs (37 citations)^{3,4,8-14,16,18} increased the likelihood of choosing and remaining in rural practice, particularly if these rural training exposures were perceived as positive experiences.

Factors related to rural practice

There was no single practice factor that dominated the literature. Instead, citations were widely disbursed among the factors, implying that multiple, interrelated factors contribute to an attractive and enjoyable rural practice. The most commonly cited practice factor was scope of practice (10 citations);^{8,11,16} rural jobs that offered a wide scope of practice and were within a physicians' realm of interest were more likely to attract and retain physicians. In terms of work factors, flexible work hours (11 citations)^{5,8,11,15,17} and manageable call schedules (11 citations)^{8-11,13,15,17} were attractive features of a rural practice and led to long-term retention. Opportunities for professional development, such as paid sabbaticals, attracted physicians to rural practice (14 citations)^{5,8,9,12,13,16,17} and similarly, a lack of opportunity for professional development deterred physicians from rural practice (4 citations).^{5,8,9,13}

The importance of pay factors was commonly cited, particularly in terms of financial incentives (14 citations).^{5,8,11,13,15,16} Communities who were willing to provide financial incentives were more likely to recruit physicians than those who were not. In terms of the specific community of rural practice, physicians placed value in the standard of education system for children, when choosing a practice location (10 citations).^{8,11,13,15,17} Once there, integrating into and enjoying the community were positive community factors in retaining physicians (8 citations).^{8,11,16,17} In addition, the presence of support networks in the form of consultants was cited as the most important regional factor when choosing a practice location (5 citations).^{8,11-13} System and legislation

Table 2: Factors Influencing Rural Recruitment and Retention

PERSON	
Personal	Health
Rural Background (37)	General Health (2)
Raised in Small Town (30)	Burnout (1)
Sex (24)	Family
Completion of High School in Rural Area (18)	Spousal Satisfaction (13)
Spouse from Small Town (9)	Long Distance Connection to Family (7)
	Likelihood of Spousal Employment (5)
	Family Enjoy Community (3)
	Childcare (3)
MEDICAL TRAINING	
Training	
Medical School Characteristics (59)	
Longitudinal Rural Training in Residency or Clerkship (37)	
Rural Rotations (26)	
Preferential Admissions (26)	
Attitudes about Rural Practice in Medical School (23)	
Choice of Residency Site (17)	
Rural Skills Loading (12)	
Early Visions of the Type of Doctor Students Want to become (11)	
PRACTICE	
Practice	Pay
Scope of Practice (10)	Fulfillment of Compulsory Services (14)
Innovative Practice Structure (5)	Financial Incentives (14)
Workload (4)	Adequate Amount and Mode of Remuneration (12)
Generalism (4)	Higher Salary (7)
Work	Medical School Loan Repayment (5)
Manageable Call Schedule (11)	Community
Flexible Hours (11)	Education System (10)
Locum Relief (8)	Integration into and Enjoying the Community (8)
Positive Work Environment (7)	Housing (7)
Collegiality of Physicians in Community (6)	Leisure Activities (6)
Professional	Feeling Appreciated by Larger Community (5)
Opportunity for Professional Development (14)	Regional
Research Opportunities (3)	Consultants (5)
Pursue a Professional Interest (1)	Regional Recruitment (4)
Legal Coverage (1)	Regional Support Networks (3)
System/Legislation	Assistance with Finding Spousal Employment (3)
Promotion (3)	Critical Access Hospital (2)
Burden of Bureaucracy (2)	
Involvement in Academic (1)	

factors [Table 2] were not deemed important predictors of rural recruitment or retention.

DISCUSSION

Rural background versus rural exposure – Are they one and the same?

Policies and processes that encourage/facilitate the admission of students who have a rural

background are one of the most well-documented strategies, leading to increased rural recruitment and retention.¹³ Being raised in a small town was one of the top three cited factors in the literature that lead to increased rural recruitment and retention. The advantage of coming from a rural background is having rural experiences to shape perception of rural living and practice. A rural background promotes stronger, more direct ties

from person to community;⁵ since this exposure happens before medical school, these students already have an idea of whether they are attracted or deterred from rural practice.

Studies differ on whether rural exposure in medical training remains predictive after adjustment for other factors. When controlling for rural background, Ranmuthugala *et al.* found that rural exposure in training was not a significant predictor of rural practice;¹⁸ however, another study showed that after controlling for other factors, both rural background and rural exposure during training independently impact the odds of working in rural practice.¹⁹

What driving factors are embedded during childhood rural exposure and can these factors be instilled in those without a rural background?

Rural background provides a connection to a community.⁵ However, rural exposure can also be a significant predictor of rural recruitment for urban-origin students;¹⁸ these students gain exposure from different experiences. We found that factors constituting rural exposure independent of rural background, such as having a rural partner, attending a rural medical school, rural undergraduate rotations, clerkship and residency, were also strongly cited predictors of rural recruitment. Urban-origin students felt that rural exposure during training helped them to feel appreciated and integrated into a community, leading to the development of a passion for rural practice.¹⁶ Exposing physicians to a rural lifestyle and practice during training may entice urban-origin trainees to practise rurally, even if it was not considered before, and this exposure may affirm whether rural practice suits them. More to the point, any rural exposure will not suffice; personalised matching to a practice and community suited specifically for the trainee will ensure the best rotation experience possible. Not surprisingly, it has been shown that a positive placement experience will attract a physician to rural medicine, whereas a negative experience will deter,^{8,9} particularly for students with no rural background and no solidified rural exposure from childhood to rely on.¹⁶ Ultimately, positive rural exposure, whether through background or training

placements, may be the ultimate attractor for rural practice, therefore highlighting the vital role of rural medical training in the recruitment and retention pathway.

Medical training – The missing link from person to rural practice

The three domains of recruitment and retention factors identified in this article fall into a sequential pattern: pre-medical school, medical school (medical training) and post-medical school. Within each of these domains, various factors have been frequently identified as important when attempting to increase the number of rural physicians. However, even though this information has been available for numerous years, there are still not enough family physicians choosing rural practice.¹ The problem could be that this continuum of recruitment and retention factors is being addressed in a piecemeal fashion, whereas a more holistic approach addressing multiple factors simultaneously might be more successful. Rural practice is currently viewed as homogeneous during medical training; preparing medical trainees for rural practice in general will entice them to choose a rural community for practice.¹⁵ However, once in practice, undesirable on-call schedules, inadequate considerations for families and not being integrated into the community are the factors that deter physicians and reduce retention. The communities are often blamed for not offering an attractive practice.^{9,16} To be retained, the rural community they choose must offer a practice that meets their desired 'wish list'.²⁰ The solution to this problem is not to promote homogeneous community practice but promote matching of students to these heterogeneous practices during medical training. It has been shown that physicians are more likely to practise where they train,⁹ so why not train physicians in a place they are more likely to practise? Enhancing continuity between the person and community practice through training may ensure that the appropriate physicians are matched to the appropriate community, based on their desires and individual circumstance. Testing students on their 'wish list' for practice and personal attributes may help to highlight community practices that would be a good fit. In a qualitative study, a rural physician explicitly

stated, 'we need to train physicians in the location that best approximates their future practice'.⁷

Limitations

This systematic review of reviews identified factors which are consistently reported as having a high degree of influence with regard to the recruitment and retention of physicians in rural and remote areas. We could not perform, or find articles, that included meta-analysis which is due to a lack of systematic reviews that reported summary statistics in a manner that would allow for the determination of which factors were found to be the strongest predictors and which showed inconsistent or weak associations.

A relatively small number of reviews reported that having a 'rural background', 'spouse with rural background' or having experienced 'rural training in residency or clerkship' were the strong predictors for rural and remote recruitment and retention. However, this was not corroborated by the majority of the reviews captured in our search. A deeper scan of the individual studies included in the captured reviews provided evidence that effect size, and statistical significance varied by location, time and sample size.

There is an inherent bias towards the older literature, as newer articles have fewer potential systematic reviews to be included in. We attempted to control for this bias by ensuring that each reference associated with a factor was only counted once, regardless of the number of reviews the reference appeared in. Furthermore, the quality of the information extracted from the review articles reflects the quality of the article itself.

CONCLUSION

The results of this systematic review of reviews revealed that the categories with the most influence over recruitment and retention were personal factors, training factors and practice factors, which relate to three different stages of a family physician's life: childhood experiences, educational experiences and in-practice experiences. To recruit and retain more physicians in rural and remote settings, it is important that policies are implemented to address all these three stages. With this, it is evident that future strategies must encompass and promote continuity across

all three of these phases to successfully increase the number of physicians who choose to work in rural practice. We anticipate that this review will be beneficial to policy and decision-makers alike, in that it will provide a clear and concise summarisation of the vast information that is currently available.

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Impact of telemedicine on diagnosis, clinical management and outcomes in rural trauma patients: A rapid review

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Abstract

Introduction: Rural trauma patients are at increased risk of morbidity and mortality compared to trauma patients treated in urban facilities. Factors contributing to this disparity include differences in resource availability and increased time to definitive treatment for rural patients. Telemedicine can improve the early management of these patients by enabling rural providers to consult with trauma specialists at urban centres. The purpose of this study was to assess the impact of telemedicine utilisation on the diagnosis, clinical management and outcomes of rural trauma patients.

Materials and Methods: A rapid review of the literature was performed using the concepts 'trauma', 'rural' and 'telemedicine'. Fifteen electronic databases were searched from inception to 29th June 2018. Manual searches were also conducted in relevant systematic reviews, key journals and bibliographies of included studies.

Results: The literature search identified 187 articles, of which 8 articles were included in the review. All 8 studies reported on clinical management, while the impact of telemedicine use on diagnosis and outcomes was reported in 4 and 5 studies, respectively. Study findings suggest that the use of telemedicine may improve patient diagnosis, streamline the process of transferring patients and reduce length of stay. Use of telemedicine had minimal impact on mortality and complications in rural trauma patients.

Conclusions: The evidence identified by this rapid review suggests that telemedicine may improve the diagnosis, management and outcomes of rural trauma patients. Further research is required to validate these findings by performing large and well-designed studies in rural areas, ideally as randomised clinical trials.

Keywords: Rapid review, rural, telemedicine, trauma

Résumé

Introduction: Les traumatisés en région rurale présentent un risque accru de morbidité et de mortalité comparativement aux traumatisés des établissements en région urbaine. Les facteurs qui contribuent à cette disparité sont les différences quant à la disponibilité des ressources et un délai prolongé avant d'accéder au traitement définitif chez les patients des régions rurales. La télémédecine améliore la prise en charge précoce de ces patients en permettant aux fournisseurs en milieu

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rural de consulter des spécialistes en traumatologie des centres urbains. Cette étude avait pour but d'évaluer l'impact de la télémédecine sur le diagnostic, la prise en charge clinique et les résultats chez les patients traumatisés en milieu rural.

Méthodologie: Un examen rapide de la littérature a été effectué à l'aide des mots-clés anglais « trauma », « rural » et « telemedicine ». La recherche a eu lieu dans 15 banques de données électroniques à compter de leur lancement jusqu'au 29 juin 2018. Des recherches manuelles ont également été effectuées dans les revues systématiques et publications scientifiques pertinentes et dans les bibliographies des études incluses.

Résultats: La recherche de la littérature a donné lieu à 187 articles, dont 8 ont été inclus dans la revue. Les 8 études portaient sur la prise en charge clinique, alors que l'impact de la télémédecine sur le diagnostic et les résultats a fait l'objet de 4 et de 5 études, respectivement. Les résultats des études laissent croire que la télémédecine améliorerait le diagnostic, simplifierait le processus de transfert des patients et raccourcirait le séjour. La télémédecine a eu un effet minime sur la mortalité et les complications chez les patients traumatisés en milieu rural.

Conclusions: Les données probantes relevées par cet examen rapide laissent croire que la télémédecine améliorerait le diagnostic, la prise en charge et les résultats chez les patients traumatisés en milieu rural. D'autres recherches sont nécessaires pour valider ces conclusions par l'entremise d'études d'envergure bien conçues menées en régions rurales, idéalement sous forme d'études cliniques à répartition aléatoire.

Mots-clés: rural, télémédecine, patients traumatisés en milieu rural, diagnostic des patients en milieu rural

INTRODUCTION

Trauma patients have better outcomes when they receive treatment at a major trauma centre in a timely manner.¹ Compared to patients injured in urban areas, rural trauma patients are less likely to be treated at a trauma centre and twice as likely to die before they reach hospital.² Potential reasons why rural trauma patients do not reach hospital or are treated outside a major trauma centre include delays in alerting or transport by emergency medical services, distance from the injury location or rural facility to the nearest trauma centre, high thresholds for rural providers to transfer patients and patient preference to remain close to their family and community.² Furthermore, rural facilities tend to have limited resources, including access to trauma specialists³ and technical equipment,⁴ which can lead to delays in diagnosis and definitive treatment, as well as increased interfacility transfers to specialised trauma centres.⁵

Delays to definitive treatment have a negative impact on survival and long-term morbidity following a traumatic event.¹ In light of the concepts of the 'golden hour' and 'platinum 10 min', improved patient outcomes following severe traumatic injury are possible with timely diagnosis and treatment.^{6,7} Telemedicine offers a solution to the challenges of rural trauma

care by connecting providers on the scene and at rural hospitals with experts at trauma centres for real-time advice on the management of trauma patients.⁸⁻¹² Since the turn of the 21st century, there has been a gradual proliferation of telemedicine applications for interactive, multimedia communication during various phases of trauma care, including pre-hospital (field evaluation and transport), in-hospital (emergency department [ED], inpatient, intensive care unit [ICU]) and follow-up/rehabilitation.¹³⁻¹⁶ When properly implemented, telemedicine has the potential to significantly improve rural trauma care by increasing access, decreasing costs and enhancing quality in areas of need.¹⁵ Although previous systematic reviews (SRs) have examined the use of telemedicine to treat and manage various patient populations,¹⁷⁻²⁰ none have focused specifically on the trauma population treated in rural areas.

The research question that guided this review was as follows: What is the impact of telemedicine utilisation on the diagnosis, clinical management and health-related outcomes of rural trauma patients?

MATERIALS AND METHODS

A rapid review was conducted to synthesise evidence regarding the impact of telemedicine on the diagnosis, management and health-related outcomes

of rural trauma patients. Rapid reviews are ‘a form of knowledge synthesis in which components of the SR process are simplified or omitted to produce information in a timely manner.’²¹ Rapid reviews follow all the steps of a state-of-the-art SR but truncate some of them to save time.²²

This rapid review followed the PRISMA guidelines and truncated on the grey literature search, quality assessment of included studies and double screening and data extraction (details are presented in the sections *Search criteria* and *Review process and data extraction*). The Participants, Intervention, Comparison, Outcome (PICO) that guided this review was as follows: (P) trauma patients, (I) treated with telemedicine in rural area, (C) any comparison and (O) diagnosis, management and patients’ health.

Search criteria

A search of the literature was conducted in September 2017 and updated in June 2018. The search strategy involved keywords specific for the following three concepts: (1) rural areas; (2) telemedicine and (3) trauma [Table 1]. No limits were placed on study location, publication date or language. A total of 15 electronic databases were searched; the search was launched on title and abstract. In addition, one reviewer hand-searched the bibliographies of all included studies, nine literature reviews on telemedicine in rural trauma^{19,23-30} and all issues of two relevant journals (*Journal of Telemedicine and Telecare*; *Telemedicine and e-Health*) that were published between 2010 and 2017. The hand search was performed by looking for a combination of keywords ([telemedicine AND rural] OR [telemedicine AND trauma]) in the title of each article; if found, the inclusion criteria were applied to the study abstract and full text. The references of any relevant articles identified via manual searching were also searched using the same approach.

Review process and data extraction

Two independent reviewers screened the search results by title and abstract using the reference management software Zotero. Original articles and abstracts published in peer-reviewed journals were eligible for inclusion. The

inclusion criteria were as follows: (1) empirical study; (2) experimental, before and after, interrupted time series, cohort or comparative research design; (3) use of telemedicine as an intervention in trauma patients; (4) reporting on diagnosis, clinical management or health-related outcomes and (5) rural hospital setting (as there is no widely accepted definition of rurality,³¹ the articles were included if the author defined the setting as being rural). Articles included in the initial screening process underwent secondary screening of the full text by one reviewer. Articles that contain any level of uncertainty were validated by a second reviewer.

A standardised data extraction form was designed in Microsoft Word and used by a single reviewer to collect the following information: study location, design, publication date, sample size, study population, injury types and type of telemedicine technology. Information reported on patient diagnosis or clinical management, as well as patient outcomes for mortality, complication rates,

Table 1: Search strategy (Launched September 2017 and June 2018)

Concepts	Keywords
Rural	Rural* OR remote* OR isolat* OR insulat* OR island* OR reserve* OR countryside* OR ‘non-metropolitan’ OR suburban* AND
Telemedicine	Telemedicine* OR telehealth* OR telemonitoring OR ehealth* OR ‘information technolog*’ OR teletrauma* AND
Trauma	Trauma*
Consulted databases	
Academic Search Premier	
Arctic and Antarctic Regions	
CINAHL Plus with Full Text	
CINAHL	
Communication and Mass Media Complete	
Communication Abstracts	
Computers and Applied Sciences Complete	
Ergonomics abstracts	
Human resources abstracts	
Library Literature and Information Science Full Text (H.W. Wilson)	
Library, Information Science and Technology Abstracts	
MEDLINE	
PubMed	
Social Sciences Full Text (H.W. Wilson)	
SPORTDiscus with Full Text	

length of stay (LOS) and interhospital transfers was collected. If there was any uncertainty during data extraction, a second reviewer was consulted to discuss the issue. Simple descriptive statistics were used to report the results.

RESULTS

Study characteristics

The literature search yielded a total of 187 results, of which 8 articles met the inclusion criteria [Figure 1].

Characteristics of the included studies are shown in Tables 1 and 2. Most studies ($n = 7$) were conducted in the United States;^{3,13,18,32-35} the remaining study was performed in China.¹⁷ Three studies were published before 2010, and 5 studies were published during or after 2010. Studies varied considerably in sample size and population. In each study, data were collected on trauma patients at multiple rural facilities, ranging from as few as 4 rural facilities¹⁵ to as many as 249 rural hospitals.¹⁷ In 6 articles, the study population included all types of trauma patients;^{3,13,17,32,33,35} the remaining 2 articles were limited to patients with head trauma³⁴ or burns.¹⁸

The predominant telemedicine technology used was a real-time audio–video connection between the referring rural hospital and the receiving

facility ($n = 6$). Three articles also reported asynchronous transmission of digital images or videos that could be stored and reviewed by physicians at the receiving facility. Three types of methodological approaches were used to test the impact of telemedicine on the evaluation, management and outcomes of rural trauma patients. The most prevalent method was to compare outcomes between patients treated with or without the support of telemedicine ($n = 5$). Two studies examined variations in diagnoses and decisions regarding patient management before and after use of telemedicine by physicians, and the remaining study compared video-enhanced telemedicine with telephone alone.¹⁸ Among studies that compared patient outcomes, with or without the use of telemedicine, patients in the telemedicine group tended to be more severely injured.

Diagnosis

Wang *et al.* examined rural injuries involving a telemedicine consult and found that this led to a change in diagnosis for 29.3% of patients and a change in treatment for 61.4% of patients. In 66.5% of cases involving treatment changes following a telemedicine consult, the change was not due to a change in diagnosis, leading the authors to suggest that even when the primary care physician made the correct diagnosis, the prescribed therapy was often inappropriate.¹⁷ Following implementation of telemedicine, Duchesne *et al.* reported improved radiological evaluation and earlier identification of severely injured patients.³ Mohr *et al.* observed no difference in the ordering or use of computed tomography (CT) scans and chest X-rays at the first ED with telemedicine use,³⁵ however, in the hospitals where telemedicine was available, there was an increased use of CT scans (adjusted odds ratio [aOR] 1.6, 95% confidence interval [CI] 1.3–1.9) and X-rays (aOR 1.3, 95% CI 1.1–1.5). In a second study, Mohr *et al.* found that moderately injured patients (injury severity score (ISS) 4–8) were more likely to receive a telemedicine consultation (aOR 1.45, 95% CI 1.05–2.01).³²

Clinical management

All 8 studies in this review reported on patient transfers [Table 2]. Two studies observed

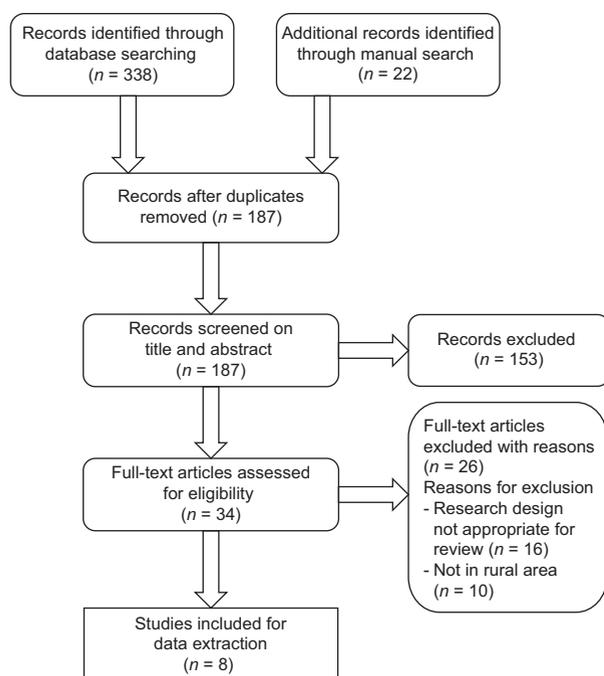


Figure 1: Flow diagram.

Table 2: Summary reporting table

Reference	Country (city)	Date	Injuries	Design	Sample size	Telemedicine system	Results
Doheny-Farina (2003) ¹³	USA (Vermont and New York)	April 5, 2000-June 29, 2001	Different trauma injuries	Comparison of outcomes between patients treated with and without telemedicine	19 patients treated with telemedicine 266 patients not treated with telemedicine	Interactive video telemedicine system	No impact on complications No impact on LOS No greater mortality rate
Duchesne (2008) ³	USA (Mississippi)	January 2000-January of 2005	Different trauma injuries	Retrospective comparison of patients' outcomes before and after the implementation of telemedicine	351 patients before implementation of telemedicine 51 patients after implementation of telemedicine	Dual video cameras with remote control capability and audio	Improvement of evaluation and management of trauma patients More severely injured trauma patients were identified No impact on mortality Decreased LOS Decreased transfer time
Mohr (2017) ³²	USA (North Dakota)	2008-2014	Different trauma injuries	Comparison of outcome between patients treated with and without telemedicine	2536 patients not treated with telemedicine 301 patients treated with telemedicine	Two-way high-definition audio-video connection	Tele-trauma consultations were requested for the most severely injured patients No impact on interhospital transfers
Mohr (2018) ³³	USA (North Dakota)	2008-2014	Different trauma injuries	Comparison of outcome between patients treated with and without telemedicine	4838 patients where telemedicine was unavailable 2662 patients where telemedicine was available 2371 patients not treated with telemedicine when it was available 291 patients treated with telemedicine	Two-way high-definition audio-video connection	Decreased LOS for transferred patients Increased CT use Increased X-ray use No impact on mortality rate

Contd...

Table 2: Contd...

Reference	Country (city)	Date	Injuries	Design	Sample size	Telemedicine system	Results
Moya (2010) ³⁴	USA (New Mexico)	November 2007-October 2008	Head trauma	Changes of decision by the consulting physician concerning the patient transfer and management before and after reviewing the digital images.	39 patients	Transmission of digital Brain and spine images	Decreased in transfer Recommended management changes
Ricci (2003) ³⁵	USA (Vermont and New York)	April 2000-November 2002	Different trauma injuries	Comparison of outcome between patients treated with and without telemedicine	41 patients treated with telemedicine 762 patients not treated with telemedicine	Audio-video connection	No impact on time between injury and arrival at referral trauma centre No impact on LOS Slightly more complications Increased mortality rate Patients treated with telemedicine had higher ISS
Wang (2016) ¹⁷	China (Western regions of China)	May 2002-December 2013	Different trauma injuries	Diagnosis and treatment changes before and after the teleconsultation	11,987 patients	Two-way video and image Transmission	Increased chances of major diagnostic change Increased chances of treatment change Most treatment changes were not due to diagnostic change
Wibbenmeyer (2016) ¹⁸	USA (Iowa)	January 2012-January 2014	Burn patients	Comparison of outcome between patients treated with and without telemedicine	204 patients treated with telephone only 78 patients treated with telemedicine	Transmission of videos of patients' injuries	Greater accuracy to correctly classify burn size More accurate initial resuscitation and triage decisions More changes in admission

ISS: Injury severity score, LOS: Length of stay.

a reduction in transfer time with use of telemedicine. Duchesne *et al.* found that telemedicine helped physicians to quickly identify and transfer severely injured patients, which resulted in decreased transfer time (1.7 h vs. 13 h, $P < 0.001$).⁵ Mohr *et al.* reported that telemedicine use was associated with earlier arrival at the final hospital (mean difference 33.6 min, 95% CI 15.2–52.1 min).³⁵ In 2 other studies, there was no difference in transfer time between patients treated with or without telemedicine.^{13,35} In their study comparing the use of video-enhanced telemedicine versus telephone telemedicine in burn patients, Wibbenmeyer *et al.* found no difference in the proportion of patients transferred by air, ground or private transport.¹⁸ The authors reported that compared with telephone alone, use of video-enhanced telemedicine decreased over- or under-resuscitation and increased triage changes in transport mode.¹⁸ Video-enhanced telemedicine also improved the ability of charge nurses to estimate burn size, but this difference was not significant.

The likelihood of patient transfer was examined in 2 studies by Mohr *et al.*;^{32,35} in both studies, telemedicine use was not associated with interhospital transfer after adjusting for confounding variables. There were 2 studies that examined the proportion of rural trauma patients transferred after a telemedicine consultation was performed. Wang *et al.* observed that 2.8% of injured patients were transferred after a telemedicine consult.¹⁷ Moya *et al.* reported that consulting neurosurgeons initially believed 64% (25/39) of referral requests required transfer; however, only 36% (14/39) of these patients were actually transferred after the neurosurgeons performed a review of web-based images.³⁴ Finally, Moya *et al.* observed that use of telemedicine resulted in recommendations for management changes in 44% (17/39) of cases treated in rural EDs.³⁴

Outcomes

Table 2 shows the impact of telemedicine use on outcomes among rural trauma patients. There were 4 studies which reported on mortality; in 3 of these studies, there was no difference in mortality with the use of telemedicine.^{5,13,35} In the remaining study, Ricci *et al.* observed a higher mortality rate

in patients treated using telemedicine (25% vs. 9%, $P = 0.003$).³⁵ However, after controlling for injury severity, the difference in mortality was rendered insignificant (8.8% vs. 5.7%, $P = 0.41$). Only 2 studies reported on complications;^{13,35} neither study found a difference in complications with the use of telemedicine.

In 4 studies, the authors evaluated the impact of telemedicine on LOS in rural trauma patients. Two of these studies found that LOS was decreased with use of telemedicine. Duchesne *et al.* reported that on average, the LOS at the local community hospital of patients treated with telemedicine was 1.5 h versus 47 h for those treated without this technology ($P = 0.001$).⁵ Mohr *et al.* found that compared to patients treated without telemedicine, ED LOS for transferred telemedicine patients decreased by 29.6 min (95% CI 14.1–45.1 min) but was not decreased among non-transferred telemedicine patients (mean difference 9.3 min, 95% CI 11.7–30.2). The telemedicine network in this study by Mohr *et al.* used a hub-and-spoke architecture which connected rural providers to a board-certified ED physician and nurse 24 h a day. The authors suggested that the decreased ED LOS they observed among transferred patients likely reflected the ability of the telemedicine hub staff to mobilise transportation resources faster than local providers, even while bedside providers performed the initial evaluation and resuscitation.³⁵ The other 2 studies did not observe a difference in LOS at the referral trauma centre with the use of telemedicine.^{13,35}

DISCUSSION

As the reality of rural and urban healthcare facilities differ in many ways,²⁻⁵ scientific evidence should, when deemed relevant, acknowledge these distinctions and provide information that relates distinctively to rural or urban healthcare centres. Numerous studies have investigated the use of telemedicine in a variety of environments and patient populations, yet evidence on telemedicine utilisation in rural trauma care specifically is still lacking. This rapid review is the first study to systematically examine the impact of telemedicine on the diagnosis, management and outcomes in trauma care treated in rural areas. Our results demonstrate that use of telemedicine had minimal impact on patient mortality, but it improved patient

evaluation and diagnosis, decreased transfer time and reduced LOS in some studies. These findings suggest that the use of telemedicine can improve certain types of care provided to rural trauma patients.

Telemedicine platforms link rural providers with specialised trauma centres to better evaluate and manage trauma patients.³⁴ This is especially important for seriously injured patients who can be challenging to evaluate due to lower levels of consciousness and the complex nature of traumatic injuries.^{36,37} Previous research has demonstrated that it is feasible for surgeons at a tertiary centre to view and guide trauma resuscitations in rural facilities using real-time tele-ultrasound.¹⁴ Several of the studies included in this review reported that trauma patients who were treated with telemedicine had higher injury severity score (ISS) scores.^{3,13,32,33} This may be explained by the fact that rural physicians are more likely to seek help in cases involving severely injured patients, where rapid management is critical and potentially lifesaving. It has been shown that diagnostic or management errors happen more frequently during the initial steps of resuscitation.³⁸ These errors can have serious consequences for the patient such as additional surgical procedures, permanent disability or even death.^{37,39}

Interestingly, a number of studies in this review showed that use of telemedicine can improve the process of transferring rural trauma patients.^{3,33,34} It is known that for similar patients, rural facilities are more likely than urban centres to transfer trauma patients, especially those with head or neck injuries.⁴⁰ Having access to specialists at a tertiary facility can enable faster triage and patient transfer^{41,42} and better prepare providers at the trauma centre to receive the patient.³⁴ Although transferring a patient may be necessary, it is often a stressful, unpleasant and even scary transition for the patient, who is in a vulnerable state.⁴³ Delays in transfer can contribute to poor patient outcomes. Experienced physicians rarely accompany the transferred patient during transport; if a physician does travel with their patient, it takes away a key resource from the rural facility.⁴⁴ Importantly, telemedicine can help to reduce the number of transfers by enabling trauma patients to be treated in rural hospitals.³⁴ Keeping manageable patients in the rural ED can positively impact resource use by

reducing unnecessary transports and admissions to an urban trauma centre. Further study is warranted to evaluate the use of telemedicine to minimise unnecessary transfers among rural trauma patients.

An earlier systematic review of telemedicine applications found that most studies were focused on diagnosis, while relatively few assessed clinical management or patient outcomes.⁴⁵ By comparison, the 8 articles identified in our review of telemedicine utilisation in rural trauma were predominantly focused on clinical management. Patient outcomes were reported in 5 articles, and the findings of these studies suggest that telemedicine may reduce LOS in rural trauma patients but has minimal effect on mortality or complications. Although patients who had telemedicine consults did receive specialised care from providers at a trauma centre, they also tended to be more severely injured; the balance of these two factors may partly explain the observed minimal effect of telemedicine on complication and mortality. There is evidence that telemedicine can reduce mortality when applied to other settings, including prehospital diagnosis of ST elevation myocardial infarction,⁴⁶ the ICU,⁴⁷ and progressive care units.⁴⁸

In addition to improving patient outcomes, the application of telemedicine also has great potential to enhance the education of providers at rural facilities.⁴⁹ Telemedicine offers a solution that addresses disparities in access to trauma education by enabling them to connect, interact and learn from trauma specialists. Future directions of telemedicine initiatives involve broader use of these technologies in the prehospital setting and providing informatics that allow trauma specialists to respond to consultation requests anywhere where they have a smartphone with internet reception.⁵⁰

This study has some limitations. Our search strategy identified a small number of studies which varied considerably in research design, telemedicine systems and measures related to care of the rural trauma patient. Moreover, there was variation in rural settings and institution-based application of telemedicine to rural trauma care, further limiting the generalisability of our findings. Finally, as this was a rapid review of the literature, we did not search for grey literature or appraise study quality of included articles.

Due to the fact that it was a rapid review, some steps were truncated. In their study that compared rapid reviews and SRs, Reynen *et al.* found that even if there exist differences in terms of quality and exhaustivity, the conclusions drawn from the rapid reviews were generally similar to those of the full SRs.⁵¹ Rapid reviews were also found to be useful for decision-makers as they are used to inform the decision-making process.²¹

CONCLUSIONS

The findings of this rapid review suggest that the use of telemedicine can improve the diagnosis, management and outcomes of rural trauma patients. While these results are promising, further research is required to validate these findings through the conduct of large-scale well-designed studies, ideally as randomised clinical trials.

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The occasional bougie-assisted cricothyroidotomy

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Management of the difficult airway may be anxiety provoking for any clinician. Furthermore, predicting 'difficulty' can be problematic as endotracheal intubations that appear difficult (i.e. from an anatomic perspective) often proceed without complication, while seemingly simple intubations prove challenging.¹ Fortunately, most airways can be effectively managed by focusing on oxygenation, ventilation and basic techniques (i.e. effective bag-valve-mask ventilation [BMV] or extra-glottic device [EGD] placement) and not by focusing on 'putting a piece of plastic in the trachea' above all else (Dr George Kovacs, Personal Communication 4th June 2019). Still, emergency department intubation is successful the vast majority of the time, although, complications increase significantly with multiple attempts.^{2,3} Nonetheless, there are situations, most notably in case of upper airway obstruction (e.g. trauma, anaphylaxis, epiglottitis and mass), where BMV and EGDs may prove to be unsuccessful rescue techniques for failed intubation. In these 'can't intubate – can't oxygenate' (CICO) scenarios, the ability to perform a surgical airway is an essential skill for

anyone called upon to perform airway management.^{1,4}

The cricothyroidotomy is the most common emergent surgical airway management technique for non-surgeons. Classically, two techniques have been described:

1. An 'open' surgical technique
2. The needle cricothyroidotomy performed using the Seldinger technique.^{1,4-8}

Both techniques can be technically challenging in the highly charged CICO scenario. More recently, the bougie-assisted cricothyroidotomy (BAC) has been described.⁵⁻⁷ The advantages of this technique include relatively few, straightforward steps that do not require as much fine motor control as other techniques.^{1,5-7} Some authors have also argued that the use of bougie as a tracheal introducer facilitates true endotracheal placement in front of the neck access (FONA) avoiding the creation of a false passage and facilitates passage of the endotracheal tube cuff through the tight stoma created by the open technique.⁷ The BAC uses materials that should be available in every environment where airways are managed (10 blade scalpel, bougie, #6 or #6.5 endotracheal tube). Further, in

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rural environments, where back-up (i.e. surgery and anaesthesia providers) and advanced technologies (i.e. flexible fibre-optic endoscopes) are often less available, a simple technique for the surgical airway, using readily available materials, is desirable. There remains some debate among clinicians as to supremacy of the BAC technique versus the needle cricothyroidotomy in the CICO situation.^{1,8} Nonetheless, in controlled trials using animal models, the BAC has been reported to be faster, and preferred, with a similar failure rate among novice providers, and preferred with a lower failure rate and lower complication rate than other techniques (i.e. the Portex Cricothyroidotomy Kit) among experienced providers.^{7,9} Still, clinicians should perform the technique with which they are most comfortable, with the BAC providing a simple, fast and potentially more reliable option for this rarely performed procedure.

INDICATIONS

1. 'CICO scenario'
2. Glottic or supra-glottic airway obstruction
3. Three failed intubation attempts without adequate oxygenation and ventilation by other means
4. Semi-elective indications: Massive facial trauma, maxilla-mandibular fixation (i.e. jaw wired shut).

CONTRAINDICATIONS

1. Absolute: <8 years old or airway anatomy not conducive to cricothyroidotomy
2. Relative: expanding neck hematoma, massively distorted anatomy and lack of appropriate skill.

ANATOMY

In the anterior midline neck, the cricothyroid membrane (CTM) is a thin, subcutaneous structure approximately 1 cm in length, stretching from the inferior thyroid cartilage to the cricoid cartilage [Figures 1 and 2]. Few critical structures (e.g. blood vessels, thyroid) overlie it in its most central and anterior positions.^{4,10,11} The thyroid typically lies inferiorly and laterally to the CTM, and major blood vessels (e.g. carotid

artery) also tend to lie relatively lateral. Smaller blood vessels (e.g. anterior jugular vein and cricothyroid artery) and the vertically oriented pyramidal lobe of the thyroid may often be found more centrally and superiorly and may be injured during FONA.¹⁰ As such, the operator should expect bleeding once a vertical incision is made.^{10,12}

MATERIALS

1. Gloves, personal protective equipment, chlorhexidine if time permits
2. #10 Scalpel blade and handle – Pre-loaded scalpels are helpful in the stressful case of CICO [Figure 3]
3. Bougie tracheal introducer – A variety of different kinds can facilitate this technique
4. 6.0 or 6.5 Endotracheal tube – The smallest that will fit over the bougie at your institution
5. 10 cc syringe
6. Self-inflating bag connected to an oxygen source
7. End-tidal CO₂ detection – Either colorimetric or continuous quantitative.

PROCEDURAL STEPS

1. Position yourself *facing the patient* at the level of the *shoulders* on the *same side of the patient as your dominant hand* (R-handed clinician on the R side of the patient)¹²
2. Lay the patient flat and *hyperextend the neck* [Figure 2]
Note: In trauma, you should not vigorously hyperextend the neck due to concerns about cervical spine control, but gentle extension to access the anatomy is indicated. Success in this procedure is paramount¹²
3. Landmark by placing the thumb and middle finger of your non-dominant hand on opposite sides of the thyroid cartilage and *place your index finger on the CTM* [Figure 4]. Palpating down from thyroid notch and up from the sternal notch can be helpful to confirm CTM position. If time permits, ultrasound may be used to assist with land-marking, but this is probably best done as part of the operator's preparation before intubation^{4,12-15} [Figures 5-7]
4. Make a 3–5 cm vertical incision across the *CTM* [Figure 8].^{4,12} Cut from just below the thyroid notch to the cricoid ring. Blunt, dissect

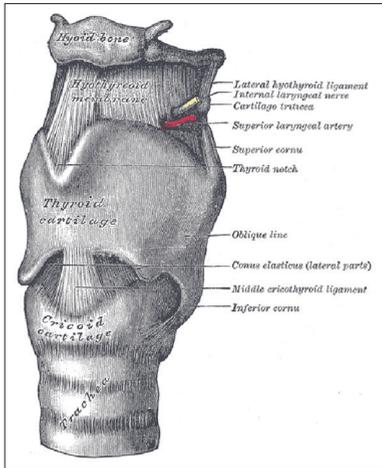


Figure 1: Source: Gray's Anatomy. Henry Gray (1918) anatomy of the human body.

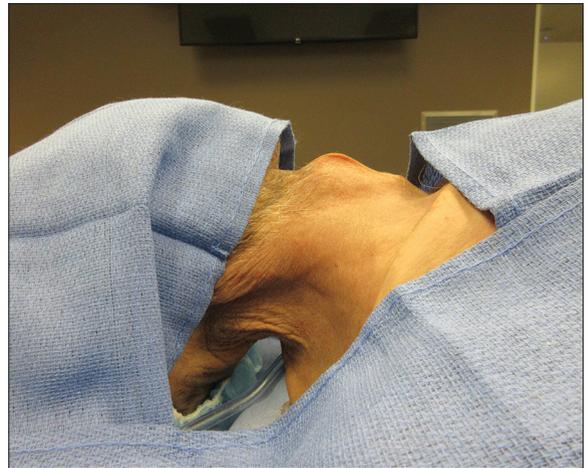


Figure 2: Surface anatomy: neck extended-thyroid cartilage, cricothyroid membrane, cricoid ring.



Figure 3: The minimal materials required to perform a bougie-assisted cricothyrotomy.



Figure 4: Primary palpation: index finger of non-dominant hand palpates cricothyroid membrane.

and *re-palpate the CTM* with the index finger of your non-dominant hand [Figure 9]. Some experts suggest omitting this step, if the CTM is readily identifiable, to prevent bleeding, *but this is generally a blind palpation-based technique not based on visualisation*. A single horizontal incision may result in inappropriate land-marking and extra-tracheal incision

5. Make a *horizontal stab incision in the middle of the CTM* [Figure 10]. *Leave the blade in place*. Rotate it 90° so the sharp end is caudad and *sweep it gently to each side of the trachea* in lieu of a dilator. Hold it firmly on the side of the

trachea opposite of you to maintain access to the stoma and facilitate bougie passage into the lumen [Figure 11]. You may choose to carefully re-palpate with your dominant index finger to ensure endotracheal position

6. Once confident you are in the tracheal lumen, use your non-dominant hand to pass the bougie (Coude tip down) into the trachea, approximately 10–12 cm until it stops or meets resistance [Figure 12]. You may feel tracheal clicks
7. 'Railroad' the 6.0 or 6.5 endotracheal tube over the bougie until the thick black markings just above the balloon (usually denoting the level of the vocal cords) are a few centimetres inside the trachea [Figure 13]. Make sure you do not unilaterally intubate one of the lungs. The surgical stoma can be tight. *Some pressure, rotation and gentle wiggling* may be required to



Figure 5: Ultrasound-guided identification of the cricothyroid membrane using a linear array probe in the midline between the thyroid notch and cricothyroid membrane. Probe indicator is aimed cephalad.



Figure 6: Ultrasound-guided image of the cricothyroid membrane. The cricothyroid membrane is the higher, mildly angulated hyperechoic structure just left of the midline on this image. It is between the thyroid cartilage (the hypoechoic circular structure on-screen left) and the cricoid cartilage (the small circular structure in the middle of the image with ring-down artefact). The small semi-circular structure with ring-down artefact on the extreme right of the screen is characteristic of tracheal rings.



Figure 7: The asterisk indicates the area palpated by the surgeon to find the cricothyroid membrane. The red circle shows the cricothyroid membrane identified by ultrasound. Source: Okano *et al.*^[15]

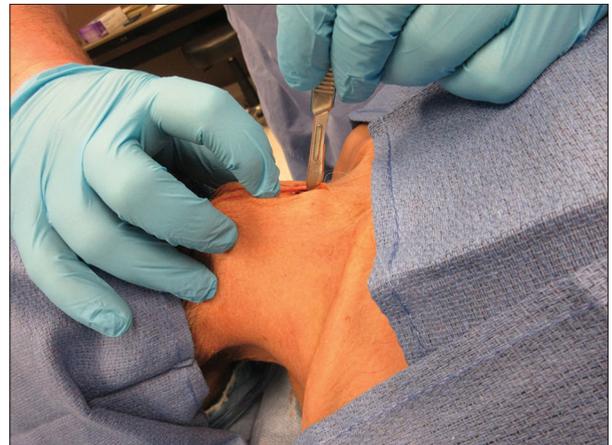


Figure 8: A 3–5 cm vertical incision is made over the cricothyroid membrane.

get the endotracheal tube cuff to pass into the trachea⁸

8. Once the tube is appropriately positioned, blow up the cuff until the pilot balloon is firm
9. Apply a self-inflating bag with end-tidal CO₂ detection. Confirm intubation with colorimetric or continuous end-tidal CO₂ detection, symmetric chest rise and auscultation
10. In most cases, it is recommended that the operator simply holds the 6.0 endotracheal tube in place at the level of the stoma until oxygenation and ventilation have been corrected [Figure 14] (Dr George Kovacs, Personal Communication, 4th June 2019). Once corrected and relative calm is restored, secure the endotracheal tube in place using sutures, tape or twine. A large amount of endotracheal tube will be left outside the

patient. Consider cutting the tube, or securing it along the neck, with a leash similar to a chest tube. A commercial endotracheal tube securing device may be particularly useful if available [Figure 15]

11. Initiate usual post-intubation care, including sedation and titration of the ventilator.

COMPLICATIONS

- Common: failure or incorrect tube placement, bleeding, thyroid or cricoid cartilage fracture, tracheal laceration/perforation, airway obstruction and subcutaneous emphysema



Figure 9: Secondary Palpation: Re-palpate the cricothyroid membrane after the vertical incision. This is crucial to ensure appropriate land-marking in obese, bearded, bleeding patients or those with distorted neck anatomy (e.g. abscess, mass).

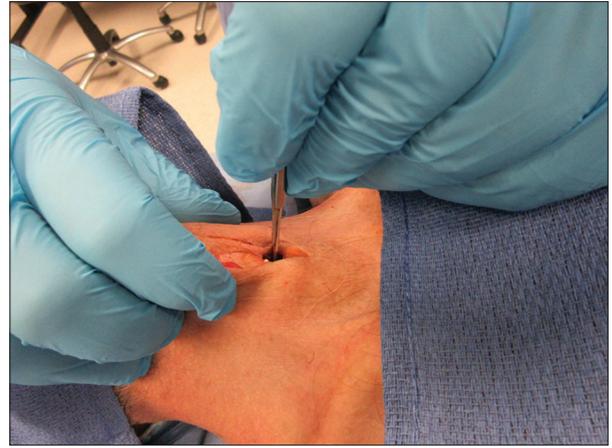


Figure 10: Horizontal stab incision through the cricothyroid membrane. Rotate so that the sharp end of the blade is caudad.



Figure 11: Maintain the stoma and facilitate bougie passage by gently anchoring the 10-blade opposite of the operator.

- Uncommon: Oesophageal injury, pneumothorax, pneumomediastinum, aspiration.

TIPS AND TROUBLESHOOTING

Making the decision to perform a surgical airway

It has been said that ‘the most difficult thing about a surgical airway is the decision to perform it’. (Dr George Kovacs, Personal Communication, 4th June 2019). This may be the case and the decision will depend on many factors, including recognition and declaration of the CICO situation, the availability of alternate providers and techniques, as well as provider confidence in success. Numerous things may assist with



Figure 12: Pass the bougie into the trachea until ‘hold up’ is appreciated.

appropriate decision-making and successful performance of a surgical airway, including ‘overlearning’ (i.e. practising until procedure or thought process is automatic) the cognitive and procedural skills required to recognise the need for a BAC and the technical skills to perform it.¹⁶ In addition, *cognitive aids* (e.g. checklists) and a *declared airway plan* that creates a ‘shared mental model’ (i.e. make sure your nurses and respiratory therapists know the plan and will speak up to remind you!) may assist with recognition of the need to perform this procedure. A pre-made surgical airway kit located prominently in your resuscitation bay may also prompt providers to think of performing this procedure and decrease the time and stress associated with gathering materials [Figure 16].



Figure 13: Railroad the 6.0 endotracheal tube over the bougie until vocal cord line above the cuff is a few centimetres into stoma. Be careful not to put the tube in too deep (i.e. mainstream the endotracheal tube).



Figure 14: Remove the bougie and firmly hold the tube in place while restoring oxygenation and ventilation.

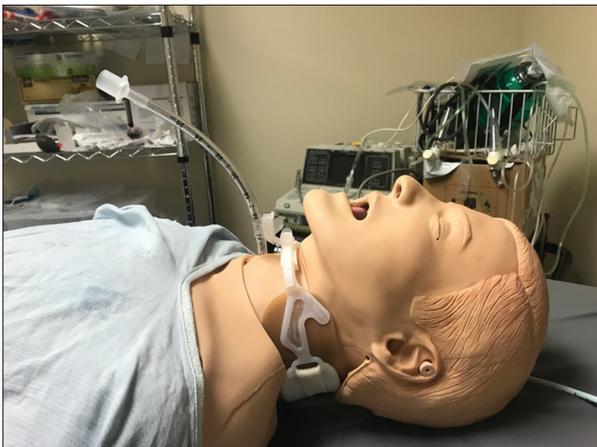


Figure 15: A commercial endotracheal tube securing device holding the endotracheal tube post-bougie-assisted cricothyroidotomy (The AnchorFast by Hollister Incorporated. No conflicts of interest, e.g., financial).

Stabilising the larynx and finding the midline – ‘The laryngeal handshake’?

A recent consensus article sourced from airway experts suggests the popular term, ‘laryngeal handshake’, is non-specific and not helpful in teaching the BAC.^{6,17} The Laryngeal handshake involves a provider taking a firm grasp of the larynx with the non-dominant middle finger and thumb, and gently rocking it from side to side. We believe this manoeuvre can be helpful to ensure an operator is in fact grasping the larynx, that the larynx itself is held in the midline and that subsequent incisions are also made in the midline in order to avoid critical structures. A trial among anaesthesiologists showed that the laryngeal handshake method

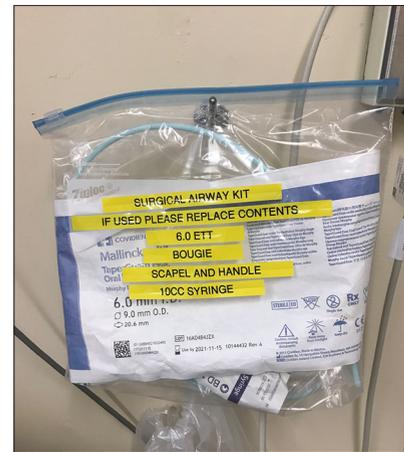


Figure 16: A pre-collected bougie-assisted cricothyroidotomy kit can ensure all materials are readily available and be a cognitive cue to perform the procedure under the appropriate circumstances.

took slightly longer for land-marking but was more accurate.¹⁸

Expect bleeding

Bleeding is an expected effect of the vertical incision made to facilitate secondary land-marking by palpation.^{10,12} Although 4 × 4 gauze should be available for assistance with momentary compression and bleeding control in between the vertical and horizontal incision, the clinician is reminded that this is largely a blind, palpation-based technique and that relying on visualisation may be problematic.

Securing the tube

In performing FONA using a typical endotracheal tube, the clinician performing a BAC has skipped

the length of the oropharynx and the tube needs only to be inserted 5–10 cm depending on neck depth. This can leave a considerable length of endotracheal tube emanating from the stoma. The excess tube can be cut pre- or post-insertion, be secured with a leash in a longitudinal fashion along the neck (similar to a chest tube) or simply be secured using a commercial tube securing device [Figure 15]. However, simply holding the tube at the stoma until oxygenation and ventilation have been corrected has face validity and is recommended by airway experts (Dr George Kovacs, Personal Communication, 4th June 2019).

Paediatric patients

Remember that the BAC can only be performed on patients with adequately developed CTMs and enough space to safely and successfully pass a bougie and endotracheal tube through the stoma created.^{4,12} This generally means that patients must be at least 8 years old and sometimes older. Transtracheal jet insufflation along with optimising other techniques (BVM and EGD) and/or a reattempt at orotracheal intubation should be considered for children without the cricothyroid complex development necessary to perform a BAC.

Procedural competency and skill maintenance

The CICO scenario, necessitating emergent surgical airway management, is a rare, stressful and high-risk situation.^{1,4,6,9,12,19,20} It is unlikely that clinicians will perform sufficient *in-vivo* procedures to be competent or display mastery of the emergent surgical airway by accumulated clinical experience alone.^{6,19-22} As such, ‘deliberate practice’ (iterative, structured, practice with feedback and subsequent skill refinement) and ‘mastery learning’ (iterative practice of progressive ‘microskills’ - e.g. mastering CTM identification before practising the vertical incision in BAC) involving task trainers and cadaveric models may represent an important way to achieve procedural competency with the BAC.^{16,20-22} This is currently under study.²² ‘Mental rehearsal’ (i.e. mentally reviewing the procedural steps, visualising the procedure) and ‘overlearning’ (i.e. practising until procedural steps are automatic and require minimal cognitive effort) may also represent ways to maintain competency and improve performance of the BAC.^{16,21-23} As cadavers may be difficult

to access (i.e. increased cost, limited availability and travel to institutions capable of cadaveric preparations), open-source 3D-printed task trainers represent a viable alternative [Additional Resources] for practising the BAC.

CONCLUSION

The surgical airway is a rare, but life-saving procedure performed in high-stress situations. Regardless of the chosen technique, considerable cognitive and psychomotor skill, as well as situational awareness, is required to perform it effectively. The BAC is a relatively simple technique that de-emphasises fine motor control compared to other techniques and takes advantage of a commonly used tracheal introducer device (i.e. the bougie). This technique, combined with appropriate training and practice, provides an attractive option for FONA in the case of CICO, or significant upper airway obstruction.

Additional resources

For full-length videos of the procedure see:

Trauma Nova Scotia Procedure Videos: <https://www.trauma-ns.com/trauma-procedure-videos>.

AIME Airway YouTube Channel: <https://www.youtube.com/watch?v=8XDE9pBdrqU>.

To practice the BAC with an open-source 3D Printed Task Trainer see here: <https://www.thingiverse.com/thing:2530474> or here <http://www.airwaycollaboration.org>.

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Erysipelothrix rhusiopathiae and contact with snow crab

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Dear Editor,
We read the report by Wilson *et al.* with great interest.^[1] The case is a patient who is a crab fisherman and butcher.^[1] Wilson *et al.* mentioned snow crab (*Chionoecetes opilio*) as a known carrier of *Erysipelothrix rhusiopathiae*.^[1] In general, *E. rhusiopathiae* is observable in several animals.^[2] In the present case, the patient might have got the pathogen from other sources, because the patient is a fisherman and had the opportunity to be in contact with many animals. Regarding snow crab (*C. opilio*), there is no report that it is a common source of *E. rhusiopathiae*. Indeed, crab is a rare possible source of *E. rhusiopathiae*. A good example is the report by Ognibene *et al.*^[3] Nevertheless, there has never been any previous case report of *E. rhusiopathiae* infection due to *C. opilio* contact according to the literature, after a search on PubMed. Finally, Wilson *et al.* noted that “the organism has been reported as infecting humans and other animals since the late

19th century.”^[1] The first confirmation that this pathogen causes human disease is by Rosenbach in 1909, which is in the 20th century.^[4,5]

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Authors' Reply

Dear Dr. Sora Yasri,

Thank you for your reply to our case report^[1] and your interest in our publication. We greatly appreciate the engagement from across the globe. You raise a valid point that while *Erysipelothrix rhusiopathiae* has been described in several cases to be transmitted via crabs, as in Gilchrist,^[2] it has not specifically been noted in *Chionoecetes opilio*. As such, it may not be accurate to attribute the infection directly to *C. opilio*, given the large number of shellfish species and other animals that our patient may have come into contact with (including other species of crab) which could have been the culprit. To your second point, this was largely poor phrasing on our part as we were referring to the first known isolation of *E. rhusiopathiae* in either animals or humans, which was by Loeffler,

who isolated the bacteria in swine erysipelas in 1886.^[3]

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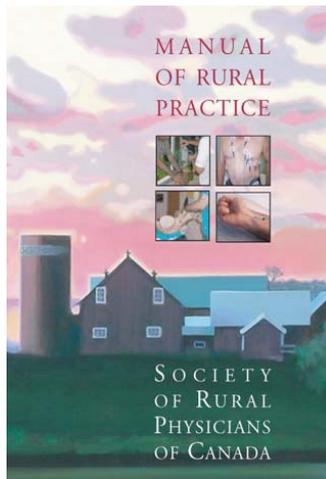



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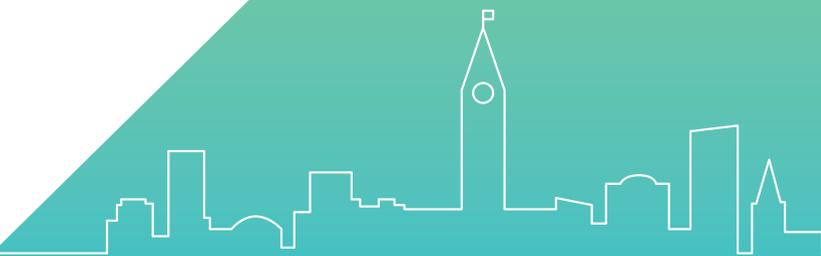
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