



Optimal Perinatal Surgical Services for Rural Women: A Realist Review

Prepared for BC Ministry of Health and Perinatal Services BC by the

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Executive Summary

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Overview

The Ministry of Health's 2012 province-wide key stakeholder consultations to establish a set of consensus-derived action items for a provincial primary maternity care agenda resulted in a series of short term 'action items'. One such issue focused on resolving tensions within the medical community regarding GPs with Enhanced Surgical Skills and their role in sustaining perinatal surgical services for rural women. Any reasoned debate about these issues, however, demands a rigorous review of the international literature. Collaboratively, we focused this review on evidence illuminating centralized and decentralized models of perinatal surgical care, specifically answering the question,

Can we meet the perinatal surgical needs of rural women more effectively through an optimally centralized or optimally decentralized model of care?

Exploring what is known from BC, Canada, and other jurisdictions in a systematic and comprehensive way will provide the scaffolding on which to build a framework to address conditions in British Columbia.

Context of the Review

In addition to the recent Primary Maternity Care Plan, perinatal planning in British Columbia has been conceptually guided by a report authored by Justice Peter Seaton in response to the Royal Commission of Health Care and Costs which recommended "[m]edically necessary services... be provided in, or as near to, the patient's place of residence as is consistent with quality and cost-effective health care" (B.C. Royal Commission on Health Care and Costs 1991: A-6). This recommendation was made based on a recognition of the challenges rural residents face in accessing health care, including insufficient supply of providers, inappropriate emergency services and the cost incurred by patients forced to travel for treatment (B.C. Royal Commission on Health Care and Costs 1991), and the belief that a decentralized health care system would better respond to many health needs within rural and remote communities. Although subsequent reports qualified this original directive, the spirit and intent have remained.

Solutions for Rural Communities

The fundamental challenge to providing operative backup for deliveries in rural communities internationally is lack of availability of surgical providers (Homan, Olson and Johnson 2013).

This has become the reality in rural British Columbia, and the solution pursued worldwide is to increase the supply of rural generalist surgeons, including training more General Practitioners with Enhanced Surgical Skills and involving more

General Surgeons in the delivery of perinatal surgical services. The relatively small procedural volumes of these programs, however, are associated with important issues regarding program sustainability – which deter specialist practice – including the challenge of maintaining competence for the professional staff, lack of opportunity for intensive application of practitioners’ skills, restriction on the numbers of skilled providers that can be supported by the local service demand (leading to vacation and on-call relief problems), and programs associated with high unit costs. **Considering the research evidence from international jurisdictions provides insights into how these issues relating to safety and sustainability may be addressed.**

Methods and Approach

This research synthesis was undertaken using the established methodology of a realist review (Pawson et al 2005), the intent of which is to “take the dynamically changing policy landscape into consideration to identify the issues as opposed to the generalization truths” (Pawson et al 2005). The reviewer (Applied Policy Research Unit, Centre for Rural Health Research) and commissioners (Ministry of Health and Perinatal Services BC) met several times to discuss the question, the key thematic areas useful to cover and the policy context of the review. Through these meetings, the specific intent of the review, to contribute to key-stakeholder planning discussions on rural perinatal surgical services, was identified. Originally 254 relevant articles were found. This was reduced to 145. Please see the full report for additional details and rationale including search terms used and databases accessed.

Findings

The research question guiding the review was operationalized by considering key themes in the evaluation of models of care. They included safety and outcomes, costs and cost-effectiveness, sustainability, and satisfaction. The main points for each theme are reviewed below.

Key Findings – Safety and Outcomes

- **There is no existing clinical, case study, or qualitative evidence that basic maternal surgical care, including caesarean section, is less safe when provided by GP proceduralists with enhanced surgical skills than when provided by specialist obstetricians;**
- Volume-to-outcome associations are extremely variable across procedure and context, but evidence suggests greater birth volume does not improve birth centre outcomes in maternal surgical care in the Canadian context;
- Lack of any local maternity services is associated with worsened birth outcomes, with both the risk that women present to underprepared health service units, and distance to care affecting outcomes;
- Lack of local maternal surgical care is associated with a lesser ability to meet the needs of the community and substantially higher outflow;
- Outflow and transfer may have problems beyond distance to care, as there are health outcome concerns raised at the continuity of care between urban delivery units and rural postpartum care providers;

- Qualitative research finds negative psychosocial affects among women traveling away from their home communities to deliver

Key Findings – Costs and Cost-Effectiveness

- Both direct system costs such as capital, human resources and training, as well as additional costs such as unintended morbidities and costs incurred by patients, must be factored into the evaluation of a model's cost-effectiveness.
- The literature reviewed here demonstrates that higher costs are associated with greater distances that women must travel to access services, both in travel expenses and in the cost of managing poor outcomes due to delayed access.
- Suggestions for cost-reductions include telemedicine and regular outreach training.
- Due to the lack of literature on comprehensive costs of either centralized or decentralized models and the tremendous variation in health service models, we are unable to determine if one is necessarily more cost-effective.

Key Findings - Sustainability

- Lack of sustainability is due largely to workforce shortage issues including recruiting and retaining care providers in low volume settings;
- Sustainability is also related to challenges with training and preparedness for rural practice for both GPs and rural General Surgeons;
- Perinatal surgical services are the 'lynchpin' in sustainable rural health care;
- Educational programs have a significant role in attracting new practitioners to rural practice; strategies include recruiting students from rural settings, although evidence of effectiveness of this strategy is mixed;
- Social drivers influencing decisions to pursue rural procedural practice include personal/family reasons and positive rural exposure;
- Effective rural training contributing to rural sustainability for GP proceduralists and rural General Surgeons should include broad procedural competencies (not limited to cesarean section);
- Current rural proceduralists must participate in training future rural providers to increase sustainability;
- Rural perinatal surgical providers are highly motivated by quality of life and social responsibility in meeting the needs of rural parturient women.

Key Findings – Satisfaction

- The context for research evidence on satisfaction focused exclusively on satisfaction of rural practice due to the lack of research on centralized models and the emerging research showing safety and efficacy of rural surgical care;
- In all jurisdictions covered in this review, rural perinatal surgical care providers feel extended in their roles: this limits satisfaction and leads to burn-out and attrition;
- Rural surgical providers that persist are highly motivated by ideals of equity and access to care for rural populations;

- Continuing professional development for rural providers is essential and difficult to achieve due to lack of local opportunities;
- There is equivocal data on the importance of practice thresholds in provider confidence and/or stress: overall the relationship is weak;
- Models of care that are highly integrated with specialist colleagues lead to increased practice satisfaction;
- There is growing evidence on patient preference with surgical care closer to home despite known limitations.

Recommendations for Planning Perinatal Surgical Services for Rural Women

The following summative recommendations are based on a comprehensive reading of the research evidence included in this summary and applied to the British Columbia health planning context.

1. Care should be provided as close to home as is organizationally feasible. **“Close to Home” must be defined and operationalized with service targets for all communities.**
2. The extent of population need for perinatal surgical services should define the organizational feasibility for local care, regional care, and subspecialized care.
3. Population need should be defined by the numbers of births in the population served, the characteristics of the births (complexity, risk), and community/regional geography.
4. Population catchments should be established for local community, regional referral, and subspecialized care, and population outcomes should be linked with the responsible services.
5. The service, whether local, regional or subspecialized, should be resourced by integrated teams of practitioners working to the full extent of their skill set, be they generalists with enhanced skills, specialists or subspecialists.
6. These integrated networks of surgical care should be established between referral services and smaller community services which would include outreach surgical support to the smaller centres.
7. Measurement of outcomes should be grounded in utilization patterns starting with normative goals for the catchment population and compared to similar populations.
8. Perinatal surgical system management should support innovative service evolution identified through outcome monitoring and leading to ‘scaling up’ where appropriate.

Notes on Terminology

General Practitioners with Enhanced Surgical Skills (GPESS) – Terminology applied to describing general practitioners with advanced procedural skills varies between jurisdiction. They are alternatively referred to as 'GP proceduralists' (Australia), GP Surgeons (United States) or 'GP Obstetricians' (Watts et al,1997). Historically, in Canada General Practitioner physicians with enhanced procedural skills were referred to as 'GP Surgeons.' More recently, this term was replaced with 'General Practitioners with Enhanced Surgical Skills (GPESS)' as it was felt this more accurately describes training and roles. Although the number is not static, there are currently approximately 40 GPESS practicing in approximately 20 rural B.C. communities.

GPA – General Practitioner Anesthetists. These are General Practitioner physicians who complete advanced training in anesthetic procedures under the guidance of board-certified Anesthetists. There are currently approximately 80 GPAs in British Columbia.

Models of Health Care Organization – although no model of health care delivery in Canada is entirely centralized or decentralized, different regions organize health care services with characteristics more predominant of one than the other:

- **Centralized Health Care** – is the organization of health care delivery around concentrated infrastructural and health human resources, usually for specialized procedures that require a high degree of technological sophistication. These concentrations correspond to urban population centers. Minimal availability of these health services occurs in the peripheries as economies of scale dictate efficiencies in high volume service provision. A centralized system is marked by a high degree of service stability for specialized procedures and travel is required by residents outside of the center to access care. An example of a highly centralized service is a coronary catheterization laboratory.
- **Decentralized Health Care** – is the organization of primary health services across a geographic region based on maximizing potential for local access. The availability of specialized services is based on population size and characteristics. Larger centers will support peripheral service needs and infrastructure and health human resources are organized in a way to maximize the advantage of concentrated resources as in a highly centralized system. A higher proportion of the population is able to stay in their communities for care. Examples of appropriate decentralized services in care for patients with complex chronic disease, low intensity mental health issues and maternity care.
- **Regionalization** – British Columbia has undergone the regionalization of health services. It involves devolving administrative responsibility for the delivery of health services to geographically-defined regional zones, and the placement of services based on relative population need. Ideally, rural perinatal service delivery occurs within a tiered system of increasingly specialized care in which women attend the unit best suited to their anticipated needs.

Assumption underscoring this review

The following working assumptions underscore this review and the ensuing recommendations:

1. Health care decision-making is guided by the Triple Aim goals of improvement in population health, improved patient and provider experience of care, and lower per capita health system costs;
2. Access to timely cesarean section backup is a key contributor to meeting a higher proportion of population need and to the sustainability of local rural community birthing services;
3. Perinatal surgical care is only part of the scope of surgical services that can and should be provided at each surgical facility;
4. Rural is not just a scaled down version of urban, but has unique strengths and challenges.

Context of the Review

Starting early in 2012, B.C.'s Ministry of Health initiated province-wide key-stakeholder consultations to establish a set of consensus-derived action items for a provincial primary maternity care agenda. The move came from recognition of signs of system instability, particularly in rural settings where over 20 small maternity services have closed in the past 10 years, and resulted in the provincial *Primary Maternity Care Action Plan* document. Although larger systemic problems – such as disparate funding models providing disincentives to inter-professional practice – exist and demand a longer horizon to resolve, collaborating partners identified a series of short term (12 – 18 month) 'action items' resulting from the issues identified that could affect immediate change. One such issue concerns meeting the perinatal surgical needs (Cesarean section) of rural women. Issue 13 in the plan notes:

Rural maternity services show system stresses early and are particularly vulnerable to shifts in provider supply or availability for intra-partum care. Several consultations have pointed to the importance of sustained availability of C-section capacity in preserving the small maternity services. The availability of general practitioners with C-section (or general surgery) skills or anaesthesia skills could play a significant role outside of urban areas. There are tensions within the medical community that make it difficult to develop a concrete next step with regard particularly to GP Surgery but also GP Anaesthesia.

Tensions regarding the role GPESS and GPAs have included concerns over privileging, credentialing, education and regulation, alongside residual questions regarding the safety of procedural care in low-resource environments. These concerns have opened the debate and created the opportunity to consider the larger question: what is the best way to meet the perinatal surgical needs of rural women? This is asked against the backdrop of regionalization in British Columbia and the Ministry's vision of care 'Closer to Home' for rural women within a political context of fiscal restraint.

Consideration of this fundamental tension leads to further questions such as:

- Is there a framework guiding reasonable levels of access to perinatal care for rural communities? Are thresholds defined?
- Are population perinatal outcomes related to level of service? (i.e. Does level of service make a difference to outcomes?)
- What evidence do we have about the logistic considerations of delivering surgical care to residents in small communities regarding recruitment, retention and Continuing Professional Development of surgical care providers? (i.e. How do we effectively manage and support small surgical services?)
- What are the characteristics of the relationship between levels of service (rural, referral and tertiary)? How does the system which includes communities with different levels of service most effectively work together?

These questions, and others, arose not only as administrative concerns of policy and decision-makers but were voiced during the Action Plan consultation process by local providers, the public and key-stakeholder groups.

Increasing Cesarean Section Rates

A key health services trend – the rising rate of Cesarean Sections in British Columbia, Canada-wide and internationally – provides a contextual backdrop to perinatal planning in that access to perinatal surgical care has become increasingly relevant across the spectrum of the population. The issue that must be considered is if more than 1 in 5 women are deemed to need surgical intervention in order to birth safely in most jurisdictions, the frequency of this intervention makes it difficult to manage birth without local access to surgical care.

Policy makers are tasked with making strategic decisions while enacting the provincial vision of maintaining a sustainable health system and more specifically, Perinatal Services BC's vision of "Healthy women having healthy pregnancies and infants." Within this mandate, a strong evidence-base is needed to support attaining the Triple Aim of improvement in population health, improved patient and provider experience of care, and lower per capita costs. The Ministry of Health and Perinatal Services BC initiated the current review to understand and incorporate best available evidence into the primary maternity care planning process. The guiding question,

Can we meet the perinatal surgical needs of rural women more effectively through an optimally centralized or optimally decentralized model of care?

is intended to capture the literature exploring all possible permutations of providing perinatal surgical care to rural women. In this way, it fills the evidence gap in current policy and planning and will contribute to informing the current health services delivery challenge by providing solutions from other jurisdictions that may inform our thinking.

Background: Closure of Small Maternity Services and the role of GPESS

Small rural communities with and without local surgical services have experienced increasing challenges to maintaining services over the past 15 years in British Columbia (Grzybowski et al 2013). In 1995/96, 1,838 c-sections were performed by 200 rural GPs in Canada (Iglesias et al, 1999). Rural intrapartum care was given by 1,704 rural GPs, who attended 25,602 births (8.4% of births in Canada that year) (Iglesias et al, 1999). Three-quarters of all GPs performing c-sections were doing so West of Ontario (Iglesias et al, 1999), and GPs with Enhanced Surgical Skills practiced at 60 of the 72 small rural hospitals (<51 beds, <15,000 person catchment) providing surgical services in BC, Alberta, the Yukon, and Northwest Territories (Chiasson and Roy, 1995). Forty-three of those hospitals had GPs performing c-section procedures (Chiasson and Roy, 1995). Many of those with surgical capacity have seen the range of surgical procedures provided at the hospital contract to the point where some facilities are primarily providing caesarean sections (Humber and Iglesias 1999). A further challenge has been trying to provide 24/7 surgical coverage with a limited number of operating room nurses, General Practitioner (GP) anaesthetists, and GPs with enhanced surgical skills (Kornelsen et al 2012). This situation only seems to be worsening as the current cohort of providers reaches retirement.

The decline of these surgical services has created significant problems of access to care for the rural populations that live in the affected communities and even greater challenges for smaller satellite communities that naturally drain into these small hospitals. Recent population-based evidence on maternal and newborn outcomes demonstrates that outcomes are better for women and their newborns if they can access services in their home community (Grzybowski et al 2013; Nesbitt et al 1997) and that local obstetrical surgical services make an important difference to the proportion of women who can be delivered in their home community (on average >75% vs. <30% if maternity services are provided with and without local caesarean section respectively). These findings align closely with recent policy initiatives that have stressed the importance of providing services as close to home as possible; the first recommendation put forth by the SOGC Joint Position Paper on Rural Maternity Care (2012) states “women who reside in rural and remote communities in Canada should receive high-quality maternity care as close to home as possible.”(28) This position statement provides strong impetus for supporting distributed rural perinatal surgical programs to the extent that the evidence supports.

It is unusual for communities with a population of less than 10,000 to have local specialist surgical services or communities with < 25,000 to have a group of specialists providing 24/7 coverage for the perinatal surgical program. For rural communities that are large enough to have a birthing service there are, in general, two models for the organization of local surgical services. For populations of 5,000–15,000, surgical services are usually provided locally by one or more GPESS, caesarean section often being the backbone to their procedural skills. For populations of 15,000–25,000, there is usually a specialist surgeon, in some instances an obstetrician, supported by one or more GPESS (“mixed model”). In

these larger communities, the GPESS provides call relief and often covers the operative delivery program. For populations greater than 25,000, there are usually groups of specialists without any GPESS (Iglesias and Jones 2002; Humber and Frecker 2008a). At the date of this review, there are an estimated 39 GPESS across rural British Columbia supported by 86 GP Anesthetists (Dr. Stuart Iglesias, personal communication). There are about 70 practicing GP proceduralists with obstetrical, anaesthesia or surgical training in Australia (Robinson et al 2010).

Currently, the Departments of Family Practice and Surgery (UBC) are contributing to the development of a training curriculum for enhanced surgical skills based on the curriculum currently in place in Saskatchewan (University of Saskatchewan, College of Medicine).

The Policy Context: Regionalization in BC

British Columbia began restructuring health care delivery in the 1990s, partly in response to The Royal Commission on Health Care and Costs, chaired by Justice Peter Seaton. In its final report, *Closer to Home*, Justice Seaton argued that “[m]edically necessary services must be provided in, or as near to, the patient’s place of residence as is consistent with quality and cost-effective health care” (B.C. Royal Commission on Health Care and Costs 1991: A-6). This recommendation was made based on a recognition of the challenges rural residents face in accessing health care including insufficient supply of providers, inappropriate emergency services and the cost incurred by patients forced to travel for treatment (B.C. Royal Commission on Health Care and Costs 1991) and the belief that a decentralized health care system would better respond to many health needs within rural and remote communities.

The subsequent *Standards of Accessibility* report (BC Ministry of Health Services and Health Planning 2002) recognized that maternity care services in rural BC could be negatively impacted by regionalization and suggested expanding the function of general practitioners to make more services including perinatal surgery, available. General Practitioners were offered additional training to respond to the need for local Cesarean sections in rural communities thus limited the need for referral and patient transport to larger centers. This directive was later put into a framework recognizing reasonable limits according to what is realistic and affordable. In *A Picture of Health* (BC Ministry of Health Planning 2002b), the notion of regional centralization was posited as a way to facilitate efficiency and resource sharing based on the argument that “clustering acute care services in regional hubs leads to improved retention of health care staff, better access to quality services for patients and better patient outcomes” (p.8). Although subsequent initiatives have tried to straddle these two policy directives, maternity care has been caught in the debate. This review will interpret best evidence of the effect of system structure (centralized or decentralized) on the key thematic areas.

Regionalization was undertaken based on creating a new organizational structure that involved the introduction of an additional layer of governance that assumes responsibility for devolved functions (Church and Barker 1998). Programs that were formerly directed by a single body are decentralized as they are taken over by new,

regionally defined governing bodies, determined primarily by geography and population and patient flows.

A regionalized system of health care delivery is based on the local availability of services to meet population need, with services necessary to address increasingly complex clinical scenarios located in regionally appropriate, larger service centres based on population size and resource allocation. These centers are generally large enough to warrant the services or centralized enough to be accessible to other small services. This enhances economies of scale and supports increasing resource and infrastructural costs in an efficient way. It relies, however, on the sustainability of small community-based facilities providing maternity care for women in their catchments with uncomplicated pregnancies with the expectation of vaginal deliveries attended by either midwives or primary care physicians. Further, these services are supported by proximal services at sub-regional facilities equipped to deal with standard complications of pregnancy requiring access to attendant obstetrical and neonatal care. These levels of care are back-stopped by tertiary obstetric units centralized in urban settings that provide the highest level of specialized obstetric and newborn care including a neonatal intensive care unit and attendant sub-specialists. The efficacy of this system is based on the availability of appropriate levels of care for population need and holds the inherent risk of unnecessary intervention if the level of care and the level of need are dissonant. This organization of perinatal services has underscored administrative planning during the preceding decades in British Columbia and other parts of Canada but also Australia. Although the conceptual underpinnings are constant, in an ideal setting, the operationalization corresponds to locally-defined characteristics and needs.

As regionalized systems of perinatal health services delivery took hold internationally during the 1970s and 1980s, an agenda around the issues of safety of both distributed services and regionalized systems have guided the research, leading Canadian researchers Black and Fyfe to state, “The degree to which services should be centralized and the number of units that should be closed are controversial questions” (Black and Fyfe 1984 p 571). This remains the heart of the issue. The purpose of this review is to summarize the evidence that illuminates this question and present it in a way that will support policy and cost effective management.

Rationale for the Study of Rural Maternity Care

Maternity care is a basic health service delivery requirement to meet population need. It has also been positioned as the lynchpin in small communities, providing a procedural base that maintains rural health systems that provide economic and social benefits to their community (Klein et al, 2002a). Research interest in optimal models of rural health care came to attention in the late 1970s due to a confluence of events, including the juxtaposition of regionalized health care delivery with recognition of the importance of receiving care within reasonable distance to patients’ residence. The efficiencies of care ‘closer to home’ were limited to primary care within a system based on the availability of increasing levels of care corresponding to the increasing complexity of patient needs. The challenge of

applying this to maternity care, however, lies in the undetermined nature of childbirth: that is, deliveries may start out being low-risk and within the realm of primary care but may quickly change to requiring intervention by specialists. The argument, therefore, is that all maternity care must take place within reasonable proximity to higher levels of services and access to efficient systems of emergency transportation *in case they are needed*. Due to the natural imperative of women to give birth where they live, however, Björn Backe asserts that maternity care by its nature is decentralized (Backe – Natl advisory committee).

Despite this system imperative, however, as a whole, *the thematic literature assumes the safety and efficacy of a centralized model of care, leaving the burden of proof for safe care on those advocating for a decentralized approach*. Likewise, however, beyond system efficiencies noted in the theoretical arguments for centralized services, *there is limited discussion for further nuanced advantages*.

Additional considerations support the health services rationale for local operative care, including the shift in technology and the trends in surgical management of illness (Humber and Frecker 2008b), the rising Cesarean section rate which demands a higher proportion of GPs perform the procedure (Chang et al 2008).

Obstetrical Surgical Care Providers in Rural Settings

The fundamental challenge to providing operative backup for deliveries in rural communities internationally is lack of availability of surgical providers (Homan, Olson and Johnson 2013).

The solution is to increase the supply of rural General Surgeons providing local perinatal surgical care or train GP proceduralists. In the early 1990s, evidence emerged suggesting that General Surgeons were aging, and due to inevitable retirement, would not be able to sustain a strong rural presence without training new practitioners (Blair, 1991; Burke, 2007; Chiasson et al, 1994; Inglis, 1995; Pollett & Harris, 2002; This led to the challenge of the profession having difficulty attracting new recruits due to the perception of lack of interest in the specialty leading to demanding call schedules and the lack of sub-specialist support in rural environments (Rebbeck, 2005). This is despite the recommendations of the Barer-Stoddart report (1991) which suggested priority be given to training generalist surgeons for practice in non-urban hospitals (Barer and Stoddart, 1991). The lack of General Surgeons in rural areas is not unique to Canada but characteristic of rural Australia as well (Campbell, Kitchen and Campbell 2011), and to the United States (Lynge et al, 2008; Lynge et al, 2009; Williams and Ellison, 2008).

The trajectory of Obstetrician-Gynecologists (OBGYN's) in rural Canada has been punctuated by different challenges, namely the difficulty of specialist practice in low-volume environments. Currently, less than 4% of OBGYN's practice in communities with populations less than 25,000 this is up from 0.4% in 1986 (Pong & Pitblado, 2005). Higher volume practice found in larger centres allows less demanding on-call schedules and the attendant lifestyle implications (more balance between work and leisure) (Rosser and Muggah, 1989). The Society of Obstetricians and Gynecologists of Canada (SOGC) recognizes the challenges of declining interest

in the specialty and that the effects are most acutely felt in rural areas (Robertson and Wright, 2007). In addition to the difficulties women face trying to access maternity care in rural Canada, these women are also having trouble accessing basic gynaecological screening which places them at higher risk for complications such as cervical cancer due to a lack of appropriate early screening. Due to the continued shortage of providers in the profession, SOGC created a National Birth Initiative for Canada with the goal of developing a framework to maintain sustainable maternity care in Canada (SOGC, 2008). Inherent in this initiative is the recognition of the need for a strategy to support rural birth; SOGC's official position is that "rural women should be able to reasonably access services that are safe and as close as possible to home communities," (SOGC, 2008). The specialized nature of obstetrics, however, situates them to provide support in referral communities, not necessarily "as close as possible to home" for parturient women in communities with a population < 25,000.

The reality in British Columbia is that most rural areas are not serviced by local specialist support, and General Practitioners with Enhanced Surgical Skills are the primary surgical service provider (Humber and Frecker 2008a; Chiasson et al 1994; Iglesias and Jones 2002). In a 2002 survey, there were 76 rural hospitals with surgical programs, with the majority in Alberta (40) and BC (20). In BC specifically; in 2000 there were 30 GPESS in 20 rural surgical programs, where a GPESS was defined as a non-specialist physician providing appendectomy and/or caesarean section services. Together, this group provided 71.9% of caesarean section and 61.8% of appendectomies performed in these 20 hospitals in BC.

For reasons of volume noted above, it is unusual for communities with a population of less than 15,000 to have local surgical services or local specialized obstetrical services for communities <25,000 by resident specialist surgeons. For larger communities there are, in general, two models for the organization of local surgical services. For populations of 5,000–15,000, surgical services are provided locally by one or more GPESS, caesarean section often being the backbone to their procedural skills. For populations of 15,000–25,000, there is usually a specialist surgeon, in some instances an obstetrician, supported by one or more GPESS ("mixed" model). In these larger communities, the GPESS provide call relief and often cover the operative delivery program. For populations greater than 25,000, there are usually groups of specialists without any GPESS (Iglesias et al 1999).

The relatively small procedural volumes of these programs are associated with important issues regarding program sustainability – which deter specialist practice – including the challenge of maintaining competence for the professional staff, lack of opportunity for intensive application of practitioners' skills, restriction on the numbers of skilled providers that can be supported by the local service demand (leading to vacation and on-call relief problems), and programs associated with high unit costs. The physical plant, anesthetic equipment, and on-call coverage must be maintained regardless of the low utilization of the operating room (OR). However, these targeted, small-volume programs are not associated with poorer outcomes. **There are no studies that document improved outcomes in surgical programs with larger volumes for the procedures usually performed in rural settings.**

Scope of this review

The breadth of issues surrounding rural service delivery is expansive. As well, the purpose of a Realist Review is to situate outcomes in the contextual circumstances of their occurrence and suggest applicability to the situation at hand. For these reasons, the boundary of inclusion is less definite than it might be in a traditional systematic review.

This review seeks to uncover evidence in support of optimally centralized or optimally decentralized models of perinatal surgical care. This question presupposes the need for local surgical care in sustainable models to meet the needs of rural parturient women. Although there is a growing evidence base on the safety of isolated primary maternity care, and concomitant research on the capacity of these services to meet the needs of only a minority of the population, this debate is not within the scope of this review. Likewise, a decentralized perinatal surgical service depends upon effective mechanisms for education, training, continuing professional development, credentialing and regulation, issues directly influencing the viability of a decentralized model. Finally, literature addressing the question focuses primarily on topics pertaining directly to perinatal surgical services.

Methods and Approach

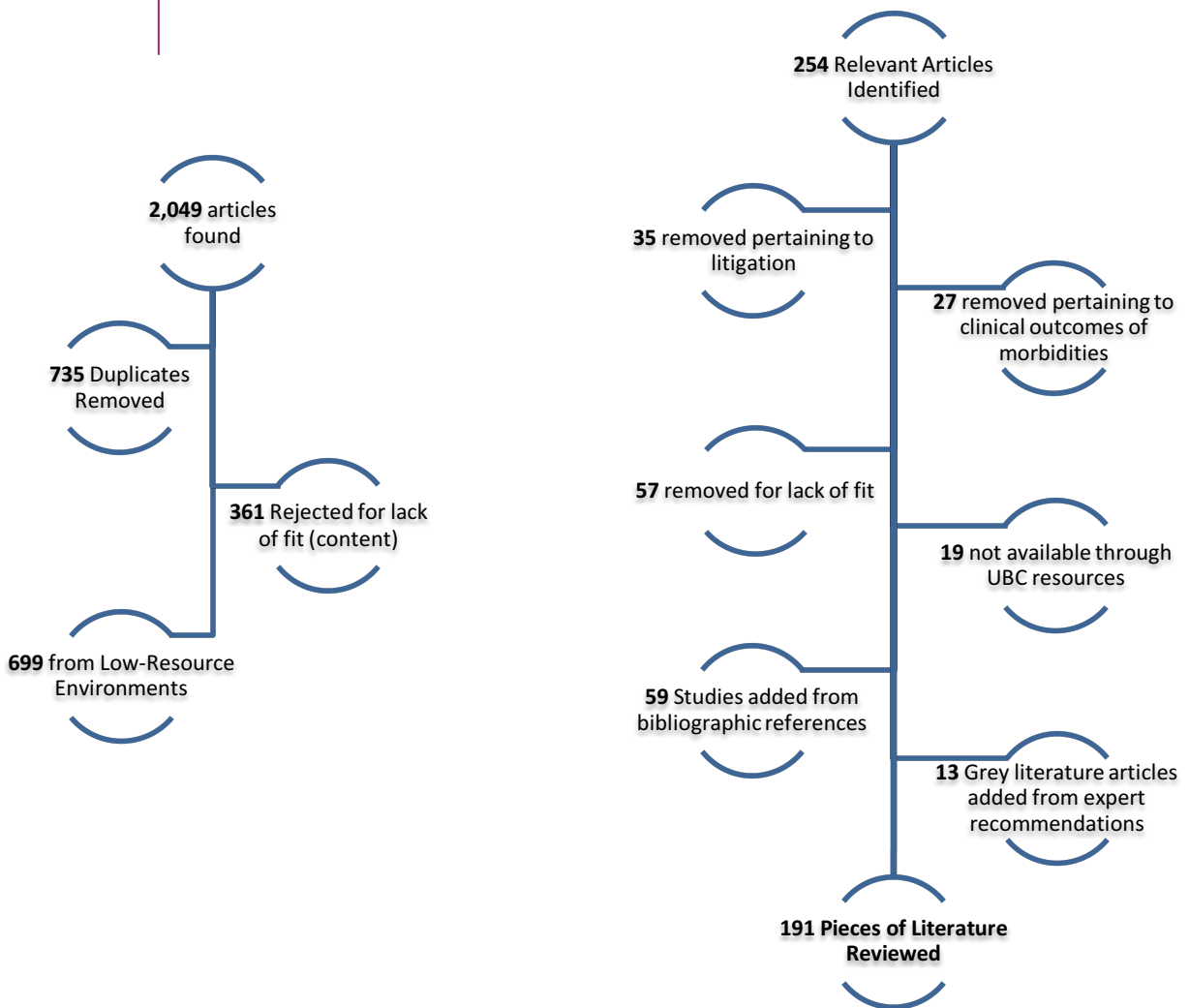
Traditionally, research synthesis has been accomplished through standard methods include meta-analysis and systematic reviews. In these approaches, the unit of analysis is the (usually weighted) evidence from each study, taken in aggregate to determine the best course of action. This approach may be efficacious in consolidating the value of one clinical approach over another but less helpful when evaluating potential health service or policy solutions, due to the variability of context. That is, a solution in one jurisdiction may have evolved due to unique circumstances of time and place. Even if repeated at a later date in the same setting, the solution may not address the situation as changes incurred by previous interventions may render it invalid. The intent of a *realist review* is to take the dynamically changing policy landscape into consideration to identify the issues as opposed to the generalizing truths (Pawson et al 2005). This method of looking at the research landscape to understand policy directions, is based on an approach Wong et al (2013) call 'CMO': understanding the relationship between Context, Mechanism and Outcome. Aside from being contextually located, evidence included in a realist review reflects the broad base of evidence relating to a topic from research reports but also including, for example, clinical guidelines, practitioner opinions and patient values (McCormack et al 2013).

Identifying the Research Question

This review was initiated to address an evidence gap in best practices for meeting the perinatal surgical needs of rural women, focused specifically on optimally centralized or optimally decentralized solutions within a planning context is marked by a constrained budget environment. The research question, collaboratively articulated by the research review team and key provincial stakeholders, is:

Can we meet the perinatal surgical needs of rural women more effectively through an optimally centralized or optimally decentralized model of care?

The reviewer and commissioners met several times to discuss the question, the key thematic areas useful to cover, and the policy context of the review. Through these meetings, the specific intent of the review, to contribute to key-stakeholder planning discussions on rural perinatal surgical services, was identified. The question was initially put to a feasibility analysis to determine if there was enough published and grey literature to address the question. During this phase we found 254 relevant articles and decided to proceed. Details of search terms are below. References and abstracts were managed using Mendeley.



Inclusion criteria

Inclusion criteria of the search include: English language; published since 1990; at least one search term from each of three areas. Our search model was intentionally broad and technique iterative so as to capture the variety of plausible considerations within the centralization of maternal surgical care services. We searched MEDLINE, PubMed, EMBASE, CINAHL, EBM Reviews, NHS Economic Evaluation Database, and PAIS International for literature.

Upon consultation with the commissioners about the subsets of literature located, a further 62 articles were removed from consideration. These included articles on the relative safety of particular morbidities for parturient women (eg. eclampsia, diabetes, HIV) (n=27) and articles regarding defensive medicine and litigation concerns (n=35). Clinical evidence of best care practices for surgical services broadly was determined to be outside of our frame of consideration. As well, litigation literature, prominently from the United States, was deemed to be less relevant in the public health environment of Canada and BC.

Search area	Keywords	Reasoning
Maternal / Perinatal health	obstetric* matern* perinatal reproduct* (birth or birthing) Parturi*	This review focuses on maternal and obstetric care, and so appropriate terms were furnished to limit the search to that singular area of care.
Perinatal Surgical Care	Surgery Surgical (cesarean or caesarean or c-section*)	We aimed for a broad surgical requirement, rather than an exhaustive list of obstetric surgeries.
Rural and Remote health services	(decentral* or de-central*) Rural Health* Rural Hospitals rural communit* remote health* remote communit* “hub and spoke” Rural Remote	The review seeks to compare models of centralized and de-centralized care. Increasingly since 1990, centralization of care has been the backdrop of studies regarding decentralized models. Moreover, this review seeks to compare models of care in their ability to provide safe, high quality, cost effective perinatal surgical care to rural women specifically, and so rural health was a required search subject.

Further inclusion criteria were used in review of the full body articles that account for a relatively high rate (30%; 57 of 192) of exclusion upon full article review. These include: direct discussion of maternal surgical care, including but not limited to safety of practice models, governance of care models, and sustainability of service delivery; and consideration of the relative centralization of care modeling (intentional and non-intentional), including but not limited to centralization of decision making, ways of incorporating specialist care, and optimal geography and/or level of service delivery.

Much of the literature excluded at the full article review stage was focused on internist, general, or other non-obstetric surgery for rural patients. Given the amount of literature on other types of surgery excluded from a targeted maternal and obstetrical surgery search, a future review of literature in the optimization of rural models of care for other types of surgery may be a useful extension of the research presented herein. As well, the overwhelming amount of material found from low-resource settings may hold important lessons for resource efficiency in BC and Canada, but was not reviewed at this time.

Though literature from low-resource settings was excluded upon review, the search parameters did not preclude any setting constraints. Consequently, literature was included from a wide variety of international contexts deemed relevant to the context in BC, including Scotland, the United Kingdom, Norway, Finland, Sweden, Holland, Germany, New Zealand, the United States, Australia, and the rest of Canada.

Type and Nature of the Data

The objective of this realist review was to summarize the international research evidence on centralized and decentralized perinatal surgical care for rural women to determine whether an optimally centralized or optimally decentralized model of care was more effective, as reported in the literature. The lack of direct evidence corresponding to these descriptors, however, gave rise to the need to operationalize the terms by describing key qualities *thematically* and evaluate the research evidence on centralized/decentralized care by theme. The themes we determined, with consultation, to be most relevant are *safety and outcomes, costs and cost-effectiveness, satisfaction of key stakeholders* (women, providers and system administrators) and *sustainability*. On reviewing this literature, it was clear that centralized models of perinatal surgical care were assumed and services that deviated from this model, such as rurally-distributed services, bore the burden of proof of safety and efficacy. This has resulted in minimal studies evaluating centralized care aside from those in a comparative sense.

The types of evidence found in this search are varied, but together offer a relatively clear picture of rural maternal surgical care models. The majority of studies found were descriptive in nature. However, it is important to distinguish two types of descriptive articles. First, a great deal of information about the state of maternal surgical care services in various rural environments was gained from case studies on rural surgical training programs and scope of practice reviews. Secondly, chart review and cohort studies without a comparison group provided detailed health outcome data from rural maternity care even where an immediate comparison

group for that data was missing. When considered together and in the broader context of international rural maternity care, the similarities in the findings indicate a good strength of evidence.

Retrospective chart review was also used in comparative studies, though, often employing population level data at the national or regional level as the comparison group. As well, several articles used chart review to compare outcomes from specialist obstetric care to the outcomes from other health professional or delivery teams. Further, many population studies were also found, investigating potential impacts to outcomes such as distance to care, hospital type, and continuity of care after discharge from a referral delivery unit. Program, or intervention research was a smaller portion of the research than expected, perhaps because of our focus on models of care rather than smaller units of the health services system. Still, a handful of articles detailed trials of new models of care, including specialist outreach and telehealth.

Finally, a few thoughtful editorials were included and considered in the case the author(s) spoke directly to the subject area, and several grey literature reports were found with the help of policy and service programming experts in both Canada and Australia.

Key Theories to be Explored

Entry into the literature was framed by certain assumptions about centralized-decentralized models of perinatal surgical care, part of the 'expert framing' of the problem (Pawson 2005) done in conjunction with key stakeholder commissioners. These assumptions, or theoretical models, are based in the belief that the effectiveness of models of perinatal surgical services are defined through the model parameters (thematic areas) above and interpreted from a systems approach. That is, we recognized the inter-relatedness of parts or components of the health care system and the propensity for changes in one area – either by design or chance – to have unintended (and unforeseen) consequences on other parts. Due to this inter-relatedness, component parts are best understood in relationship to other system components: you cannot change one part without affecting other parts (Meadows 2008).

Ideologically, an approach to organizing health services for a region may include centralization through regional referral centres. Alternatively, an approach could be driven by the desire to distribute services to the greatest extent possible. In either extreme, establishing services with a strong centralist or decentralist propensity will influence the entire structure across a range of key themes. For example, in one extreme all perinatal surgical services for a given region are located in regional referral centres, staffed by 24/7 obstetricians and specialist teams. All women from communities outside of this designated referral centre will have to leave their communities to have their babies. In order to support care at the centre, resources are moved from the periphery to the centre. Main challenges include ones of transport to access services in a timely way. Efficiencies of scale and risk management dominate the planning discourse. At the other end of the scale, planning strategies attempt to maintain maximal services in small, distributed centres requiring the attendant local resources. The challenges are in maintaining

quality of care in low-volume setting and diminished resources available at the centre to provide more complex care. Neither model of governance will serve the needs of the population optimally. We need a governance model that shares planning between small and large centres and optimizes service structures to meet the needs of the population as expressed by the Triple Aim Framework (improvement in population health, improved patient and provider experience of care, and lower per capita)(Institute for Healthcare Improvement 2014).

Synthesis Findings

Optimally Centralized Perinatal Surgical Care: Broad theme advantages and disadvantages

As noted, there is a system tendency towards centralized (regional) care with minimal literature to support efficacy of this approach. System characteristics for centralized health services in general may include improved flow across a health region, faster mobilization of resources in a crisis and knowledge transfer between sites (Brown 2005), although these characteristics are not readily applicable to maternity services. The primary advantage to perinatal surgery is in ‘economies of scale’: centralized high-volume allows from an efficiency perspective (Black and Burchill 1999) and, from a historical perspective, better access to “doctors, antibiotics and blood transfusions” (Monk et al 2013).

However, there is an emerging understanding of the disadvantages to centralized care; including the ‘de-skilling’ of rural provider culture and the concomitant stress this gives rise to. Disadvantages to centralized maternity care in the literature include a lack of continuity of care between the centralized hospital and remote patient setting marked by an absence of collaboration regarding discharge planning, ‘disempowerment’ of patients due to a lack of pre-existing relationships and an infrastructure that does not solicit patient involvement (Bar-Zeev 2012). Further issues with centralized care include increased intervention rates for low-risk populations in urban and teaching hospitals compared to rural hospitals (Albers and Savitz 1991; Cheng et al 2013) the dilution of case loads of rural providers (Cross 1993) and emergency transport costs (Humber and Iglesias 1999). Most notable is the increased risk that rural women experience when they must travel long distances to services such as unintended morbidities (Grzybowski et al 2011; Nesbitt et al 1997; Ravelli et al, 2011) and poor prenatal compliance, particularly for those of low income households or without adequate transportation (Nesbitt et al 1990; Monk et al 2013).

Many of the advantages of centralized perinatal surgical care expressed in this literature were represented as a mechanism to avoid the disadvantages of decentralized care including difficulty recruiting surgically trained providers (Heneghan et al 2005). The main advantage of centralized perinatal surgical systems, however, is the assumed cost-savings due to concentrated infrastructure (capital and human resource) to support the high volume of procedures done in one location. **We did not find any peer-reviewed or program evaluation studies to confirm this.**

Decentralized models of care, which emphasize local access to perinatal surgery in communities where population and isolation warrants it (Grzybowski et al 2010) within a tiered system of increasing levels of specialist care, were seen to reduce the risk of transfer itself (Baird 1996), to better meet the needs of rural women and families (Humber and Dickinson 2010; Maouris et al 2010) and to create equitable access to care (Iglesias et al 2005).

Disadvantages to decentralized models of perinatal surgical care lie primarily in the amount and availability of resources, including health human resources, infrastructure and provider training, needed to sustain such systems. For example in Baker et al's (2006) study on rural General Surgeons they found that providers were not prepared for the challenges of their position due to lack of specific focus on training for rural circumstances (lack of consultants, lack of locum coverage, long on-call hours). An Australian study on GP proceduralists also noted these obstacles, as well as additional barriers due to credentialing and perceived medical-legal problems (Glazebrook and Harrison 2006).

Perinatal Surgical Care for Rural Women: Safety and Outcomes

General practitioners with enhanced procedural skills have historically been critical in providing caesarean section support for rural and remote maternity units. In this review, family physicians were found to be performing c-sections in rural locations in the United States from Alaska to Kentucky (Baker et al, 2010; Barclay, Knapp, Kallail, 1996; Breon et al, 2003; Callaghan, 1994; Gates, Walker and Denning 2003; Hueston and Murry, 1992; Rosenthal, Holden, and Woodward, 1990; Smith and Murphy, 2000; Wadland et al 1994; Young and Byrd, 1999), Australia (Campbell, Kitchen, and Campbell, 2011; Homer et al 2011; Robinson et al 2010; Swayne and Eley, 2010; Welch and Power, 1995), Scotland (Godden, 2005; Tucker et al, 2005; Tucker et al 2010), New Zealand (Simmer, 2006), and across Canada (Baker, 2006; Dooley et al, 2009; Iglesias et al, 2005; Iglesias, Iglesias, and Arnold, 2010; Johnson and Yin, 2006; Rourke, 1998). Concern over volume thresholds and competency has ultimately led to a series of studies on the safety and service quality of GPs with enhanced surgical skills.

One of the earliest contributions to this field is the retrospective chart audit at two rural hospitals in Washington and Oregon states in the years between 1978-1992 by Deutchman et al (1995). The authors found that GPs performed 79% of caesarean section procedures at those hospitals. Reviewing the data from these deliveries, the authors concluded that GPs met or exceeded all standards of surgical outcomes in the published medical literature. As well, data on the 5,950 deliveries performed by GPs in rural New South Wales, Australia between 1990 and 1991 demonstrated that "[t]here is no evidence that obstetric care in NSW rural hospitals with accredited obstetric units is below standards acceptable to the community" (Woollard and Hays, 1993, p242) when compared against all 88,275 deliveries in New South Wales in same period.

Descriptive studies found similar results from GPESS supported units from around the world. Kirke (2010) looked at 195 births at a remote hospital with GPESS care 600km east of Perth, Australia with barriers to referral. Though complex and high-risk pregnancies were referred early, many women developed antenatal risk factors

including hypertension, obesity, pre-eclampsia, and a high level of gestational diabetes. As well, intrapartum and post-partum complications such as maternal sepsis, antepartum hemorrhage, shoulder dystocia, failure to progress, and fetal distress occurred at rates similar to regional averages. Yet, no perinatal or maternal mortality was experienced in the study period, and health outcomes were reported as safe for mothers and babies, evincing the safety of a GPESS led unit. Cameron and Cameron (2001) used obstetrical audit data from 1991-2000 at the rural Atherton hospital near Cairns, Australia to show that perinatal mortality (stillbirth plus neonate death within 28 days) was substantially lower than the state average (5.3 per 1,000 vs 11.8 for Queensland State or 11.8 for the Far North Queensland county). This unit was run by GPs, some of whom held an obstetrics diploma, with specialist support 96 kms away, outreach and evacuation services for part of the study period, and four to six annual visits from a specialist obstetrician-gynaecologist provided by the Far Northern Region Obstetrics and Gynaecology Service (FROGS).

In another Australian study, Scherman, Smith, and Davidson (2008) studied the outcomes of a mid-wife led unit with GP surgical support and OB specialist consultation. The unit had low antenatal (10%) and intrapartum (4%) transfer, and just 8% intervention. No Apgar scores below 7 were recorded at 5 minutes, and 89% of neonates required no resuscitation. The rate of perinatal injury was half the state average at just 27%. Though midwives lead the unit, the exceptionally low transfer rate was possible because of GP surgical support in the event of emergency.

Noting the achievement of expected safety standards in GPESS led units, a further consideration of the research is the safety of care relative to specialist-led models of care. Aubrey-Bassler et al (2007) studied outcomes in four Canadian provinces (BC, Alberta, Saskatchewan, and Ontario), considering 1,448 c-sections by 15 rural GPs and 4,344 by specialists. Data was collected from Discharge Abstracts between 1991 and 2000 and showed that rates of iatrogenic morbidity were slightly higher among GPs (OR 1.6; 2.5% vs. 1.6% for specialists). However this was accounted for by the difference in rate of puerperal infection (1.6% vs. 0.8% for specialists). Surgical error was the same between groups. GP proceduralists did, however, have higher rates of referral to acute care and their patients had slightly longer post-surgical hospital stays (by 5.5 hours on average).

These findings were echoed by [Homan, Olson, and Johnson \(2013\)](#) in a smaller study between two comparable hospitals in New England. Using 125 consecutive c-sections from each hospital – one with GP led maternal surgical care and other with specialist led surgery – this study found no difference in intraoperative or infectious complications, and no difference in neonate outcomes. Demographics of delivering mothers, prenatal risk factors, and indications for c-section were found to be similar between the two samples. The GP-led unit experienced fewer post-operative complications in contrast to the findings of Aubry-Bassler et al (2007), but the obstetrician led unit did have a shorter post-operative stay as found in the Canadian study above.

Lynch et al (2005) compared a hospital with c-section capability in Bella Coola to a similar hospital on Haida Gwaii with maternity services but no surgical capability. In both communities, transfer or referral require considerable travel time and can be

delayed by inclement weather. Between the two hospitals, there were no differences in adverse outcomes and no maternal deaths were reported in the study period between 1986 and 2000 for either unit. The primary difference was in referral rates. Almost 20% more local women were able to deliver in a c-section capable maternity unit than in the unit without surgical support.

In the studies noted above, GPESS cases were pre-selected to include only low-risk courses of care with known complications referred to specialist obstetricians prior to delivery. Using population level data addresses this methodological shortcoming.

The largest study of this kind in BC examined 87,294 singleton births between 2000 and 2007. Grzybowski, Stoll, and Kornelsen (2013) compared births from catchment areas with GPESS surgical support (n=9,174) to the outcomes from obstetrician serviced catchments (n=54,714). Using 2-step logistic regression analysis to predict rates of adverse perinatal outcomes, the authors showed that health outcomes were comparable between GPESS-led surgical units, mixed-model units with both GPESS and specialists, and obstetrician surgical units. Iglesias et al (2005) used a population study with Albertan births from 1999-2000 to examine patient outflow as well as outcomes based on level of available maternity services in a community. The study illustrates that areas with limited maternity services are likely to have an increased rate of induction, and that in communities without local c-section capability, there is large outflow. Communities that offered intrapartum care without local c-section capability (level 1A) delivered 22.1% of the maternity population and that this number increased to 70.1% in communities with local c-section capabilities (level 1C).

Tucker et al (2010) found very similar rates in Europe's most centralized health care system in Scotland. Comparing 1,400 deliveries from 8 of the 12 rural maternity catchments of Scotland, the authors demonstrated that roughly the same percentage of women remain 'low-risk' throughout their pregnancy, and similarly, the rate of spontaneous vaginal delivery is stable when measured by catchment area rather than birth unit. Though low-risk cases were managed well by low-resource units, greater outflow from catchments with 1A equivalent services threatens sustainability. As with the Iglesias et al (2005) study above, midwife-only units (no surgical capability) were only able to perform 31% of local deliveries, while midwife-led units with GP surgical support managed 70% of local cases, and OB-led units performed 86% of the births from their local catchments. Thus, low intervention rates found in midwife only and midwife-led units in other studies are shown to be reliant on referral and surgical support, as to be expected in tiered model with risk management mandate.

Similar referral numbers appear in all population level data found for this review. Kornelsen, Grzybowski, and Iglesias (2006) found that with GPESS support in a community, between 78% and 85% of births take place locally in BC and Alberta. Without c-section capability, that rate falls to between 24%-35%. Humber and Dickinson (2010) reported the most optimistic numbers, finding rates of 85% and 40% respectively.

There is, in fact, no clinical, case study, or qualitative evidence that caesarean section is less safe when provided by GPs with Enhanced Surgical Skills when

compared to either general or specialist surgeons. Quite the opposite, we have found that GPESS achieved outcomes that matched specialist care.

In addition to assessments of practitioner skill, research attention has been paid to the volume of procedures in rural maternity units as a marker of safety. Questions of the association between volume thresholds and procedural outcomes underscore these analyses.

The balance of evidence shows that small units providing low procedural volume provide care in keeping with expectations for safe birthing. Three studies included in this review indicated an outcomes disadvantage among neonates delivered in small units, but no accounting was made for risks associated with traveling to services. As well, absolute differences were minute and outcomes positive.

Tracy et al (2006) examined over 750,000 births over three years in Australia to compare outcomes by birthing unit annual volume. The study was limited to low-risk women precisely because higher risk cases are designated to central tertiary units. Among women without pre-existing or antenatal development of hypertension or diabetes, and whose babies were born at >2500g, rates of mortality were comparable in units with fewer than 100 deliveries and those with 2000 or more. Units of all sizes were found to have similar outcomes, while smaller units tended to have less intervention, including lower rates of c-section (Tracy et al, 2006).

Importantly, Tracy et al's (2006) categories for unit size and chosen sample size are in direct reference to a controversial study from Moster, Lie, and Markestad (1999) who found that Norwegian maternity units with 2000-3000 births per year had better outcomes than smaller units. The Moster, Lie, and Markestad (1999) study looked at 700,000 low risk singleton births between 1972-1995, and found that units with <100 annual deliveries were almost twice as likely (OR 1.8) to experience a late neonatal death (within 28 days of birth) than a unit with 2000-3000 births per year. However, a host of other studies have criticized the methodology of this study (see below) and its limitations undermine the power of many of the central claims by the authors.

Moster, Lie, and Markestad (1999) note that the extremely low rate of neonatal death in Norway made it necessary to use such a large sample to find differences, but also indicate that neonatal death in 1995 was less than half the rate in 1972 (3.5 vs 7.7 per 1000). Among low risk women, late neonatal mortality (within 28 days) was just 0.5 per 1000 live births between 1990-1995. Norum et al (2013) studied births from the scattered, northern, remote population of Norway and concluded that a very decentralized model of care was necessary for a country where inclement weather and seasonal darkness makes transfer and even referral challenging. The pressing question is not whether the births that happened in higher level units were safer, but whether intrapartum care to women living rural and remote areas would be safer and achieve better outcomes under centralized conditions. By excluding all out-of-hospital deliveries in their analysis, including those during transfer, and not considering the attendant challenges and health impacts of greater (or total) referral to centralized maternity units, Moster, Lie, and Markestad (1999) carefully avoid a critical geographic reality.

In fact, Viisainen et al (1999) examined accidental, out-of-hospital births in Finland between 1962-1973, and compared it to data from 1992/93 (this data was not tracked in Finland between 1973 and 1992). Between 1962 and 1973, the rate of accidental, out-of-hospital birth fell from 1.3 per 1,000 to 0.4 per 1000. In 1992/93, it had reached 1.0 per 1,000 live births. Viisainen et al (1999) argued there was a temporal connection between the closure of small units and the rise in accidental, out-of-hospital births, known to have exceptionally poor outcomes relative to delivery in any intended and medically observed setting. In fact, the crude risk factor for perinatal death was six times higher among babies born accidentally out of hospital, and over three times higher when birth weight is controlled (Viisainen et al, 1999; Heminki, Heino, and Gissler, 2011).

Despite increased concern over accidental, out-of-hospital births in Finland, the rate continued to increase during the 2000's according to Heminki, Heino, and Gissler (2011). Their study of all births in Finland from 1991-2008 found that among children born weighing >2500g (the same low-risk cut-off used by Mosler, Lie, and Markestad, 1999 above), mortality was similar across all hospital types, sizes, and locations. However, the number of maternity units in Finland decreased 31% over that span while births declined just 9%, and accidental, out-of-hospital births increased. Of note, the rate normalized across regions during the study period, indicating that not just rural and remote women suffered this care deficit, but that urban-adjacent women also began to experience unplanned, out-of-hospital births in increasing numbers. This fits with data from BC, Canada reported by Grzybowski, Stoll, and Kornelsen (2011) that women one to two hours from service were more than 6 times (OR=6.41) more likely to have an unplanned, out-of-hospital birth. Heminki, Heino, and Gissler (2011) provide a strong case for the need for smaller, local-to-mothers birthing units, concluding, "[t]he analysis suggests that in a regionalized system with a functioning referral system, there is no need to close down small hospitals for reasons related to health or healthcare procedures." (Heminki, Heino, and Gissler, 2011, p1191)

Their conclusion echoes that of another Finnish study by Viisainen, Gissler, and Heminki (1994). Population birth data from 1987/88 (n=123,065) was analyzed by service level of delivery hospital and catchment, selected for low-risk deliveries. Their study showed effective regionalization, with low-weight and premature neonates and those requiring surveillance concentrated in level three (highest level) hospitals. In catchment analysis, women determined to be low-risk had similar outcomes regardless of the hospital type at which they delivered. "[T]his study... indicates that 'safety' cannot be used as a basis for centralizing birth care in large level 3 facilities." (Viisainen, Gissler, and Heminki, 1994, p404)

Heller et al (2002) challenges this notion, asking if regionalization and the desire to have birth closer to home is leading to higher mortality. The authors found a gradient of worsening outcomes from the largest and best resourced birth units in Hesse, Germany to the smallest. Looking at 582,655 births between 1990-1999, they report that in units with <500 births per year, early neonatal death (within 7 days of birth) is three times more likely than in units with >1500 births annually. However, the authors note that without evidence on staffing, skill, training, team work, and other factors of quality of care within the delivery units, the actual cause of higher mortality is unknown. Interestingly, this study uses the most inclusive

definition of 'low-risk,' calling all babies born of normal weight (2500g-4200g) without death by congenital abnormality a low-risk pregnancy and birth. Models which controlled for time of birth and gestational age were attempted and had similar results, and late neonatal death (within 28 days) was also examined. However, referral was assumed appropriate, and maternal conditions were not controlled.

Merlo et al (2005) also found a small unit outcome disadvantage, this time in Sweden, and attempted to define the percentage of proportional change in risk of neonatal mortality by birthing unit size. Using a multilevel logistic regression in which all births between 1990-1995 (691,742) were nested into hospital outcomes (n=66), one cause of higher risk in some smaller units became clear. Just 4% of Sweden's institutionalized births take place in units with <500 annual births and without a pediatrics department, and this group showed the largest risk for neonatal mortality. The authors note, however, that the absolute survival rate in these relatively higher-risk birthing environments was 99.9%, and the absolute survival difference compared to large regional hospitals was 0.06%.

This extremely small difference in absolute outcomes was found in Heller et al (2002) as well. Among births at regular weight, neonatal death was reported at 0.6 deaths per 1000 births in small units in Hesse, Germany, and just 0.19 per 1000 in the largest units. This is very much in line with the mortality rate observed in Norway (Moster, Lie, and Markestad, 1999). As well, Norum et al (2013) report a neonatal mortality rate of 2.2 per 1,000 for all births in Northern Norway, and a national rate of 2.3 per 1,000. For context, as of 2011, Germany also achieved a neonatal mortality rate of just over 2 deaths per 1000 births, roughly half of Canada's rate of 4.7 (UN Data, 2011).

Finally, there is a potential confound in the data of Heller et al (2002) and Moster, Lie, and Markestad (1999): the relative health of the adult population. A study from Sweden by Finnstrom et al (2006) found lower rates of neonatal death, respiratory disturbance, cerebral palsy, and 5-minute Apgar scores <4 in smaller delivery units when controlling for maternal age, parity, gestational age, smoking during pregnancy, maternal body mass index, and parent cohabitation. Their massive study of 1.5 million singleton births between 1985 and 1999 found that in units with <500 annual births, the odds of neonatal death was just 0.84 compared to the reference category of units with 1000-2499 annual births (Finnstrom et al, 2006). Those units with 500-999 births did slight better with an odd ratio of 0.82 of neonatal death. The authors found, as did Merlo et al (2005), that the existence of a pediatrics department played a significant role in lowering the neonatal mortality rate in smaller units, but the absolute numbers were too small to be statistically significant. They conclude that regionalized referral is functioning and that care is of a relatively homogeneous quality regardless of location.

Serenius et al (2001) corroborated these findings when they examined the cause and context of all 9,785 stillbirths and neonatal deaths in Sweden between 1983-1995. Again, data was controlled for by maternal age, parity, and smoking during pregnancy, and again, the smallest units were found to be less likely to experience a death (OR=0.65). A highly functional referral system ensured that high-risk pregnancies were centralized to high-resource settings.

Volume-to-outcome associations are under-studied in Canada, and associations specific to cesarean section are under-studied worldwide. In a systematic review of volume-to-outcome association studies in the United States and Canada, Urbach et al (2005) found that Canada's public health system considerably reduced the effect of volume on outcomes. Little research on thresholds exists in Canada, with only 14 of the 142 studies found by Urbach et al (2005) reporting on Canadian data. Further, just 4 of the studies including data on obstetrical procedures. Of 278 separate analyses reported in these 142 articles, 206 (74%) found any statistically significant association, with Canadian studies even less likely to find any association (OR=0.24). Though obstetrical specific data was collapsed into an 'other' category in Urbach et al's (2005) analysis, even surgeries known to have a volume-to-outcome association (such as complex heart procedures) were shown to have a lesser effect intensity in Canada compared to the United States. The authors concluded that a single-payer, globally financed health care system with regionalized organization reduces volume concerns, as complex procedures are already referred to high-level care facilities without facility competition.

One study stands out as having particular applicability to this review. Using all births attended by family physicians at BC Women's Hospital and Health Centre from 1997-1998 (n=4,444 births), Klein et al (2002b) analyzed outcomes according to the personal volume of attending family physicians (n=152 physicians). Thresholds of <12, 12-24, and >25 were used to explore whether attending more births led to better birth outcomes, but no differences were found in the volume cohorts in maternal complications, 5-minute Apgar scores <7, or adverse admissions to intensive or special care. Low-volume GPs were more likely to consult with an obstetrician and more likely to transfer care to a specialist, but outcomes were not impacted by attending a greater volume of births.

Though some conflicting evidence exists that centralizing care to units with greater volume and resources may be safer, the balance of evidence suggests that low-volume is not associated with greater risk. With respect to determining the appropriate level of centralization, the safety of smaller units also has to be considered in light of existing evidence that increased distance to care is associated with worsening outcomes.

Examining 49,402 births to women from rural catchments between 2000-2004, Grzybowski, Stoll, and Kornelsen (2011) found that neonatal mortality was three times more likely for births in which the women had to travel four or more hours to services (OR=3.17). As well, induction was found to be 1.3 times more likely in women who had to travel to services, mostly for logistical reasons (Kornelsen, Moola, and Grzybowski, 2009).

Through interviews and surveys with a representative sample of providers in rural Scotland, Tucker et al (2005) found 47.5% of respondents agreed that practitioners in referral centres did not understand the constraints of transporting women for birth complications (37% disagreed). Stating the need for effective local services, one interview respondent underscored the tremendous challenges of referral or transfer from a rural or remote location, '[i]t's the time, it's the distance, it's the geography, it's the weather ... in the wintertime even helicopters don't fly' (Tucker et al, 2005, Interview 21, general practitioner, p37).

Even in the relatively more dense Netherlands, longer travel times are associated with worsened outcomes (Ravelli et al, 2011). Travel of more than 20 minutes to care resulted in higher total mortality (OR=1.17), higher neonatal mortality within 24 hours (OR=1.51), and greater rates of adverse outcomes (OR=1.27) in Ravelli et al's (2011) study of 751,926 births in Holland between 2000-2006. Few women in the Netherlands travel more than 30 minutes (as measured by driving time without delays) to birthing services, which is quite different than in the relatively sparse and very large province of British Columbia. However, their finding of an odds ratio of additional risk of 1.01 per minute of travel time is evocative when considering the centralization of services as a method of improving outcomes.

Main Points

- **There is no existing clinical, case study, or qualitative evidence that caesarean section, is less safe when provided by GP proceduralists with enhanced surgical skills than when provided by specialist obstetricians;**
- Volume-to-outcome associations are extremely variable across procedure and context, but evidence suggests greater birth volume does not improve birth centre outcomes in maternal surgical care in the Canadian context;
- Lack of any local maternity services is associated with worse birth outcomes, with both the risk that women present to underprepared health service units, and distance to care affecting outcomes;
- Lack of local maternal surgical care is associated with a lesser ability to meet the needs of the community and substantially higher outflow;
- Outflow and transfer may have problems beyond distance to care, as there are health outcome concerns raised at the continuity of care between urban delivery units and rural postpartum care providers (Bar-Zeev et al 2011);
- Qualitative research finds negative psychosocial affects among women traveling away from their home communities to deliver.

Limitations to the data include the limited evidence on the unanticipated psychosocial consequences of relocation for care (Kornelsen and Grzybowski, 2012).

Evidence on Costs and Cost-Effectiveness

Research evidence on costs and cost-effectiveness includes studies that address factors that affect the cost of service provision, primarily **system costs including capital costs, health human resources costs and training costs of medical staff**. Comparing overall system costs is complex as different models of service generate intended and unintended consequences and both direct and indirect costs. Furthermore, specific regional solutions to service provision are built upon existing infrastructure and resources that are difficult to quantitate against new investment.

Generally, most analyses focus on the direct health system costs such as capital investment or operating costs associated with provider models. The external costs associated with patient travel to access services or the indirect costs associated with unintended morbidities are generally not included in the costing analyses, and Heminiki, Heino, and Gissler (2011) reported the same shortcomings. Most of the

literature links the cost of care to a service model or characteristic, whereas some of the literature takes this analysis a step further, linking the cost of care to health outcomes.

Centralization is primarily associated with larger **investments in capital**, concentrated in one facility, whereas decentralization is shown to require larger expenditures in human resources in order to adequately staff each site. A study using a population-based approach to modeling health services in Manitoba (Black and Burchill, 1999) showed this in an effort to assess the feasibility of repatriating care from urban Winnipeg hospitals back to rural community hospitals. Using Dauphin Hospital as a benchmark (the authors assume that all regions should have the same proportion of cases referred to Winnipeg as Dauphin), the study suggests that 810 annual obstetric cases and 1100 surgical cases could be redirected to rural hospitals. They found that in order to repatriate these cases, the rural locations would not require capital upgrading, but might require some additional beds or human resources.

Health human resources are used as a proxy for cost-effectiveness on the principle assumption that if a patient requires more of a provider's time and attention, they must represent a larger cost to the system. The Australian College of Midwives conducted a pilot study on this principle (1994), comparing the post-partum human resource time require by mothers who had vaginal deliveries to mothers who had caesarean sections. They found that longer hospital stays are associated with birthing interventions and that births via caesarean section required 3.4 "nurse days" for both mother and newborn, for a total of 6.8 days. On the other hand, mothers who had a normal vaginal delivery and their infants required only 3.2 days total care, less than half the human resource cost of the caesarean section. When considering post-partum human resource costs, vaginal deliveries were more cost-effective to the healthcare system.

Roos et al (1999) attempted an analysis of how many GPs a region requires according to existing utilization patterns and population health. In the study, each area's initial entitlement to physician contact was adjusted according to the health characteristics of area residents. Healthier populations have lesser need for and utilization rates of GPs, but maldistribution of services in Manitoba was found by the authors to be a barrier to care in rural areas. At the same time, a surplus of physicians in urban Manitoba was argued to contribute to an over-investment in physician services, with adult health care costing 33% more per adult resident in Winnipeg than rural Manitoba (Roos et al, 1999)

The rate of c-section has continued to climb worldwide, and is currently over 26% in Canada (CIHI, 2007). None of the literature reviewed for this report compares the cost (human resources, equipment etc.) of labour and delivery for vaginal birth versus caesarean section in a Canadian context.

An important component of human resource costs for rural maternity services is the costs required to **train and maintain competence of care providers**. Aubrey-Bassler et al (2007) note the disparity in costs of training GPs compared to Obstetricians to perform caesarean sections. Rosenthal itemized costs incurred by practitioners to travel to facilities with higher levels of service for maintenance of procedural skills. These costs included transportation to the teaching community,

accommodation, registration fees, lost earnings, the fixed cost of keeping a practice open, and locum costs (Rosenthal 2001). In his editorial review of rural procedural specialties in Australia, Rosenthal emphasizes that these costs must be balanced against the financial benefits of continuing to practice in obstetrics. He cites a 1994 study that calculated that a general practitioner in Victoria needed to deliver 13.5 obstetric cases per year before making any profit and suggests that financial support from the Australian government is necessary in order to diminish the costly barriers to rural obstetrical care.

Beyond these direct costs, **indirect and external costs must be considered**. Indirect costs include the additional expenses of unintended morbidities that result from the model of care and external costs are those borne by patients and their families in order to access services, which never appear within the system.

Evidence demonstrates that women who travel greater distances to access maternity care experience poorer birth outcomes (Grzybowski et al 2011; Hulme and Blegen 1999; Nesbitt et al 1997; Nesbitt et al 1990; Ravelli et al, 2011). The **costs of treating the unintended morbidities** associated with poor birth outcomes are often left out of analyses. In a retrospective cohort study of rural hospitals in Washington State, Nesbitt et al (1990, 1997) classified communities by the amount of outflow occurring (percentage of women who leave their community to give birth). The studies found that women living in high-outflow communities (less than a third delivering locally) were more likely to experience birth-associated complications, premature births and stays longer than 5 days in the hospital. These unintended morbidities are reflected in the cost of perinatal care. The mean cost of infant care in high-outflow communities (\$1,041) was significantly higher than the mean costs of infant care in low-outflow communities (\$817). Further, the proportion of newborns with care more expensive than \$5,000 was 1.9 times higher in the high-outflow communities than the low-outflow communities. It is possible that this disparity is due to the practice of referring high-risk pregnancies, which are more likely to result in poor outcomes, out of smaller communities. However when examining premature infants with major complications (a high-risk situation), the author found that infants were still more likely to require care costing over \$3,000 if their mothers lived in high-outflow communities (71.4%) than low-outflow communities (50.5%), suggesting distance to care as a negatively influencing variable.

Nesbitt's findings are supported by a large retrospective cohort study conducted by Grzybowski et al (2011). The authors examined the outcomes and the **cost associated with distances** that women have to travel in order to access maternity care in British Columbia. They found increased rates of NICU 2 admissions and more NICU2 and 3 bed days for newborns whose mothers live 1-2 hours from maternity services. This translates into costs to the health system of \$1,300/day for NICU 2 and \$2,500 for NICU 3. The authors argue that the cost-effectiveness of sustaining rural maternity care may be better than previously considered due to higher system costs in the event of adverse conditions, and the increased rate of adverse conditions among women traveling for maternity care. Further to the unanticipated costs of dealing with morbidities, Grzybowski et al emphasize the costs borne by patients who must leave their local community to deliver. These

costs including travel, accommodation, food and lost income, must be factored into a more holistic approach to analysis.

These findings were consistent with a 1999 study of the University of Iowa Hospital and Clinics (Hulme and Blegen 1999). The study found that rural women who underwent a cesarean section had the longest length of stay and the highest cost of care when compared to urban or rural-adjacent groups. However, it was not determined whether these outcomes were due to decreased local access to care, to the practice of referring high-risk patients, or other factors.

Beyond costs borne by families and the system, centralization of specific procedures or patients, especially surgical cases, can have dramatic effects on the health and viability of rural hospitals and communities (Doty et al 2008; Doty et al 2009; Zuckerman et al 2006). With a fee-for-service system and hospitals competing for healthcare dollars, the United States shows the most concern about the relationship between surgery and financial viability. Still, applicable to all rural settings are the associated benefits to a rural community of having surgical capacity, such as improved stability and growth, and investment in community development and jobs from other sectors (Cogbill, 2012; Klein et al, 2002a; Miewald et al, 2011; Prior et al, 2010)]

Birthing Interventions

There is research evidence that focuses on costs incurred by interventions such as cesarean sections and inductions when compared to normal vaginal deliveries.

The Australian College of Midwives cite a study in New South Wales which reports average costs per mother of different delivery scenarios: caesarean section without complications (\$2,860), caesarean section with complications (\$3,280), normal vaginal delivery without complications (\$1,196), and normal vaginal delivery with complications (\$1,766). These costs reflect an average across the ten participating facilities. Costs were calculated by allocating overhead costs proportionally to each facility, then subsequently allocating those costs proportionally to the procedure groups. Based on the high cost of care for birthing interventions, the authors argue that investment upstream in the health system, such as community health projects or increased prenatal care, would lead to savings (Australian College of Midwives 1994). Similarly, Zust and Briggs (2010) suggest that induction of labor is associated with higher system costs because it requires intensive monitoring, increases the length of hospital stay, and increases the number of interventions and caesarean sections (Glantz 2005; Crowley 2000; Symon 2000). These authors found that the low-risk women served by a Midwestern USA hospital had an induction rate of 37.7%, almost twice the national average (20.6%) and that only 44% of these inductions were based on medical indications. The authors explain that according to the physicians concerns about adequate staffing, the most likely reason for unindicated induction of labour was to assure the availability of qualified labour and delivery nurses at the time of delivery. This suggests that savings on workforce costs may have actually led to an overall increase in spending due to the induction procedure. However, such strategic inductions may reduce external costs incurred by traveling women by reducing the number of days they spend away from home.

Grzybowski et al (2012) found similar higher rates of induction based on distances to services for rural women in B.C.

Approaches to Reducing Costs of Rural Perinatal Surgical Care

* **Telemedicine has been proposed as a possible approach** to providing specialist surgical support to rural communities (Chan 2007; Magann et al 2011; Odibo 2013; Minnesota Department of Health 2013). Tele-service delivery can be cost-effective above a threshold number of consultations which offset the initial start-up costs (Magann et al 2011; Odibo 2013). In their review of the literature on the use of telemedicine in obstetrics, Magann et al (2011) cite studies from several countries (the UK, the USA, Australia and Chile) that demonstrate telemedicine can provide access to specialists for fetal surgery, echocardiography, genetic counseling, and management of high-risk conditions such as diabetes or hypertension. Further, this review showed that specialists who could monitor at-risk patients and evaluate fetal heart rates at a distance were able to reduce costs (Magann et al, 2011). Programs such as “ANGELS” (Antenatal and Neonatal Guidelines, Education and Learning System) in Arkansas and its counterpart “STORC” (Solutions To Obstetrics in Rural Counties) in Tennessee provide 24-hour access to a maternal-fetal medicine specialist for rural hospitals, real-time antenatal care, ultrasound by a traveling sonographer/RN, triage and transport services for patients (Odibo 2013; Minnesota Department of Health 2013). In just over a year of operation, the STORC program was able to save \$29,000 (USD) in patient travel expenses. By using a secure firewall and the internet instead of a T1 conference line, the STORC program is able to minimize their operating costs. For high-risk cases requiring communication with a fetal medicine sub-specialist, Chan (2007) demonstrated that tele-consultation costs averaged A\$74 per visit, and allowed for 90 consultations from Brisbane to Townsville. Of these referrals studied, 24 would have been sent to Brisbane at a total travel cost of A\$13,000, demonstrating that not only was telemedicine a much more cost-effective option, but that it allowed for more consultations to occur. Despite evidence that telemedicine is a cost-effective option, however, it is not clear which obstetrical procedures are best conducted (services are best provided) with this method. Further, these analyses do not reflect costs of upgrading equipment, troubleshooting, or costs to the patient. *Itinerant surgeons are depicted in the literature as another cost-effective method of providing surgical care to rural communities (Godden 2005; Drew et al 2006). The Orkney Islands, situated off the north coast of Scotland, 120 miles from the nearest referral centre, conducted a comparison of providing internal medicine procedures by a resident surgeon versus an itinerant. They found that with the additional service, the overall costs increased, however, “when the costs are considered against health gain, they appear acceptable” (Godden 2005). Further, they found that the cost of an itinerant surgeon, working 50% of the time from Inverness, was similar to the cost of staffing locally, as three incumbents would be required to meet the national working

time guidelines (Working Time Directive). Drew et al (2006) found that when they conducted a survey of itinerant specialists in rural communities of Massachusetts, visiting specialists feel they can provide cost-effective specialist care with a high degree of provider satisfaction and a low amount of administrative responsibilities.

** Maouris et al (2010) describes a program staffed by a small team of 2-4 obstetrician/midwife educators from a large maternity hospital, which travelled to 14 rural hospitals in Western Australia to provide training once every 12-18 months. This training significantly improved the health outcomes of the rural and remote hospitals without any additional resources or specialist support (decrease in rate of caesarean section, rate of low Apgar score, rate of vaginal breech, rate of stillbirth and perinatal death rate, though the last two were not significant). The program cost A\$360 per trainee or A\$25,000-36,000 per year.*

Main Points

- Both direct system costs such as capital, human resources and training, as well as additional costs such as unintended morbidities and costs incurred by patients, must be factored into the evaluation of a model's cost-effectiveness.
- The literature reviewed here demonstrates that higher costs are associated with greater distances that women must travel to access services, both in travel expenses, and in the cost of managing poor outcomes due to delayed access.
- Suggestions for cost-reductions include telemedicine and regular outreach training.

Due to the lack of literature on comprehensive costs of either centralized or decentralized models and the tremendous variation in health service models, we are unable to determine if one is necessarily more cost-effective.

Sustainability of Decentralized Models of Perinatal Surgery for Rural Women

Research evidence on threats to the sustainability of perinatal surgical services for rural women focuses on threats to sustainable rural (decentralized) services, broadly described as 'workforce' issues. They include challenges with training and preparedness for rural practice, recruiting and retaining practitioners in rural settings, and the sustainability of small services due to low resources and low volume of procedures. These challenges are underscored by an acceptance in the descriptive literature from all jurisdictions in this review that rural providers have a broader case-mix than their urban or semi-rural colleagues and require training tailored to address this difference (Buck et al 2004; Glasser, Peters, and MacDowell 2006; Callaghan 1994; Breon et al 2003; Baker et al, 2010; Buser, 2002; Buser 2009; McDowell et al, 2009; Crump et al, 2013; Smith and Murphy, 2000).

Specific to perinatal surgical care, 90% of Iowa's rural surgeons report routinely doing c-sections in Breon et al (2003), while just 11% of non-rural general surgeons reported the same. In rural Western Australia, 62% of GPs reported providing

obstetrical care, and 46% had performed a c-section in the last year (Welch and Power, 1995). Similar rates of c-section participation were found in southern Australia (43%; Watts et al, 1997) and New South Wales (41%; Woollard and Hays, 1993). In a study of family practice graduates in Alberta 1985-1995 (Universities of Alberta and Calgary), Chaytors, Szafran, and Crutcher (2001) found that 78% of those practicing in rural areas performed deliveries, compared to just 53% of graduates in metropolitan practice. As well, 11% were performing c-sections in rural areas, versus just 1.8% in metropolitan areas.

The broad case mix of rural GP surgeons is in part defined by other existing local services (Gruen, Knox, and Britt 2002; Campbell, Kitchen, and Campbell 2011). Reviewing the case mix of three rural general surgeons over five years, Tulloh, Clifforth, and Miller (2001) conclude, “[e]ach surgeon’s caseload is shaped not only by his areas of interest and training, but also by the complement of other specialist services available in the region.” (217) Robinson et al (2010) argue that GPESS are at the core of rural surgical service provision precisely because they fill care gaps.

As such, limitations on the procedures done by these GPs with enhanced procedural skills would only serve to expand the gaps in local care and create greater outflow, particularly in surgical maternity care where available emergency support is part of risk management. Evidence shows that high outflow often leads to facility closure (Nesbitt et al 1990), which could lead rural services to unravel (Kornelsen et al 2013).

This body of literature is based on the recognition that rural services are not ‘like urban services, only smaller’ (Bar-Zeev et al 2011). Instead, different levels of resources and different care patterns exist. In a review of family practice policy in the UK, Godden (2005) found that those differences are potentially misunderstood when administrative bodies make policy decisions across disparate geographies, and centralization can be an incidental consequence of policy that assumes a common work experience between rural and urban providers. Bauman et al (2008) found a similar problem in Canada, where policy for mixed rural and urban populations led to strategies and programs that were ineffective in a rural setting. Alexander (1998) calls for rural policy and program decisions to be considered from ‘bottom-up,’ to allow flexibility to local context and need.

Otherwise, the result can be increased instability and reduced sustainability of rural perinatal surgical services. Structural differences demand geographically specific solutions to workforce shortage issues, educational programs, and recruitment of rural providers. Each theme is reviewed below.

Workforce shortage issues The reality of the declining rural workforce is common to all jurisdictions covered in this review. In the BC context, 90% of BC’s GPESS workforce is over 45 years of age and 60% are foreign trained. (Humber and Frecker, 2008a) Similarly, in 1995, 50% of Canada’s general surgeons were over 55. (Inglis, 1995) Beyond an aging workforce, maldistribution is a problem as well. In the mid-1990’s, an estimated 24% of Canadians lived in rural areas, while just 17% of GPs practiced rurally, and only 4% of specialists (Chiasson and Roy, 1995). A study of Manitoba GP utilization rates argued that Brandon and Winnipeg were over-served (by a combined 89 GPs) while northern Manitoba had a large deficit

(41 GPs) and the rural south was also lacking (6 GPs) (Roos et al, 1999). An estimated 65% of rural counties in the United States have a workforce shortage (McDowell et al, 2010) and the workforce is aging, with those working in the smallest communities most likely to be over 50, male, and foreign trained (Heneghan et al, 2005; Lynge et al, 2009). Over 75% of rural hospital CEOs in the United States indicated a primary care shortage at their hospital, and over 34% indicated an OB-GYN shortage. As well, Borgstrom and Heneghan (2009) identify a distribution problem, in which 25% of Americans live in areas designated 'rural,' while just 12% of physicians practice in rural areas. Williams, Satiani, and Ellison (2011) note that 18% of births in the United States occur in rural settings. Further, just 10% of America's general surgeons are in rural areas (Bogstrom and Heneghan, 2009), while estimates suggest a need for 19% of general surgeons to be in rural areas for adequate rural care (Borgstrom and Heneghan, 2009; Williams, Satiani, and Ellison, 2011). As well, just 10.7% of OB-GYN surgeons are in rural areas of the United States (Williams, Satiani, and Ellison, 2011).

Deeper analyses of the 'surgeon deserts' in the United States show that there are 1,105 counties with general surgeon to population ratios that are 25 per 100,000 or higher, while 925 counties have no general surgeon at all (Belsky et al, 2009). National figures approximate an existing 6.4 general surgeons per 100,000 population, with small rural and remote settings the least well served (4.67 per 100,000) despite lesser population density (Thompson et al 2005). Almost all (95%) of counties without a GS are considered rural, and 50% have an existing hospital according the study by Belsky et al (2009). The current accepted figure – produced by consulting firm Solucient – suggests a requirement of six general surgeons per 100,000 people (found in Belsky et al, 2009). The total ratio of general surgeons to population has declined 25.91% between 1981 and 2005 (Lynge et al, 2008), and is expected to result in a shortage of nearly 2,000 general surgeons by 2020 (Williams and Ellison, 2005). This is expected to happen within a larger process of centralization, where rural patients will face the greatest surgeon shortages and distance to care (Thompson et al, 2004).

Larimore and Davis (2005) found that availability of maternal surgical care in rural Florida had a dramatic impact on infant mortality. Their mathematical model of the impact of service availability predicts that the loss of a single family physician performing maternal care in a rural county would account for a 2.3% increase in infant mortality in that county, and the loss of an OB-GYN would account for 9.6% increase. The model presumes a greater volume of deliveries for OB-GYN, and is derived in a context where OB-GYN's are the primary leads in delivery but only 4% of the state's providers practice rurally. Larimore and Davis (2005) found that 17.6% of the variation in Florida's infant mortality rate could be attributed to service availability, a number similar to the 14.4% found by Allen and Kamradt (1991) in Indiana.

National statistics in the United States illuminate the challenge of replenishing an aging workforce while relying on a provider choice model for physician distribution. Of 1,000 surgical residents graduating in America annually, only 25% go in to general surgery, and only 10% of those choose to work in rural areas (25 of 1,000 annual US graduates). (Breon et al, 2003)

Swayne and Eley (2012) identified perinatal surgical care as the “lynchpin” in the pattern of unsustainable rural healthcare. In their study on the enablers and barriers to rural generalist procedural practice, one GP respondent noted, “[i]f you lose your obstetrics it all goes. The obstetrics and the operating theatre are linked together because it’s a practical thing. If you want to do obstetrics you have to have a 24 hours operating theatre. The loss of obstetrics means the impetus of keeping the theatre open dies and vice versa.” (GP respondent; Swayne and Eley, 2012, p40)

Educational Programs

In 2005, just 11% of graduates from medical schools in the United States between 1988 and 1997 were practicing in rural environments (Chen et al, 2010). In family medicine, 23% of graduates from that decade currently practice rurally. That rate is stable relative to previous analyses (Rosenblatt et al, 1991), though Chen et al (2010) believe that it reflects a peak of rural and family practice interest in the early 1990’s followed by a steep decline not yet captured in the data.

Surgical educational programs with a rural component report higher rates of graduates taking up rural practice, general practice, and primary care practice (Anderson, 2000; Crump et al, 2013; Eley et al, 2012; Hancock et al, 2009) A key characteristic of these programs is facilitating rural experience to avoid subspecialty competition for procedural experience (Borgstrom and Heneghan, 2009) and teaching rural specific competencies. Existing recruitment strategies are based on the belief that those from rural backgrounds are more likely to practice there, and those with positive experiences in rural communities are similarly more inclined to work there. (Eley et al, 2012)

Crump et al (2013) found that a rural program graduated practitioners more likely to stay in Kentucky, work in a rural setting, and choose general practice. Anderson (2000) found that establishing a rural medical program had positive effects on rural care. A program near Buffalo, New York, attracted faculty physicians and improved access to and quality of care in the area immediately, even as the goal of the program was to train rural practitioners for long-term workforce replenishment.

Burkholder and Cofer (2007) attempted to find out how many medical schools in the United States currently have rural surgery programs. Their survey to all 224 surgeon residency programs asking about their rural surgeon training found just 36% self-identified as having such a curriculum. The study was hampered by a low response rate (24%) with an assumed self-selection bias that inflates the number of programs with rural training. Further, the nature of each program was not probed. However, in ranking the necessary additional skills for rural surgeons, OB/GYN related procedures were rated most necessary by Program Directors.

Though these are positive indications, predictors of long term success are limited in the literature, perhaps because the programs are somewhat new or simply understudied. Eley et al (2012) surveyed 115 (of the 180) graduates of the Australian Rural Clinical School (RCS) initiative since it began in 2002. Only 40% of those graduates were in rural practice at the time of the survey, between 2 and 9 years after their graduation. In examining what factors affected their practice location decisions, the authors conclude, “[t]he primary drivers that influence

decisions to pursue rural medicine are personal/family reasons, positive rural exposure and specialty training requirements.” (Eley et al 2012, p10) Flowing from this finding, the authors recommend placing medical students into rural locations for more of their training with the intention of having more non-career life decisions take place in a rural setting. As an example, the Bassett Healthcare rural surgical residency allows students from Columbia Medical School to transfer to Cooperstown in rural New York after completing 18 months of their standard program. The residency program provides 6 weeks of remote training as well and the authors found that exposure to rural living is as important as rural specific procedural training. (Borgstrom and Heneghan, 2009)

Due to the recognition that generalists often fill care gaps in rural communities (see above), Campbell, Kitchen, and Campbell (2011) argue that rural training should be even more specific than a single list of procedural competencies – general surgeons should be trained to meet community needs not met by regional specialists. Pollett and Harris (2002) made a similar suggestion in their editorial on behalf of the Canadian Association of Surgical Chairs, “The future of rural surgical care in Canada: a time for action.” They recommend creating a rural training track (or trajectory) so medical school graduates can be trained to meet the surgical needs of individual communities. Wollard and Hays (1993) found that over half of the GPs in New South Wales, Australia were willing to participate in training future rural providers. Given this, it may be possible for current rural practitioners to be involved in training their own replacements.

Recruitment of Rural Providers

Through their survey of 390 rural general surgeons and 145 urban general surgeons in the United States, Heneghan et al (2005) attempted to determine motivations for practice location. Rural providers were less motivated by income (20% of rural providers indicated this as a motivation versus 36% of urban providers), professional growth (45% vs 65%), availability of hospital facilities (39% vs 58%), quality of surgical community (34% vs 58%), quality of medical community (41% vs 60%), and even by family proximity (35% vs 51%). They were, however, motivated equally by quality of life (77% vs 78%), leading the authors to conclude that exposure to rural areas may improve the opinion of graduates about the quality of life in rural settings and lead them to choose a rural path.

Campbell et al (2011) have detailed the attempts made in Australia to increase recruitment of rural providers since 2001. The introduction of the Australia Rural Clinical School initiative (a rural pathway), creation of more general and rural practice placements in medical schools, provision of financial incentives for graduates who move into rural practice, and creation of regionalized Australian General Practice Training for specific geographic health systems are the principle means of Australia rural recruitment. Taken together, these strategies have led to increases in the number of rural GPs. (Campbell et al, 2011) However, the authors note that only 29% of rural pathway graduates have remained in rural practice upon graduation and the number of rural pathway registrants entering surgical obstetric training remains insufficient to meet the current needs of rural communities.

In a qualitative study of the 70 GPs practicing obstetric, surgical, or anesthetic procedures in the Bogong region of Australia, Robinson et al (2010) distinguished between the motivations for *choosing* rural practice and the reasons for *staying with* rural practice – or recruitment and retention – from an administrative perspective. Lifestyle, cultural fit, spousal employment, secondary schooling options and a sense of belonging were reasons stated as being important to GP attraction to rural general practice. However, it is the diversity and challenge of general and procedural medicine that attracts and keeps GPs in rural settings (Robinson et al, 2010).

Kornelsen et al (2012) conducted a qualitative study of the training experiences of GP surgeons in BC and Alberta that showed very similar results. Interviews with 70 participants across the two provinces identified motivations for advanced training included health human resource concerns, responding to community needs, enhancing their own professional competence, and gaining personal satisfaction. A typology of reasons for retention developed inductively from interviews with 22 rural GPs in California and Nevada looks similar (Hancock et al, 2009). The important factors were grouped into: familiarity; sense of place; community involvement; and self-actualization. The authors argue that a focus on retention that built specifically on these themes would effectively improve recruitment as well, raising the standard of living and making interactions with rural practice more positive. Exposure to rural environments as brief as summer camps, recreational activities, and rural service projects were found by Hancock et al (2009) to impact choice of practice location.

Main points:

- The research evidence cited in this review focused exclusively on decentralized (rural) models of perinatal surgical care by GPs with enhanced surgical skills due to the threatened sustainability of this model;
- Lack of sustainability is due largely to workforce shortage issues including recruiting and retaining care providers in low volume settings;
- Sustainability is also related to challenges with training and preparedness for rural practice for both GPs and rural General Surgeons;
- Perinatal surgical services are the ‘lynchpin’ in sustainable rural health care;
- Educational programs have a significant role in attracting new practitioners to rural practice; strategies include recruiting students from rural settings, although evidence of effectiveness of this strategy is mixed;
- Social drivers influencing decisions to pursue rural procedural practice include personal/family reasons and positive rural exposure;
- Effective rural training contributing to rural sustainability for GP proceduralists and rural General Surgeons should include broad procedural competencies (not limited to cesarean section);
- Current rural proceduralists must participate in training future rural providers to increase sustainability;

- Rural perinatal surgical providers are highly motivated by quality of life and social responsibility in meeting the needs of rural parturient women.

Satisfaction with Centralized and Decentralized models of Perinatal Surgical Care

Note that research evidence that was found on satisfaction of perinatal surgical services for this review was focused on the challenges of rural practice, particularly in the face of diminishing support from centralized services. This reflects the phenomenon noted above regarding the assumption of centralized care and the lack of attention to evaluating the efficacy of this model for rural women and care providers. This has created an imbalance of available evidence thus difficulty comparing centralized and decentralized models of care based on the variable of satisfaction. This gap must be acknowledged when reading these findings.

Provider Satisfaction with Practice

A consistent theme in the research literature is reports that rural providers feel extended by the expectation to perform beyond usual role delineations. Campbell, Kitchen, and Campbell (2010) examined the logbooks of two rural general surgeons in Australia over five years, finding that their workload was too high during the study period and included performing non-surgical tasks such as stabilizing patients, as well as providing emergency surgical care in all disciplines. The two surgeons were in a one-in-two on call schedule at times, and had to expand their skills to fit community needs. These practice conditions were attributed to lack of proximal specialist support (nearest specialist service was 200 km away).

In the survey of rural and urban General Surgeons in the United States by Heneghan et al (2005) noted above, the authors found rural providers had lower satisfaction with specialist support, access to technology, recruiting and retaining assistants, vacation, and on-call schedules. Drew et al (2011) surveyed visiting specialists about their preference and motivations in place of practice and found that respondents preferred their urban or urban adjacent practice (mean=1.64 where 1 is very satisfied and 5 is very unsatisfied) to their satellite rural practice (mean=2.27). As well, these providers found their overall workload to be dissatisfactory (mean=2.67). Despite this, 72% of respondents indicated they intend to continue their existing clinical arrangement through the next 5 years. The authors suggested that sustainability in practice despite low satisfaction was due to personal ethic (27% of specialists reported “opportunity to deliver care to underserved patients” and 23% noted “added convenience for rural patients” as motivating factors).

Retention of rural providers was examined by Humphreys et al (2002) in Australia. Asking 677 GPs about the factors influencing why they stay in rural settings or why they intend to leave, the authors found that rural GPs were most concerned about on-call arrangements, followed by professional support. However, rural GPs were also clear that the variety of their work, including procedural care, was a key reason they chose to practice rurally. This echoed the earlier findings of Alexander (1998),

who surveyed all the rural GPs in New South Wales, Australia and found that they valued procedural work such that closure of surgical facilities may lead them to leave rural areas.

In an editorial about the challenges and rewards of rural surgical practice in Canada, Darrell Baker (2006) reinforces these findings. Lack of contact with colleagues, difficulty accessing consultants and specialists in emergencies, poor locum coverage, long on-call hours, distant Continued Medical Education (CME), and lifestyle issues are all listed as serious problems. "So, why would anyone want to be a rural surgeon in Canada?" Baker (2006) asks. "The rewards far outweigh all of the drawbacks. The sincere gratitude of the patients, the exciting variety of the caseload, financial incentives, and the camaraderie of the staff of a small hospital are just a few of the things that make it all worthwhile." (p1632) Likewise, in their study of rural general surgical practice in British Columbia, Humber and Iglesias (1999) found that the variety of caseload is a key part of satisfaction among rural providers, reiterating the planning principal of using providers to their broadest scope of practice.

The unique opportunities of rural practice encouraged Bourke et al (2010) to offer a new frame for understanding rural health care. The authors argue rural health research often starts with a "deficit approach," in which rural health services are seen as lacking urban facilities and knowledge and thus inherently problematic. Instead, Bourke et al (2010) suggest framing rural health care through a "strengths approach," noting that rural providers have greater opportunity to see and address social determinants of health, participate in change at the community level, and engage the community in innovative service planning and programs – all opportunities that are more challenging in dynamic and diverse urban practice environments. Bourke et al (2010) argue that improving rural health services means using these existing strengths to address population health, rather than trying to make rural healthcare look more like urban healthcare by overcoming resource deficits.

Stress, Risk, and Support

The research evidence identified that 'filling the gaps' in rural health care leads to considerable stress for providers, accentuated when they do not feel adequately prepared or supported. Swayne and Eley (2010) found that the most significant barriers to practicing procedural medicine in rural areas of Queensland, Australia are the closure of facilities and downgrading of services. One GP respondent told the authors, "[w]ith the cessation of obstetrics as a routine, the stress of un-booked, emergency (& sometimes very difficult) deliveries when not keeping up with skills becomes an almost unbearable worry." (Swayne and Eley, 2010, p39). Even where facilities continue to exist, specialist and system support is critical for GPs doing obstetrics. "Essentially, if the fly-in specialist service were to fold and not be there to rescue us when we got into trouble I would seriously have to reconsider whether or not I would still practice procedural obstetrics. Having already thought about it I probably wouldn't – which is a real shame." (GP respondent, Swayne and Eley 2010, p41)

Training and Continuing Professional Development

Welch and Power (1995) found that 17% of rural and remote GPs doing obstetric practice in Western Australia wanted to upgrade their procedural skills to feel better prepared to provide maternity care and thereby mitigate stress. 83% of those already performing obstetrical care had post-graduate obstetrics training, and 59% held a relevant diploma (RACOG/DRCOG).

Glazebrook and Harrison (2006) identified a lack of local CME for rural providers as a significant barrier to gaining and maintaining advanced procedural skills in Australia. Lack of training opportunities, lack of locum relief, and the distance to training were all cited as barriers. Additionally, the costs associated with maintaining procedural skills were identified as a deterrent. Through the *Rural and Remote Procedural GPs Program*, Australia now provides financial support to 1,500 rural procedural GPs to seek 2 weeks of professional development, covering costs of locum and travel up to \$15,000 per year (Glazebrook and Harrison 2006). Pollett and Harris (2002) made recommendations reflecting this program for funding in a Canadian context. Writing on behalf of the *Canadian Association of Surgical Chairs*, the authors called for better locum coverage to afford rural surgeons a better lifestyle and an opportunity for skills upgrading. Further recommendations to give GPs the opportunity to do some surgeries with credentialing were also made.

Practice Thresholds

In a study of 167 GPs practicing obstetrics in southern Australia, Watts et al (1997) found that the 'self-reported comfort with obstetrics' was 7.46 on a 10cm Visual Analogue scale. Comfort was correlated significantly with length of obstetric training and number of deliveries per year. The authors report that those with >12 months training were more confident, and those who delivered <10 deliveries were less comfortable. Number of years of experience had no correlation with comfort.

The practice threshold number found by Watts et al (1997), though low, was not found at all by Norris et al (1996) in their study of 86 (of 112) rural GPs practicing obstetrics (including c-section) in Washington State. Instead, Norris et al (1996) found that comfort with procedures was based on the number of procedures performed in residency and not on number of deliveries during practice.

Tucker et al (2005) found there was a confound between competency and comfort. Interviews with a purposive, representative sample of rural maternity providers in Scotland (n=70) was supplemented with a survey (n=125), on which 42% of respondents agreed with the statement: "It's like riding a bicycle - once you have delivered babies, you don't forget how." Asked specifically about how many births per year were required for a competency threshold, answers varied wildly and were frequently left blank. One respondent wrote, "I find number of cases difficult to answer. It would depend on your previous experience and additional training." (Tucker et al, 2005, Questionnaire open comment, midwife 0081, p37)

No other direct evidence was found regarding thresholds of care to maintain competency; in each study cited, obstetrically-specific medical school and residency training was essential for GPs to feel confident providing obstetrical care.

Integrated Models of Care

Several authors cite the importance of integrating rural and remote surgical services with activities and supports available at specialist centers. This may involve itinerant specialists with regular rotations to the community to perform procedures, supervisor rural practitioners learning new skills, allow them to practice established skills or providing telephone and tele-health consultation. The productivity of these relationships is predictive of sustainable decentralized practice.

Rosenthal, Ferrara, and Hesler (1996) performed a review of existing literature in support of stand-alone birthing centres for rural New York State. The closure of maternity units in small hospitals had significantly impacted care to rural women. The Rural Health Council of the New York State Department of Health thus convened a stakeholder and expert panel to consider options including home births and re-opening maternity units within hospitals. The panel decided on stand-alone birth centres led by nurse-midwives to deliver low-risk women locally and coordinate the referral of women with higher-risk pregnancies to regional centres with surgical care available. Though Rosenthal, Ferrara, and Hesler (1996) found acceptable outcomes for stand-alone birth centres, this option was only possible with the support from regional hospitals and the integration of birth centres into the referral and transfer protocols of centralized surgical specialists.

Swayne and Eley (2010) identify a necessary synergy between various professional groups and the communities they serve to make rural health viable. "This combined medical staff [on a fly-in specialist team]... relies on local resources, such as a 24-hour theatre for obstetric emergencies, while local resources need to be augmented with allied health and fly-in specialist support in order to give the medical workforce confidence that they can access appropriate and timely help. All of these require a community willing to put their trust in a local health care system. It is this synergy that allows a viable rural procedural practice." (GP respondent, Swayne and Eley 2010, p40)

Client Satisfaction

Literature on client and patient satisfaction of rural surgical care is typically framed around satisfaction regarding *location of care* (home or away) and is focused primarily on the relative comfort, safety, and preference felt by rural women with local care. For example, Hays, Evans, and Veitch (2005) found that rural hospitals were regarded positively by patients in their review of 91 obstetrical, surgical, or anesthesia cases performed by rural GP proceduralists in Australia. Asked to compare the experience to previous experiences with urban hospitals or to what they had heard about urban hospitals, the patients and their families identified positive attributes and characteristics such as being "not just a number", "familiarity", "continuity of care", and "convenience." (Hays, Evans, and Veitch 2005). Overall, 83% of patients indicated that they were "very satisfied" with care at the rural hospital. A majority (90%) said that they were "very satisfied" with their doctor. Post-hospitalization, 95% indicated that they were "very satisfied" or "satisfied" with the care they had received.

Baird, Jewell, and Walker (1996) also found that GP proceduralists were important to allowing for birth close to home in rural Scotland. As part of their study of 997 births in a rural midwife led, GPESS supported unit, the authors reported that birthing women indicated an appreciation for the continuity of care provided by GP involvement. Authors noted that the transfer rate would have doubled without GPESS support.

Patient or client empowerment was an important factor in the study by Bar-Zeev et al (2011) of Australia discharge practices between a regional hospital and two remote health centres. In this referral model, women were sent to the regional hospital for birthing. The average number of hospital health workers mothers interacted with during a 3 day admission to the referral hospital was 9 in the Bar-Zeev et al (2011) study, with one woman seeing as many as 15. Entering a new environment with no relationship to the providers was challenging for women, but was made much harder for those with cultural barriers and Aboriginal women for whom English was not a primary language. Different care practices were also found to be concerning, and the result was a feeling of isolation (Bar-Zeev et al 2011). In one haunting case study, respondents detailed a woman with limited English who had undergone c-section for reasons she did not understand in the regional hospital. She did not report to the remote health centre and no discharge paperwork was sent. Her local health centre only found out she had undergone c-section when she presented with sepsis days later and had to be transferred back to the regional hospital. This disempowerment can lead to a breakdown in the relationship between delivering mother and care providers, with each seeing the other as a barrier to successful care (Kornelsen and Grzybowski, 2012; Bar-Zeev et al 2011).

In Humber and Dickenson's qualitative study (2010), they provided a typology of needs for rural patients (through a lens of Maslow's hierarchy of needs). Based on unstructured interviews with 15 rural surgical patients, they found that patients felt less safe and secure in larger urban centres, they felt that doctor visits were short and infrequent when compared to local surgical care, medical care was delayed, and communication was unfamiliar or inadequate. Other disadvantages included the lack of appropriate discharge planning, generic treatment, and lack of continuity of care. Additionally, participants indicated they were best able to meet the need for community and belonging when accessing care locally through a complex personal and professional relationship with their health care provider. Local care was perceived to be more continuous and less rushed in the community, and the atmosphere was more relaxed and friendly (Humber and Dickenson 2010). Although participants in this study underwent surgical procedures beyond cesarean section, obstetrical patients were included and findings may be transferable to this population.

Main Points

- The context for research evidence on satisfaction focused exclusively on satisfaction of rural practice due to the lack of research on centralized models and the emerging research showing safety and efficacy of rural surgical care;

- In all jurisdictions covered in this review, rural perinatal surgical care providers feel extended in their roles: this limits satisfaction and leads to burn-out and attrition;
- Rural surgical providers that persist are highly motivated by ideals of equity and access to care for rural populations;
- Continuing professional development for rural providers is essential and difficult to achieve due to lack of local opportunities;
- There is equivocal data on the importance of practice thresholds in provider satisfaction: overall the relationship is weak;
- Models of care that are highly integrated with specialist colleagues lead to increased practice satisfaction;

There is growing evidence on patient preference with surgical care closer to home despite known limitations.

Models of Perinatal Surgical Care for Rural Women: Practice Examples

No descriptions of rural perinatal service delivery models in this review were either entirely centralized or entirely decentralized; they instead exhibited varying characteristics of both with varying degrees of geographic and service-level integration. Qualities of successful systems, whether centralized or decentralized, included the following:

- (1) High degrees of inter-professional cooperation. Deutchman (United States 1995) notes that rural surgical services required “enthusiastic support from the medical community and inter-professional support between midwives, GPs and specialists/consultants, more support from anesthetists and nursing staff (Campbell 2011);
- (2) Specialist support in rural settings and the particular importance of fly-in specialist services (Swayne 2010);
- (3) Practitioners working to their broadest scope of practice at each tiered level of service (Humber and Iglesias 1999);
- (4) Clearly articulated referral criteria, referral pathways and transfer processes within a region (New South Wales Ministry of Health, 2012)
- (5) Attention to local contextual barriers to care such as language, geography, climate (Dooley et al, 2009)

These characteristics were common across the literature. Several discrete models, however, embodied the characteristics in an integrated, sustainable framework and provide examples of an approach that may inform planning for perinatal surgical services for rural women in B.C. They are reviewed in brief below.

1. New South Wales – Rural Surgical Networks Model (New South Wales Ministry of Health, 2012)

The New South Wales Surgical Services Taskforce in conjunction with the Ministry of Health conducted 200 consultations and 26 site visits, leading to their recommendation to develop the Rural Surgical Networks Model. The model consists of one major non-metropolitan hospital that acts a regional resource Centre and one or more district hospitals. The Network as a whole

serves the needs of the local community (Local Health District) with agreed sharing of services. For example, there are an adequate number of surgeons at the Centre to handle the surgical need in the smaller facilities where the specialist physicians work collaboratively with local GP proceduralists. Further, formal agreements within the Network for referral pathways and transfer processes are updated regularly and disseminated widely. Local Health Districts without a major hospital can still develop a Network where district hospitals work as a combined service to fulfill the Centre role. This “hub and spoke” model is recommended for its sustainable approach to a broad provision of surgical services.

2. *Sioux Lookout Meno Ya Win Health Centre (Ontario) (Dooley et al, 2009)*

Located in Sioux Lookout, Ontario, this health centre serves 25,000 people in 28 remote, fly-in communities in the Northern part of the province. Pre-natal care needs are met through a federally funded traveling ultrasonography technician, telephone calls to expanded-role nurses or on-call physicians, and twice weekly prenatal clinics at the Centre itself. Tele-health evaluations are used where possible for mid-trimester visits, and have been used to assist deliveries in remote communities when parturient women were unable to evacuate (i.e., due to weather). SLMHC provides intrapartum care for low-risk pregnancies and provides anaesthesia and surgical procedures by trained general practitioners (4 local and 3 locum). A neonatal resuscitation instructor is on staff to ensure all providers maintain their competence. As most of the population served by SLMHC is Aboriginal, there is a focus on culturally appropriate care, with ties to traditional foods and medicines. Interpreters are available 16 hours a day. The service is facilitated by a nurse coordinator who is responsible for organizing remote consultations and ensuring that appropriate risk assessment and referral process are followed. From 2005 to 2007, SLMHC had a 24% caesarean section rate (compared to provincial average of 28%) and 73% of these procedures were emergent.

3. *Clenoch Maternity Unit, Scotland (Baird, 1996)*

Clenoch Maternity Unit is located in the rural community of Stranraer, UK, and serves the surrounding population of 21,000. The clinic is an example of an inter-professional maternity service, staffed by general practitioners (some with obstetrics training), midwives, and itinerant consultants from the nearest obstetrical unit in Dumfries (120km). Practically all GPs from the surrounding area refer their patients to CMU, where they are booked by a GP and referred, based on patient risk and preference, to the most fitting location for their delivery. CMU has demonstrated it can safely and effectively provide care for low-risk births, can provide emergency caesarean-sections by GPs with enhanced skills (3.8%) and, with support from a nearby community hospital staffed by GP anaesthetists and a general surgeon, can manage unplanned transfers (12.8%). Authors report that rural mothers value the continuity of care and the opportunity to deliver locally that CMU provides.

Conclusions and Recommendations; Evidence-based rules for planning perinatal Surgical Services for Rural Women

The following summative recommendations are based on a comprehensive reading of the research evidence included in this summary and applied to the British Columbia health planning context.

1. Care should be provided as close to home as is organizationally feasible. **“Close to Home” must be defined and operationalized with service targets for all communities.**
2. The extent of population need for perinatal surgical services should define the organizational feasibility for local care, regional care, and subspecialized care.
3. Population need should be defined by the numbers of births in the population served, the characteristics of the births (complexity, risk), and community/regional geography.
4. Population catchments should be established for local community, regional referral, and subspecialized care, and population outcomes should be linked with the responsible services.
5. The service, whether local, regional or subspecialized, should be resourced by integrated teams of practitioners working to the full extent of their skill set, be they generalists with enhanced skills, specialists or subspecialists.
6. These integrated networks of surgical care should be established between referral services and smaller community services which would include outreach surgical support to the smaller centres.
7. Measurement of outcomes should be grounded in utilization patterns starting with normative goals for the catchment population and compared to similar populations.
8. Perinatal surgical system management should support innovative service evolution identified through outcome monitoring and leading to ‘scaling up’ where appropriate.

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Bibliographic reference	Jurisdiction	Research question	Context	Study Design	Main Findings
<p>Albers, L. L., & Savitz, D. A. Hospital setting for birth and use of medical procedures in low-risk women <i>Journal of Nurse-Midwifery</i>. 1991. 36: 327–333.</p>	<p>National study, USA</p>	<ul style="list-style-type: none"> • How do rates of intervention compare among low-risk versus high-risk women in the United States? • How do rates of intervention vary by hospital setting (teaching hospital, other urban hospital, and rural hospital)? 	<ul style="list-style-type: none"> • Data from 1980, thus changes in practice occurred (ie. Rates of C-section rose). • Insurance coverage not considered 	<p>Cross-sectional survey</p>	<ul style="list-style-type: none"> • Low-risk women had a higher rate of EFM and Induction than high-risk women (CIs not shown) • Intervention rates (EFM and induction) were higher in urban and teaching hospitals compared to rural hospitals
<p>Alexander C: Why doctors would stay in rural practice in the New England health area of New South Wales. <i>Aust J Rural Health</i> 1998, 6(3):136–9.</p>	<p>Rural New South Wales, Australia</p>	<ul style="list-style-type: none"> • What factors affect decision to stay in rural practice? 	<ul style="list-style-type: none"> • Well-documented shortage of rural doctors in Australia, but policy and research both focus on national or State level. Little research exists at the health region level • 139 GPs practicing in New England region of New South Wales in 1997 • However, only 129 FTE. New England Health area requires 157 FTE (shortfall of 28 FTE) • 15% annual turnover, comparable to 14% turnover rate found for rural GPs in general in Australia in decade between 1987-1997 	<p>Cross-sectional survey</p>	<ul style="list-style-type: none"> • Professional environment needs to be conducive to satisfying rural practice, including access to hospitals, reasonable work load, and procedural responsibilities • Quality of life issues also critical, including social and cultural facilities, work opportunities for the physician's partner, and infrastructure for children • GPs value procedural work and are less likely to stay in situations of bed/unit closure or loss of procedural privilege • Retention strategies need to be coordinated and not piece-meal • Strategies need to be tailored to local need
<p>Allen DJ, Kamradt JM: Relationship of infant mortality to the availability of obstetrical care in Indiana. <i>Journal of Family Practice</i> 1991, 33(6):609.</p>	<p>Indiana, USA</p>	<ul style="list-style-type: none"> • Is the availability of obstetrical care in rural areas correlated with infant mortality? 	<ul style="list-style-type: none"> • 996 physicians were providing OB care in Indiana • Indiana is a primarily rural state, with 62 of its 92 counties considered nonmetropolitan • 10 counties have no OB services; 32 have inadequate services; 16 have precarious services; just 34 have adequate OB services • Between 1987 and 1990, the number of GPs performing obstetrical care in non-metro counties dropped from 41% to 29%, due mostly to litigation concerns • Indiana had a very high infant mortality rate – 10.99 deaths per 1000 live births in 1989 	<p>Cross-Sectional study</p>	<ul style="list-style-type: none"> • 14.4% of the variance in infant mortality in nonmetropolitan counties is explained by physician availability

<p>Anderson G: The effect of a rural track residency program with an emphasis on obstetrics on physician shortage areas. <i>Journal of Rural Health</i> 2000, p. 230–1.</p>	<p>A rural tracks residency program in Olean, New York, a town of 17,000 people 75 miles outside of Buffalo</p>	<ul style="list-style-type: none"> • Are rural residency programs effective for encouraging practitioners to choose rural practice? 	<ul style="list-style-type: none"> • 1991-1995 • Area has had high physician turnover, one hospital closure, and a further hospital turned into a health care centre with primarily nursing home care and urgent care services • Local area has many Health Professional Shortage Areas • Obstetricians in the area decline from 5 to 2. Both of those remaining were near retirement • The largest hospital experienced declining admissions, deliveries, and emerg visits on way to an \$8.5M loss over four years • After 1996 • Since 1996, Olean General hospital has participated in a rural track residency program that has changed the direction of health care services in the area. 	<p>Hospital-based retrospective cohort study</p>	<ul style="list-style-type: none"> • Between 1996-2000, deliveries at Olean General increased 26%, c-section declined (24% to 19%), and the residency now performs 75% of local deliveries • Shows that a rural track residency program can have immediate impacts on rural health service provision while renewing the rural provider workforce over time
<p>Aubrey-Bassler, K., Newbery, S., Kelly, L., Weaver, B., & Wilson, S. Maternal outcomes of cesarean sections: do generalists' patients have different outcomes than specialists' patients? <i>Canadian family physician.</i> 2007. 53(12): 2132-8.</p>	<p>Small, isolated hospitals in Ontario, BC, Alberta, Saskatchewan</p>	<ul style="list-style-type: none"> • How do maternal outcomes of Cesarean section compare when performed by a GP versus a specialist? 	<ul style="list-style-type: none"> • Rural and semirural GP surgeons in Canada being compared to specialists in high resource environments • Authors note that rurality could be its own impacting variable: rural patient population likely to be lower SES and have higher parity rate; potential for limited care in rural areas; staff possibly less aware of operating room best practices 	<p>Retrospective matched cohort</p>	<ul style="list-style-type: none"> • Significantly higher rates of all major morbidity and major surgical morbidity were found among GPs. However when, major postpartum infection was excluded there was no difference. • GPS safety not only within expected guidelines, but comparable to obstetrics specialists in low-risk populations
<p>Australian College of Midwives: Costing caesarean sections: a pilot study. <i>Australian College of Midwives</i> 1994, 7(2): 6–10.</p>	<p>Non-teaching referral rural hospital in Australia</p>	<ul style="list-style-type: none"> • How does length of stay and classification of care level (based on birth intervention) influence human resource costs of the hospital? 	<ul style="list-style-type: none"> • Not clearly discussed 	<p>Case study (quantitative and qualitative data)</p>	<ul style="list-style-type: none"> • Authors argue that cost savings can be made within hospitals for investment upstream in the health system (including community health projects) by being conscious of cost of intervention in birth
<p>Backe, B. (n.d.). <i>Maternity Care in Norway.</i> Nowegian Univesity of Science and</p>	<p>Presentation</p>	<ul style="list-style-type: none"> • What is the history of and current situation for the provision of 	<ul style="list-style-type: none"> • Changing organization of provision of midwifery services. Midwives become publically funded and autonomous professionals in 1990s. 	<p>N/A</p>	<ul style="list-style-type: none"> • N/A

Technology, National Advisory Committee for Obstetrics. http://www.helse-nord.no/getfile.php/RHFINTER/Prosjekter/Making it Work/Maternity care in Norway - Bjorn Backe.pdf		maternity care in Norway?	<ul style="list-style-type: none"> • Obstetrical care has always been decentralized in Norway. 		
Baird AG, Jewell D, Walker JJ: Management of labour in an isolated rural maternity hospital. <i>BMJ</i> 1996, 312(7025) : 223–6.	Maternity unit run by GPs and midwives in rural Scotland	<ul style="list-style-type: none"> • What maternal and newborn outcomes are associated with rural maternity unit led by midwives and GPs? 	<ul style="list-style-type: none"> • Though not detailed, the authors are writing in the context of a response to a proposed model of care with midwives supported by specialists (from <i>Changing Childbirth</i>, a 1993 report from the Department of Health). 	Retrospective cohort	<ul style="list-style-type: none"> • Findings support the need for specialist support of rural units, but not the elimination of GP obstetrics care • Transfer identified as a risk, and in some cases could not be completed due to timing and long distance of travel to more central, higher resource unit. De-centralizing care is necessary for limiting the risk of transfer itself
Baker DK: Rural surgery in Canada. <i>World Journal of Surgery</i> 2006, 30(9) : 1632–3.	Rural Ontario	<ul style="list-style-type: none"> • What are the challenges faced by rural surgeons in Ontario? 	<ul style="list-style-type: none"> • Rural surgeons not often prepared for challenges of position due to lack of specific focus on training rural providers • Patient safety is compromised by long travel in emergencies and inclement weather • Author argues that Canadian rural surgery is dying off slowly because of lack of support/recognition for its particular challenges 	Editorial written by 1 of the 17 rural surgeons in Ontario	<ul style="list-style-type: none"> • Author recommends a commitment to rural surgery as a specialty in Canadian medical schools, better locum support from provincial medical associations, and more support for continuing education • Also suggests a model of care in which touring surgical teams come into communities to do elective cases, leaving GP Surgeons to do emergency operations
Baker JW, Buttini MJ: The Flying Obstetric and Gynaecology Service in rural Queensland: Its first two years. <i>The Medical Journal of Australia</i> 1991, 154(9) : 578–82.	Rural counties in Idaho	<ul style="list-style-type: none"> • What is the scope of practice, and what outcomes are associated with GPs by gender, age and employment group? 	<ul style="list-style-type: none"> • Rural family physicians known to have broader scope of practice than urban counterparts • Female doctors more likely to be younger and employed than male doctors. May be important group to study for retention potential 	Cross-sectional survey (quantitative and qualitative measures)	<ul style="list-style-type: none"> • Younger physicians doing more obstetric work than older physicians (among 30-48 yr olds, c-section procedure performed by 41% of sample, vs just 33% among those 49-83) • Male doctors more likely to perform obstetric / maternal care. Prenatal (59% vs 52%), vaginal delivery (54% vs 43%), and c-sections (39% vs 29%) all have higher participation by men from the sample than women doctors • Doctors who are employed also have a higher c-section participation rate of 43% vs 35% than those in their own practice • Given lower maternal services offered by

					those in their own practice, the sustainability of rural maternal services may depend on continued growth of younger, employed physicians.
Bar-Zeev J. S, Barclay L, Farrington C, Kildea S: From hospital to home: The quality and safety of a postnatal discharge system used for remote dwelling Aboriginal mothers and infants in the top end of Australia. <i>Midwifery</i> 2012, 28(3):366–73.	Northern Territory (NT), Australia	<ul style="list-style-type: none"> What outcomes are associated with the postnatal transition of care from a regional hospital to a remote health service for remote dwelling Aboriginal mothers and infants? 	<ul style="list-style-type: none"> Significant risks for patients; reduced antepartum visits, lack of coordinated and continued care, and reduced awareness of medical needs post-partum all result from ad hoc discharge coordination For providers, considerable hours tracking down details of care in hospital wastes time at both ends 	Retrospective cohort, semi-structured interviews, and participant observation	<ul style="list-style-type: none"> It is clear that this model of centralized maternal surgical care is fraught with problems in continuity of care, while also disempowering the patient HC Staff complained often that workers in the central hospital were very unaware of the challenges of rural care and often assumed it was simply a smaller version of an urban hospital. Lack of resources in the remote health centres made antepartum care a challenge when regional hospital didn't provide necessary equipment or medication, or where available care (eg. Home care) was assumed to be available.
Baumann A, Hunsberger M, Blythe J, Crea M: Sustainability of the workforce: government policies and the rural fit. <i>Health Policy</i> 2008, 85(3):372–9.	Rural Ontario hospitals with <100 beds	<ul style="list-style-type: none"> How are government policies affecting rural workforce sustainability? 	<ul style="list-style-type: none"> Policy targets: 70% of nursing positions be full-time in response to growing need for nurses but only on a part-time and casual basis. New Graduate Initiative to have grads enter into full-time positions for extended training and orientation Late Career Initiative was a brief pilot program providing funding the hospitals to move nurses over 55 years of age into less physically demanding roles, such as mentoring 	Cross sectional, qualitative interviews with nurses and nurse admins	<ul style="list-style-type: none"> Nurse staffing policies affect rural areas differently than urban ones. Budgets for rural hospitals more constrained, making adding full-time nurses extremely challenging As nurses in rural areas often wait years for a full-time position, it's often done by seniority and so the New Grad Initiative can disrupt the culture of the workplace and made nurse respondents feel disrespected Rural hospitals also struggled to implement to the Late Career Initiative, as some hospitals didn't have the resources to apply for the funding and others had to cancel the program because they didn't have the capacity for nurses to move away from patient care Workforce policies have to consider rural barriers specifically
Belsky D, Ricketts T, Poley S, Gaul K, Fraher E, Sheldon G: <i>Surgical Deserts in the US: Places Without Surgeons.</i> American College of	USA, National	<ul style="list-style-type: none"> What is the distribution of general surgeons in the United States? 	<ul style="list-style-type: none"> 44.7 GS per 100,000 population nationally, but with major disparity by county Estimates place surgeon need at an aggregate of 6.01 GS per 100,000 people nationally 	Cross-sectional, descriptive	<ul style="list-style-type: none"> 925 counties without any GS, 95% of which are rural 50% of those without a GS have a hospital where the surgeon could work 9.5M people live in those 925 'surgeon deserts'

Surgeons Health Policy Research Institute; 2009. http://www.acshpri.org/documents/ACSHPRI_F S2.pdf			<ul style="list-style-type: none"> • 1,105 counties have a surgeon ratio of 25+ per 100,000 people 		
Black C, Burchill C: An assessment of the potential for repatriating care from urban to rural Manitoba. <i>Medical Care.</i> 1999, 37(6) : 167–186.	Manitoba	<ul style="list-style-type: none"> • How often, and for what services are health care users accessing care at the following facilities: a) Winnipeg hospitals, b) target local hospitals and c) other hospitals? 	<ul style="list-style-type: none"> • Manitoba government intending expansion of rural hospitals to off-set closure of Winnipeg hospitals beds and repatriate care to local communities • Transportation routes and seasonal conditions greatly impact hospital usage, and rural hospital usage was much lower by intended users than anticipated. 	Population-based retrospective cohort study	<ul style="list-style-type: none"> • While there are benefits to providing care closer to where people live, when case volumes for specialized care decrease, concerns of quality and efficiency arise. • Some care can be logically redirected. However, surgical care may be better suited to centralization thanks to the efficiency of scale and the improved outcomes of procedure threshold numbers. • Redirecting surgical care may also require a massive investment in human resources for specialization outside the centre. • So where some rural units would have to undergo (non-capital) upgrading to handle the added the volume and complexity of cases, Winnipeg hospitals would not see a meaningful reduction in costs required or service delivered or even beds occupied
Borgstrom DC, Heneghan SJ: Bassett Healthcare rural surgery experience. <i>Surgical Clinics of North America.</i> 2009. 89(6) : 1321–ix.	Mary Imogene Bassett Hospital in Cooperstown , NY, USA	<ul style="list-style-type: none"> • What are the experiences of general surgery graduates? 	<ul style="list-style-type: none"> • Though 25% of Americans live in areas designated 'rural,' just 12% of physicians practice in rural areas • Just 10% of general surgeons are in rural areas • Authors quote estimate of level of general surgeons in rural areas for adequate rural care at 19% 	Case study	<ul style="list-style-type: none"> • Through dedicated rural surgery training, general surgeons can be exposed to rural life and will be disposed to pursue that career
Bourke L, Humphreys JS, Wakerman J, Taylor J: From “problem-describing” to “problem-solving”: challenging the “deficit” view of remote and rural health. <i>Aust J Rural Health</i> 2010, 18(5) :205–9.	Australia-National Review	<ul style="list-style-type: none"> • How can we challenge the view of rural and remote health as poor environments to work in and create an alternative view to the deficit approach? 	<ul style="list-style-type: none"> • While the focus on health disadvantages in rural communities has ensured that rural and remote communities remain on political agendas and secure funding and programs, the largely 'deficit' perspective has also contribute to the stereotyping of rural and remote health as problematic environments to work in. 	Expert opinion	<ul style="list-style-type: none"> • If the focus in rural and remote health is on change rather than deficit, rural and remote health can build on their strengths and be promoted as problem-solving. Building on strengths provides a basis to improve what works, promote positive aspects, challenge stereotypes, attract staff, encourage local responsibility for health and develop further strategies to ensure optimal health and well-being.
Breon TA, Scott-Conner	Rural Iowa	<ul style="list-style-type: none"> • What types of 	<ul style="list-style-type: none"> • Surgical Need: 	Cross-	<ul style="list-style-type: none"> • Existing need in surgical work force large

<p>CEH, Tracy RD: Spectrum of general surgery in rural Iowa. <i>Current surgery</i> 2003, 60(1): 94–9.</p>		<p>surgery are performed by rural surgeons?</p> <ul style="list-style-type: none"> How do the practices of urban and rural surgeons differ in Iowa? 	<ul style="list-style-type: none"> In 1996, 31 general surgeons recruiting partners, 25 of them rural 1996: 18 rural hospital administrators actively recruiting surgeons Most positions had been open over a year, most still open in 2000 Of 1,000 surgical residents graduating annually, only 25% go in to general surgery, and only 10% of those work in rural areas (25 of 1,000 annual US graduates) Existing shortage compounded by expected increase in general surgical services 25% of people (55 Million) in US live in rural areas, just 12.3% of physicians work in rural areas 1988: urban population had physician to population ratio of 448:1, rural 1038:1 In counties with fewer than 25,000, ratio was 1639:1 In Iowa, ratio exceeds 3000:1 in 1/4 of rural counties Nationally, just 10% of general surgeons work in rural areas. Estimates for projected need in 2000 was that 19% would need to work in rural areas for adequate care Rapid closure of rural hospitals 	<p>section survey and qualitative interviews</p>	<p>and growing</p> <ul style="list-style-type: none"> General surgeons declining in favour of subspecialties, with the risk that maldistribution results alongside shortage Incentives for rural and general surgery have to be developed/introduced or reinforced
<p>Burkholder HC, Cofer JB: Rural surgery training: a survey of program directors. <i>J Am Coll Surg</i> 2007, 204(3):416–21.</p>	<p>United States-National Study</p>	<ul style="list-style-type: none"> What is the importance and prevalence of rural surgery training in American general surgery residency programs? 	<ul style="list-style-type: none"> This study revealed that just over one-third of general surgery residency programs that completed the survey have a curriculum in place to train residents for a rural practice. 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> The presence of a curriculum to train rural surgeons is related to the belief that such a curriculum is necessary and that training rural surgeons is part of that residency program's mission. Residency programs have different attitudes and practices with regard to rural surgery training; research programs and larger surgery programs were less likely to think that this was a part of their mission.
<p>Buser KB: Laparoscopic surgery in the pregnant patient--one surgeon's</p>	<p>Tri-County Hospital in Lexington,</p>	<ul style="list-style-type: none"> What are the outcomes of one 	<ul style="list-style-type: none"> One general surgeon and six family physicians serve this population. 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> The surgeon's reports indicate that, despite unavailability of on-site subspecialty care,

<p>experience in a small rural hospital. <i>JLSLS : Journal of the Society of Laparoendoscopic Surgeons</i> 2002, 6(2): 121–4.</p>	<p>Nebraska, USA(a 40-bed)</p>	<p>surgeon providing urgent laproscopic treatment to pregnant patients over 5 years at a small rural hospital?</p>	<p>Specialty support is available in Omaha, a little over 200 miles away, with urgent patient transportation subject to weather constraints.</p>		<p>laparoscopic procedures can be safely carried out on pregnant women in a rural setting (in any trimester), without the need for transport to a larger referral centre, provided the surgeon is skilled in surgical obstetrics and well-trained and experienced in advanced laparoscopic techniques</p> <ul style="list-style-type: none"> • In a rural setting, the surgeon should have a well thought out plan of action in advance, to deal with potential operative complications, and have sub-specialty communication support available
<p>Buser KB: Laparoscopic surgery in the pregnant patient: results and recommendations. <i>JLSLS : Journal of the Society of Laparoendoscopic Surgeons</i> 2009, 13(1): 32–5.</p>	<p>Tri-County Hospital in Lexington, Nebraska, USA (a 40-bed facility serving the 11,000 people of Lexington as well as several smaller rural communities)</p>	<ul style="list-style-type: none"> • What are the outcomes of one surgeon providing urgent laproscopic treatment to pregnant patients over 11 years at a small rural hospital? 	<ul style="list-style-type: none"> • One general surgeon and six family physicians serve this population. Specialty support is available in Omaha, a little over 200 miles away, with urgent patient transportation subject to weather constraints. 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • Results indicate that laparoscopic surgery can be safely conducted in pregnant patients, in any trimester. These procedures can be performed in a rural hospital setting if there is a strong support structure in place to handle potential complications. The limiting factor is the surgeon's awareness of their own capabilities and limitations. The surgeon must be skilled in surgical obstetrics and advanced laparoscopic techniques, or have immediate consultative operative assistance available.
<p>Callaghan, J. A twenty-five year survey of a solo practice in rural surgical care. <i>Journal of the American College of Surgeons.</i> 1994, 178(5): 459-65.</p>	<p>Small rural hospital in Decorah, Iowa</p>	<ul style="list-style-type: none"> • What are the surgical care and surgical outcomes of a rural hospital in Iowa? 	<ul style="list-style-type: none"> • Rural residents of this study prefer to be treated in local hospital than neighboring medical centre • The strong social connection between patients and health care professionals has suggested higher patient satisfaction and better patient care. 	<p>Hospital-based retrospective cohort study</p>	<ul style="list-style-type: none"> • The range of surgical treatment expected from the surgeon in a rural setting exceeds that of the surgeon in a metropolitan or large medical center. Action should be taken to ensure adequate training for those who wish to practice in the rural setting.
<p>Cameron B: Outcomes in rural obstetrics, Atherton Hospital 1981-1990. <i>The Australian Journal of Rural Health</i> 1998, 6(1): 46–51.</p>	<p>The Atherton Hospital, Far North of Queensland (rural hospital)</p>	<ul style="list-style-type: none"> • How do maternal and newborn outcomes from Atherton Hospital compare to outcomes from Queensland and the Far North Statistical Division? 	<ul style="list-style-type: none"> • Although the paper did not address directly, it is implied that decentralized model is in favor in geographically isolated area where there is a lack of access to specialist service as the perinatal mortality rate at Atherton Hospital compared favorably with Queensland and the surrounding Far North Statistical Division figures. 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • This study found that maternal and newborn outcomes in this small rural hospital compared favourably to regional and provincial outcomes. This suggests that maternity care in a rural hospital can be safe where antenatal and obstetric care is provided a GP.
<p>Cameron B, Cameron S: Outcomes in rural obstetrics, Atherton Hospital 1991-2000.</p>	<p>The Atherton Hospital, Far North of Queensland</p>	<ul style="list-style-type: none"> • How to maternal and newborn outcomes from Atherton Hospital 	<ul style="list-style-type: none"> • There is a decline in private rural obstetricians who serve as vital support backup for their public hospital colleagues. This suggests that it is 	<p>Hospital-based retrospective cohort</p>	<ul style="list-style-type: none"> • Perinatal mortality at Atherton Hospital: 5.3/1000 vs. Far North Queensland region 11.8/1000 vs. Queensland: 11.3/1000

<p><i>Aust J Rural Health</i> 2001 9(1):39–42.</p>	<p>(rural hospital)</p>	<p>compare to outcomes from Queensland and the Far North Statistical Division?</p>	<p>important that salaried Medical Officers have adequate levels of obstetric training.</p>	<p>study</p>	<ul style="list-style-type: none"> • No maternal deaths • The C-section rate at Atherton Hospital has raised to 17.4% during 1991-2000 from 13.0% during 1981-1990 • Good perinatal and obstetric outcomes occur at small rural hospitals where obstetric care is provided by the non-specialist rural doctor • The perinatal mortality has remained relatively stable over the two decades
<p>Campbell NA, Kitchen G, Campbell IA: Operative experience of general surgeons in a rural hospital. <i>ANZ Journal of Surgery</i> 2011, 81(9): 601–3.</p>	<p>Wimmera Base Hospital in northwestern Victoria, Australia (rural hospital)</p>	<ul style="list-style-type: none"> • With what frequency, and under what conditions did the two surgeons at Wimmera Base Hospital encounter various surgical procedures over a five year period? 	<ul style="list-style-type: none"> • Lack of surgeons in rural areas of Australia and difficult to attract surgeons to rural areas • The authors note that there has been a succession of physicians with varying degrees of expertise at Wimmera Base Hospital during the study period • The residents need to travel 200km to the nearest larger hospital 	<p>Retrospective review of surgical logbooks</p>	<ul style="list-style-type: none"> • Surgical trainees intent on practicing in rural areas should seek to gain experiences appropriate to meeting the needs of the community where they intend to practice. A broad skill base is required, and should include the ability to manage surgical emergencies across all specialties. A supportive team of medical and paramedical staff is required for achieving the best outcome for patients.
<p>Campbell DG, Greacen JH, Giddings PH, Skinner LP: Regionalisation of general practice training: are we meeting the needs of rural Australia? <i>Med J Aust</i> 2011, 194(11): S71:S74</p>	<p>Rural Australia</p>	<ul style="list-style-type: none"> • What are the successes of the 'regionalization of general practice training program' in Australia since 2001? 	<ul style="list-style-type: none"> • There has been a significant decline in the number of acute care health services in rural Australia over the past 30 years. As a result, rural residents need to travel greater distance to access medical care • In response to undersupply of general practitioners in rural areas, the government of Australia had made changes to general practice training in 2001, including the establishment of regionalized Australian General Practice Training (AGPT) 	<p>Narrative review</p>	<ul style="list-style-type: none"> • AGPT selection criteria should include a medical student's "connection to rural" as research has indicated rural origin is a strong indicator of a rural career • The current vocational training structure must provide appropriate training pathways that equip graduates with the skills for rural practice, especially "rural generalist" and procedural practice.
<p>Chan FY: Fetal tele-ultrasound and teletherapy. <i>Journal of telemedicine and telecare</i> 2007, 13(4): 167–71.</p>	<p>High resource, tertiary maternal/fetal care hospital Brisbane, Australia</p>	<ul style="list-style-type: none"> • What is the diagnostic quality of first-trimester ultrasound images transmitted in realtime using low-cost telecommunications? 	<ul style="list-style-type: none"> • Most rural and remote areas lack access to ultrasound • The effectiveness of tele-ultrasound has been shown in other studies, however most of the studies required high speed broadband connections at a high cost 	<p>Prospective cohort study</p>	<ul style="list-style-type: none"> • Telemedicine as method to shrink gap between services in centre and rural periphery. • Question of 'optimally' centralized / Decentralized care a concern. This model still calls for rural referral centres, and Townsville can be up to 1500km from various parts of north Queensland.
<p>Chang Pecci C, Leeman L, Wilkinson J: Family medicine obstetrics fellowship graduates: training and post-fellowship experience.</p>	<p>USA nationwide study</p>	<ul style="list-style-type: none"> • What clinical experiences are offered by family medicine obstetrics fellowship programs? 	<ul style="list-style-type: none"> • In 1978, 46% of GPs delivered babies • In 2005, 23% of GPs deliver babies • This difference most impacts rural and underserved populations who tend to rely on GPs for more of their care than do more privileged patient populations 	<p>Cross-sectional survey</p>	<ul style="list-style-type: none"> • A majority of graduates perform c-sections in their post-fellowship practice and care for high risk pregnancies • 66% of sample have obtained c-section delivery privileges • In particular, 91% of rural practicing

<p><i>Family Medicine</i> 2008, 40(5): 326–32.</p>			<ul style="list-style-type: none"> • 66 (44.3%) of sample practice in rural setting where they will be most challenged to provide care for high risk patients without geographically adjacent referral support 		<p>fellowship grads have obtained c-section delivery privileges, and place of practice was found to be the most indicative factor in obtaining CD privileges.</p> <ul style="list-style-type: none"> • Most (77.5%) still perform fewer than 30 C-sections annually • Authors are attempting to account for family physicians doing c-sections, but note that many rural providers do not attend an obstetrics fellowship before becoming privileged in the procedure. Access to experience in residency considered, but not explored.
<p>Chaytors RG, Szafran O, Crutcher RA: Rural-urban and gender differences in procedures performed by family practice residency graduates. <i>Family Medicine</i> 2001, 33(10):766–71.</p>	<p>Two medical schools in Alberta, Canada</p>	<ul style="list-style-type: none"> • How does type of procedure and obstetric care provided by family practice residency graduates vary by practice location and gender? 	<ul style="list-style-type: none"> • Family practice residency training programs have been criticized for not sufficiently preparing graduates to perform the procedures for rural practice 	<p>Cross sectional questionnaire</p>	<ul style="list-style-type: none"> ○ Rural family physicians were more likely to perform a wide range of procedures than those in metropolitan areas. The authors explained that this may be due to the absence of specialist in rural areas
<p>Chen F, Fordyce M, Andes S, Hart LG: Which medical schools produce rural physicians? A 15-Year Update. <i>Acad Med</i> 2010 85(4):594–8.</p>	<p>United States-Nationwide Study</p>	<ul style="list-style-type: none"> • How is rural medical training affecting rural workforce and recruitment? 	<ul style="list-style-type: none"> • Persistent shortage and maldistribution of physicians in rural America • Evidence shows that explicit focus on training rural generalist physicians is needed beyond simply expanding medical school class sizes • Findings of current rural practice choice patterns are consistent with results from 1991. • In 1991, 12.6% of recent med school grads entered rural practice 	<p>Cross-sectional workforce analysis</p>	<ul style="list-style-type: none"> • 11% (20,037) of medical school graduates from 1988 through 1997 practiced rurally in 2005 • 23% (6,282) of family practice grads from that period practiced rurally in 2005 • 10.7% (1,135) of OB-GYN grads worked rurally, with the majority (870) in large rural areas • Rural residency trainees were more than three times more likely to practice in rural areas.
<p>Cheng YW, Snowden JM, Handler S, Tager IB, Hubbard A, Caughey AB: Clinicians' practice environment is associated with a higher likelihood of recommending cesarean deliveries. <i>J Matern Neonatal</i> 2013</p>	<p>National US</p>	<ul style="list-style-type: none"> • How do various aspects of clinician practice setting affect clinical variance in c-section? 	<ul style="list-style-type: none"> • Rising rate of c-section in America • Some research showing clinical variance according to demographic factors, such as men more likely to recommend c-section • Existing regional difference in c-section rates, with the South most likely to recommend incision. Reasons remain unknown and may be related to population health or clinical environment 	<p>Cross-sectional Online survey using 8 hypothetical clinical vignettes</p>	<ul style="list-style-type: none"> • Clinicians over 60 years old more likely to suggest c-section • Male clinicians more likely to suggest c-section • Regional differences exist in observed c-section threshold • Number of deliveries per year not associated with clinical variance • Rural practice setting shows observed higher likelihood for suggesting c-section, but difference was not statistically significant

<p>Cross DA: Guidelines for regional anesthesia in obstetrics: Potential impact on obstetric anesthesia services in rural Alabama. <i>South Med J</i> 1993, 86(1):33–7.</p>	<p>Rural Alabama hospitals with fewer than 200 beds and providing rural anesthesia care</p>	<ul style="list-style-type: none"> • What impact would new guidelines for regional anesthesia have on obstetric care in rural areas of Alabama? 	<ul style="list-style-type: none"> • Responding to 1991 American Society of Anesthesiologists (ASA) Guidelines for Regional Anesthesia in Obstetrics, which state in part that all anesthesia care should be administered or medically directed by an anesthesiologist 	<p>Hospital-based retrospective study</p>	<ul style="list-style-type: none"> • Anesthesia provided in 52% of births • 35% of C-sections and 10% of vaginal births attended by anesthesiologists • Epidurals regularly administered by anesthesiologists in just 4 of 18 responding hospitals, with the anesthesiologist remaining “in-house” (?) in just two respondent hospitals • If reflective of all 36 rural hospitals in Alabama, roughly 6,000 births would be affected by new Guidelines with access to anesthesia and the interventions that require it limited to those facilities with greater resources • Challenges to de-centralization: Existing rural obstetric practices don’t rely on specialists. Even if these guidelines would provide ideal care, practicality is limited
<p>Crump WJ, Fricker RS, Ziegler C, Wiegman DL, Rowland ML: Rural track training based at a small regional campus: equivalency of training, residency choice, and practice location of graduates. <i>Acad Med</i> 2013, 88(8):1122–8.</p>	<p>Two campuses of the University of Louisville School of Medicine</p>	<ul style="list-style-type: none"> • How did medical students’ outcomes on the Medical Licensing Examination compare between the rural and main campuses? • What is the likelihood of choosing family medicine between the two campuses? • How did the practice sites compare for both campuses? 	<ul style="list-style-type: none"> • Authors argue that national problem of under-serving rural populations closely related to traditions of medical education • Cite studies that support the now accepted contention that students from rural areas who study in less urban environments are more likely to choose rural practice setting, and yet most medical education is in urban university environments • Rabinowitz et al (2008) state that just 3% of current medical students plan a rural career • 68% of Kentucky counties considered Health Professional shortage areas 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • Rural program graduates showed slightly lower MCAT Scores (mean 8.82 vs 9.19), and step 1 USMLE (Medical Licensing Exam). • But Step 2 (Clinical knowledge) of the USMLE and clinical shelf exams showed similar scores for Louisville grads and their rural counterparts • Students identified hysterectomy, and further gynecology skills as areas needed in fellowships, including office gynecology, colposcopy, and cervical loop excision • 86% would be in favour of a Certificate of Added Qualifications for obstetrics
<p>Cyna AM: Anaesthesia in rural Queensland: clinical experience with the Flying Obstetric and Gynaecology Service. <i>Anaesth Intensive Care</i> 1993, 21(6):831–6.</p>	<p>Roma, south-west of Queensland</p>	<ul style="list-style-type: none"> • What is the role and the workload of an anesthetist of the Flying Obstetric and Gynaecology service? 	<ul style="list-style-type: none"> • The Flying Surgeon Service was established in Australia in 1959 as a way to provide elective and emergency service to rural communities of western Queensland • The team consists of surgeon/obstetrician, anesthetist and pilot • The FOG visited 27 towns scattered over an area of approximately one million square kilometers 	<p>Prospective audit of 760 consecutive anaesthetics from one anaesthetist’s notebook</p>	<ul style="list-style-type: none"> • FOG service can be a potential strategy to address maldistribution of anesthetists in rural areas • Study showed that almost all anaesthetics were administered to females undergoing obstetrics or gynaecology procedures. C-section and rupture ectopic pregnancy were the commonest reasons for an emergency visit

<p>Daniel L: Australia closes maternity wards despite a rising birth rate. <i>Br J Midwifery</i> 2009, 17(7):459.</p>	<p>International description of state of rural obstetric care</p>	<ul style="list-style-type: none"> • What is the state of rural obstetric care in Australia compared to Cambodia, Canada and Uganda? 	<ul style="list-style-type: none"> • Australia: Increased travel for parturient women; Decreased access to care, prenatal, intrapartum, and postpartum; Gov't claims difficulty in retaining staff in remote areas the primary cause of closure • Canada: Intervention in labour becoming problematic even in the eyes of Society of Obstetricians; Though not presented, the travel of rural women to urban centres may encourage induction given costs on both the State and the patient for missing work, traveling, staying in residence, and delivering over a lengthy period; Emphasis on natural birthing where possible suggests the applicability of local rural services in low risk cases 	<p>Editorial</p>	<ul style="list-style-type: none"> • One recommendation of maternal health review is to identify how midwives can be more involved, including setting standards for advanced midwifery practice • Reducing intervention (and a return to natural birthing) may be key to reducing pressure on expensive, medicalized birthing facilities
<p>Deutchman M, Connor P, Gobbo R, FitzSimmons R: Outcomes of cesarean sections performed by family physicians and the training they received: a 15-year retrospective study. <i>J Am Board Fam Pract</i> 1995, 8(2):81–90.</p>	<p>Two rural hospitals: one in Oregon and one in Washington</p>	<ul style="list-style-type: none"> • How do rates of obstetric intervention and outcomes compare for two rural hospitals over a period of 10-15 years? 	<ul style="list-style-type: none"> • Due to the distance to the nearest tertiary care centre, referring patients to obtain obstetric care is often impractical 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • About 79% of all c-sections at the 2 study hospitals were performed by family physicians as the primary surgeons. Only 2.2% were performed by an obstetrician/gynecologist • C-sections carried out by family physicians is not a common practice in the United States. The authors mentioned that only 4.5% of active members of the American Academy of Family Physicians have cesarean privileges at their hospitals. • The medical chart and logbook review showed that c-sections completed by family physicians at rural regional hospitals were relatively safe with few reported complications • This suggested that residency-trained, board-certified physicians can help to support obstetric needs at rural hospitals
<p>Dooley J, Kelly L, St Pierre-Hansen N, Antone I, Guilfoyle J, O'Driscoll T: Rural and remote obstetric care close to home: program description, evaluation and discussion of Sioux Lookout Meno</p>	<p>Sioux Lookout Meno Ya Win Health Centre Program. Northern Ontario</p>	<ul style="list-style-type: none"> • What outcomes are associated with the small rural health centre, Sioux Lookout Meno Ya Win Health Centre Program? 	<ul style="list-style-type: none"> • 2007 report created by the Society of Obstetricians and Gynecologists of Canada identified a need for increased opportunities and reduced barriers for Aboriginal women to deliver close to home in a familiar environment. • Closures of obstetrics programs and decreasing physician availability in rural 	<p>Program evaluation</p>	<ul style="list-style-type: none"> • Comparable caesarean deliveries are made in the program as compared to the provincial averages. • Success rate of vaginal birth after caesarean was 80% versus the provincial success rate of 53%. • Gestational diabetes rates resulted in 25.5% rate of large-for-gestational-age

<p>Ya Win Health Centre obstetrics. <i>Can J Rural Med</i> 2009, 14(2):75–9.</p>			<p>areas are deemed by Ontario Women’s Health Council as a maternity crisis.</p> <ul style="list-style-type: none"> Recently, the BC government has allocated funds to re-establish family physician involvement in obstetrics. 		<p>babies versus a provincial rate of 11%.</p> <ul style="list-style-type: none"> No intrapartum foetal or maternal death and only 1 readmission (2006-2008) 6 new-borns weighing less than 2500 g were delivered. Programs such as this need a volume of 300-350 deliveries per year. If not, they need funding for physicians and nurses to visit regional centers to maintain competence
<p>Doty B, Zuckerman R, Finlayson S, Jenkins P, Rieb N, Heneghan S: General surgery at rural hospitals: a national survey of rural hospital administrators. <i>Surgery</i> 2008, 143(5):599–606.</p>	<p>United States-Nationwide Study</p>	<ul style="list-style-type: none"> How do rural hospital administrators perceive the state of their general surgery programs and the impact that providing surgical services has on their hospitals’ financial viability? 	<ul style="list-style-type: none"> Despite the fact that 20% of the US population resides in rural communities, just 9% of physicians practice in these areas and general surgeons in particular appear to be in short supply in small rural towns. 	<p>A 12-item survey was mailed to a random sample of national and rural hospital administrators</p>	<ul style="list-style-type: none"> Eighty-three percent of rural hospital administrators perceived their surgical program to be very important to the financial viability of their hospital and stated that they would reduce services if the hospital were to lose its surgery program. Thirty-four percent of hospitals have a surgeon leaving within the next 2 years and more than one-third of hospital administrators are currently searching for a surgeon.
<p>Doty B, Heneghan SJ, Zuckerman R: General surgery contributes to the financial health of rural hospitals and communities. <i>Surg Clin North Am</i> 2009, 89(6):1383–7, x–xi.</p>	<p>United States-National Review</p>	<ul style="list-style-type: none"> What is the economic impact that surgical care delivery can have on rural hospitals and communities and the potential costs associated with not having a general surgeon or surgical services available at rural hospitals? 	<ul style="list-style-type: none"> Although the ability to offer a broad range of services may strengthen a rural hospital’s financial condition, it can be difficult to provide extensive medical or surgical services on a small, restricted budget. Many rural hospitals, especially those located in small, isolated communities, also struggle to attract and maintain qualified staff to deliver medical and surgical care. 	<p>Expert Opinion</p>	<ul style="list-style-type: none"> General surgeons and the services they deliver make a significant contribution to the health and stability of rural hospitals and communities, yet once in rural practice, general surgeons often face significant financial challenges, long work hours, and frequent on-call responsibility that may not be adequately compensated. There is a need for more research on the financial issues associated with rural surgery.
<p>Doty B, Zuckerman R: Rural surgery: framing the issues. <i>Surg Clin North</i> 2009, 89(6):1279–84, vii.</p>	<p>United States-National review</p>	<ul style="list-style-type: none"> What are the workforce, practice, training, quality, economic, and community issues associated with rural surgery? 	<ul style="list-style-type: none"> Many people in rural areas have limited access to a general surgeon, and there is strong evidence that predicts a decline in the number of general surgeons practicing in rural communities. 	<p>Expert Opinion</p>	<ul style="list-style-type: none"> The number of medical students choosing to pursue general surgery has been in decline since 1992, and few graduates choose to enter rural practice. The presence of a general surgeon in a rural hospital provides great financial value to both the hospital and the community, and also decreases the likelihood of rural residents needing to travel to a distant hospital to seek care. The issues surrounding delivery of rural surgical care are complex, and it is important to continue the dialogue around these issues

					in order to address the challenges.
Drew J., Cashman S. B., Savageau J. A., Stenger, J.: The visiting specialist model of rural health care delivery: A survey in Massachusetts. The Journal of rural health. 2006. 22: 294-299.	Massachusetts, USA	<ul style="list-style-type: none"> • What are the experiences of the specialist care delivery model? 	<ul style="list-style-type: none"> • Majority of support staff and medical equipment still provided by rural hospital setting. Thus traveling specialists are not a traveling medical service, but a supplement to existing rural care • Visiting specialists roughly even split between medical and surgical specialists • Relatively stable group, with most specialists having been visiting ancillary clinic for over 5 years and intending to stay the same in next 5 years. 	Survey	<ul style="list-style-type: none"> • For small and emergency rural hospital clinics (as few as 15 beds), visiting specialists presented as a cost effective way of delivering rural specialist care with a high degree of provider satisfaction and low Hospital Admin responsibilities/liabilities with regard to human resource investment
Eley DS, Synnott R, Baker PG, Chater AB: A decade of Australian Rural Clinical School graduates--where are they and why? Rural Remote Health 2012, 12:1937.	Rural Clinical Schools, Australia	<ul style="list-style-type: none"> • Which of the rural clinical school graduates are practicing in rural locations, and why? 	<ul style="list-style-type: none"> • 1997, Australia begins Rural Undergraduate Support and Coordination program, which includes compulsory rural clinical placements for med students • As well, begin University Departments of Rural Health program to provide opportunities for rural skill development • In 2001, Rural Clinical Schools (RCS) were established as part of the Australian Government's Rural Medical Workforce Strategy • Intended to improve rural workforce recruitment and retention through rural undergrad clinical training experience • Rural Clinical Schools now established in 14 med schools across Australia with independent programs 	Retrospective cohort study	<ul style="list-style-type: none"> • Authors suggest putting medical students into rural locations for more of their training with the intention of having more non-career life decisions take place in a rural setting
Farmer J, Lauder W, Richards H, Sharkey S: Dr John has gone: assessing health professionals' contribution to remote rural community sustainability in the UK. Soc Sci Med 2003 57(4):673-86.	Remote and peripheral areas of Scotland	<ul style="list-style-type: none"> • How do health professionals contribute to the economic livelihood and social sustainability of rural communities? 	<ul style="list-style-type: none"> • Remote areas of Scotland lack transport and communications infrastructure, have few economic opportunities, and do not readily attract medical or nursing staff. Due to lack of services, health care professionals who work in these remote areas often provide duties outside their scope of practice. 	Expert Opinion	<ul style="list-style-type: none"> • Health care professionals can provide significant social contribution to rural communities in the areas of service provisions, community sustainability, and social, economic, and cultural capital. It is important to explore health care professionals' roles in remote rural areas so evidence can be generated to inform strategic investment decisions about future health care provisions.
Finnström O, Berg G, Norman A, Olausson PO: Size of delivery unit and neonatal outcome in Sweden. A	Sweden, National	<ul style="list-style-type: none"> • What is the relationship between delivery unit volume and neonatal outcomes? 	<ul style="list-style-type: none"> • Comparing 1.5 million singleton births between 1985-1999, authors found improved neonatal outcomes over the study period. Neonatal mortality declined from 3.3 per 1,000 deliveries 	Retrospective Cohort Study	<ul style="list-style-type: none"> • Units with <500 births per year had fewer deaths, better Apgar scores, and fewer respiratory issues on average than units with 1000-2500 births when maternal health controlled

<p>catchment area analysis. <i>Acta Obstet Gynecol Scand</i> 2006 85(1):63–7.</p>			<p>to 2.1 in the 15 years under study.</p> <ul style="list-style-type: none"> • Of 67 maternity units in 1985, 7 small units closed during study period, as did 2 of the largest units. 4 further units were merged with neighboring units, leaving 54 units in 1999. • The proportion of mothers in catchments served by the smallest delivery units (<500 annual births) who actually delivered there was ~80% 		<ul style="list-style-type: none"> • However, neonates from catchments served by small maternity units had on average slightly higher neonatal mortality (not statistically significant) even with maternal health controlled • Better neonatal outcomes in small delivery units shows effective regionalization, while worsened outcomes for rural catchments is not explained. • Small units without a pediatrics department had much worse outcomes than those with such a department, suggesting factors beyond volume have to be considered • Authors conclude that quality of care is homogeneous across size of delivery unit and that regionalization is functioning appropriately
<p>Gillman LM, Vergis A: General surgery graduates may be ill prepared to enter rural or community surgical practice. <i>Am J Surg</i> 2013, 205(6):752–7.</p>	Canada	<ul style="list-style-type: none"> • What are the perceived competencies of graduating general surgery residents in Canada? • What should be the expected product of a general surgery resident? 	<ul style="list-style-type: none"> • Contemporary general surgery faces many challenges with respect to training, which may affect the competencies of graduating general surgery residents • Given the broad spectrum of procedures performed by rural general surgeons, should rural/community practice become a subspecialty choice for residents? 	Cross-sectional survey	<ul style="list-style-type: none"> • Most of the graduating general surgery residents were continuing on to subspecialty training rather than choosing to practice directly • Graduating general surgery residents were likely to feel unprepared to replace rural or community practice general surgeons
<p>Glasser M, Peters K, Macdowell M: Rural Illinois hospital chief executive officers' perceptions of provider shortages and issues in rural recruitment and retention. <i>J Rural Health</i> 2006, 22(1):59–62.</p>	Rural Illinois	<ul style="list-style-type: none"> • What are rural hospital CEOs' perceived health workforce needs and barriers to recruiting and retaining health professionals in their communities? 	<ul style="list-style-type: none"> • There is a shortage in the health workforce, particularly in rural areas • Studies report that a health provider's choice of location to practice is influenced by economic, personal and social aspects of health care provision 	Cross-sectional survey	<ul style="list-style-type: none"> • Rural CEOs expressed a need for more primary care physicians, and an increased capacity in nursing • The participants viewed community development as a key factor in recruiting and retaining health professionals
<p>Glazebrook RM, Harrison SL: Obstacles and solutions to maintenance of advanced procedural skills for rural and remote medical practitioners in Australia. <i>The Journal of</i></p>	Rural and remote Australia	<ul style="list-style-type: none"> • What are the obstacles and solutions to maintenance of advanced procedural skills for rural and remote medical practitioners in 	<ul style="list-style-type: none"> • Rural communities are disadvantaged in the provision of health services due to recruitment challenges • Having procedural GPs allows for the local provision of services that would not be possible otherwise: part of the comprehensive health care picture for rural communities 	Literature review	<ul style="list-style-type: none"> • "Allowing qualified rural and remote doctors to have access to maternity units, anesthetic units and surgery operating theatres with appropriately trained nursing and allied health staff support enables them to maintain their skills and stay motivated to remain in rural areas."

Rural Health 2006,6(4):502.		Australia?			
Godden DJ: Rural health care in the U.K.: a rapidly changing scene. <i>J Agric Saf Health</i> 2005, 11(2):205–10	Rural Scotland	<ul style="list-style-type: none"> How will recent developments in Europe and the U.K. impact health service delivery in rural and remote areas? 	<ul style="list-style-type: none"> Changing policy in UK and European health care provision and employment law are having unintended impacts on rural health care services 	Review article	<ul style="list-style-type: none"> System re-design faces a tension of national/large body administrative decision making bodies versus local practicalities and realities
Government of Western Australia - Department of Health: <i>WA Health Clinical Services Framework 2010-2020</i> . 2010. http://www.health.wa.gov.au/hrit/docs/clinicalframework.pdf	Western Australia	<ul style="list-style-type: none"> Objective(s): Clinical planning across the state public sector for safe, high quality, efficient and effective care. 	<ul style="list-style-type: none"> When providing country health services the following unique factors need to be considered: <ul style="list-style-type: none"> The need for patients to travel long distances to major centres such as the Perth metropolitan area for diagnosis, treatment, follow-up care Recruitment and retention of staff, especially in specialty areas Availability of professional support Greater reliance on general practitioners and the broader range of skills they require to serve the population Lack of private services in some country areas (must be public care) Reforms that improve the capacity of the workforce: <ul style="list-style-type: none"> Nationally consistent registration and accreditation for 10 occupations (80% of clinical workforce) Use of simulated learning environments to expand clinical training capacity Expanding education/training at major regional hospitals as part of the Rural Clinical Schools Program Projections of supply and demand for specialty by site 	Report	<ul style="list-style-type: none"> Currently using Demand Modeling for metropolitan and country areas to predict inpatient, outpatient and emergency department activity. Demand modeling uses 3 major steps: a)projection of base year (status quo model – current utilization + population projections) b)scenario model (modify the status quo model by applying the impact of a series of interventions that will affect utilization) c)capacity model (redistribute demand to hospitals based on the closest, most appropriate and available hospital. Scenario and capacity models developed with AHS planners and WA Health Infrastructure team.
Gruen RL, Knox S, Britt H: Where there is no surgeon: the effect of specialist proximity on general practitioners' referral rates. <i>Med J Aust</i> 2002, 177(2):111–	Australia	<ul style="list-style-type: none"> Does proximity to specialist surgeons influence referral rates? 	<ul style="list-style-type: none"> 22% of Australia's population, 20% of GPs, and only 7% of surgeons located outside metro and large rural areas Rural and remote residents usually travel to major city centres to access specialist care 	Cross-sectional survey	<ul style="list-style-type: none"> Presence of a local specialist did not affect referral rates in general surgical problems, orthopedic, ENT, urological, or gynaecological problems However, rural GPs were doing considerably more antenatal care, which can

5.					be seen in referral rates from areas with no specialist support
Grzybowski SC, Cadesky AS, Hogg WE: Rural obstetrics: a 5-year prospective study of the outcomes of all pregnancies in a remote northern community. <i>CMAJ</i> 1991, 144(8) :987–94.	Southern region of the Queen Charlotte Islands, BC	<ul style="list-style-type: none"> Can a small isolated hospital with no Cesarean-section capacity, handling less than 50 deliveries per year, provide acceptably safe obstetric and perinatal care? 	<ul style="list-style-type: none"> Previous studies claimed that small hospitals must be able to provide anesthesia and should have a caseload of at least 100 deliveries per year to perform safe cesarean practice. This cut-off would have large implications for the small and scattered maternity services in Canada's north. 	Retrospective cohort study	<ul style="list-style-type: none"> Of the local deliveries, there was a 6.2% rate of adverse perinatal outcome. Of the deliveries transferred antepartum or intrapartum, 3 of the 33 neonates died (9.1%), and four had low birth weight but all did well. No data was presented on the outcomes of the planned off-island deliveries. The results suggest that a reasonable standard of practice and reasonable outcomes can be expected for obstetric care provided in a small, isolated hospital without cesarean section capability. None of the perinatal deaths appeared to be due to a lack of cesarean section capability.
Grzybowski S, Kornelsen J, Cooper E: Rural maternity care services under stress: the experiences of providers. <i>Can J Rural Med</i> 2007, 12(2) :89–94.	Provincial study- British Columbia, Canada	<ul style="list-style-type: none"> How is the experience of care providers affected when maternity services are unstable? 	<ul style="list-style-type: none"> Between 2000 and 2004, 14 maternity units in BC closed, and another 3 placed under moratoria. A review of policy from 1990-2003 shows that there was no clear plan for rural maternity services, and so many policy decisions were made ad hoc and in a reactionary manner 	Cross-sectional study	<ul style="list-style-type: none"> Providers indicated challenges in maintaining skills in a low-volume setting. Though some physicians can supplement their case mix with work in high-resource settings, nurses don't often have the luxury to leave the community to supplement their training or experience. Providers are conflicted as emergencies and women who refuse to leave community for care mean that giving up obstetrics all together will only lead to worsened skills and potentially dangerous (albeit more rare) deliveries.
Grzybowski S, Stoll K, Kornelsen J: Distance matters: a population based study examining access to maternity services for rural women. <i>BMC Health Serv Res</i> 2011, 11 :147.	British Columbia, Canada	<ul style="list-style-type: none"> How does distance required to travel to access the nearest maternity services with Cesarean section capability impact maternal and newborn outcomes? 	<ul style="list-style-type: none"> Current policy change toward centralization has externalized financial and health costs of worsened maternal outcomes, while downloading direct costs to health care users. The effects are both clinical (as discussed below) and social, as rapid centralization has reduced access to high quality care for many women. 	Retrospective cohort study	<ul style="list-style-type: none"> Perinatal mortality increases by factor of 3.17 for families traveling >4hrs Increased rates of NICU 2 admission and more NICU bed days for mothers 1-2 hours from service Much higher rate of birth en route for women living 1-2 hours from services Higher rates of induction for logistical reasons in women without local care facilities Higher rates of maternal intervention under care by specialist
Grzybowski S, Kornelsen J, Prinsloo L, Kilpatrick N, Wollard R: Professional isolation	Presentation at rural health symposium	<ul style="list-style-type: none"> How does the role of general practitioner anesthetists in rural 	<ul style="list-style-type: none"> Closures of small hospitals in rural areas as a result of centralization of services in referral centres With the closure of small hospitals, 	Review article	<ul style="list-style-type: none"> From the discussions with rural general practitioner anesthetists (GPAs) and key decision-makers, it was clear that an evidence-based plan is needed to address

<p>in small rural surgical programs: the need for a virtual department of operative care. <i>Can J Rural Med</i> 2011, 16(3):103–5.</p>	<p>held in Vancouver, 2010.</p>	<p>communities affect the sustainability of rural health service delivery?</p>	<p>patients had to travel greater distances to access basic care which would potentially lead to less than optimal outcomes</p> <ul style="list-style-type: none"> • Difficulty in accessing training and continuing medical education can lead to shortage of skilled GPA in rural areas 		<p>the following issues:</p> <ul style="list-style-type: none"> • Creating a registry of GPAs in BC and their level of GPA-related activity (this is particularly pertinent because GPAs reported that the financial incentives for general practice outweighed those for anesthetic practice) • Identifying GPAs' scope of practice • Considering practice-related questions, such as why the practice life of GPAs is so short (< 5/year on average) • Evaluating the importance of GPA services to the quality of care provided in rural emergency departments
<p>Grzybowski S, Stoll K, Kornelsen J: The outcomes of perinatal surgical services in rural British Columbia: a population-based study. <i>Can J Rural Med</i> 2013,18(4):123–9.</p>	<p>Provincial study- British Columbia, Canada</p>	<ul style="list-style-type: none"> • What is the relative safety of GPASS attended births to those at other service levels? 	<ul style="list-style-type: none"> • Rural maternity services are being discontinued in British Columbia and across rural Canada, often because of the loss of local surgical services. General Practitioners with enhanced surgical skills can provide operative backup for perinatal surgical care in rural catchment areas that are too small to support specialist surgeons because they can provide generalist primary care as the core part of their practices. 	<p>Retrospective population-based cohort study</p>	<ul style="list-style-type: none"> • The population outcomes for small surgical services staffed by GPASSs were as good as the population outcomes for referral services staffed by obstetricians.
<p>Halm EA, Lee C, Chassin MR: Is volume related to outcome in health care? A systematic review and methodological critique of the literature. <i>Ann Intern Med.</i> 2002, 127:511–20.</p>	<p>English language literature published between 1980-2000</p>	<ul style="list-style-type: none"> • Is higher volume associated with better outcomes in health care? • Is centralizing and specializing procedural care an appropriate strategy for improving health care outcomes? 	<ul style="list-style-type: none"> • In the 1980's, researchers began examining the relationship between greater volume and procedural outcomes. • Because of findings of an association between higher volume and better outcomes in many procedures, consumer groups have begun recommending health consumers seek high-volume settings. • As well, limited access to reliable, valid, and timely data on health outcomes has led policy makers to assume a volume-to-outcome relationship and use volume as a shorthand for quality in many cases 	<p>Systematic Review</p>	<ul style="list-style-type: none"> • Though higher volume is associated with better outcomes for some procedures, the magnitude of the association varies greatly by procedure and setting. • Even when a significant association exists, volume does not predict outcomes for individual hospitals or practitioners. • The confidence of these findings is also limited by poor methodological rigor in many studies. • Research is needed on drivers of good outcomes in both small and large volume settings. • The policy implications are clear: evidence is needed from the appropriate jurisdiction on the specific procedure in question as volume-to-outcome associations cannot be assumed to be a positive or significant.

<p>Hancock C, Steinbach A, Nesbitt TS, Adler SR, Auerswald CL: Why doctors choose small towns: a developmental model of rural physician recruitment and retention. <i>Soc Sci Med</i> 69(9):1368–76.</p>	<p>United States; physicians recruited from rural California and Nevada</p>	<ul style="list-style-type: none"> • What factors influence recruitment and retention of rural physicians? • How can recruitment and retention of rural physicians be improved? 	<ul style="list-style-type: none"> • As early as the 1920's, rural physician shortage has been a subject of research • While 20% of Americans live rurally, just 9% of physicians practice rurally • Increased specialization of physicians further impacts the supply of potential rural generalists • As well, medical schools matriculate fewer rural students and a greater number of financially advantaged, urban ones. 51.5% of students admitted in 2004 had parents who made \$100,000 or more, up from 23.5% in 1997. • Recruitment needed to solve shortage, but retention thought to be easier to affect. • Research shows that those raised in a rural setting are more likely to practice in a rural setting after medical school 	<p>Qualitative case study</p>	<ul style="list-style-type: none"> • Priming physicians for rural practice is important, and can include long-term living, recreation, or education in a rural setting. • Once primed, physicians are drawn to rural practice for four main reasons: familiarity; community involvement; place integration; and/or self-actualization • Self-actualization includes diversity of practice, workload, and satisfaction • Graduates of rural track programs were not necessarily inclined to practice rurally, with only one of 22 respondents noting it as the primary influencing factor in the decision • Instead, spousal factors and the above four reasons were found to be more indicative of the decision to practice rurally • Mentoring as well as recruitment and retention programs aimed at developing these areas are
<p>Hart LG, Amundson BA, Rosenblatt RA: Is there a role for the small rural hospital? <i>J Rural Health</i> 1990, 6(2):101–18.</p>	<p>National scope, rural hospitals in USA</p>	<ul style="list-style-type: none"> • How does the structure, role and content of small rural hospitals compare to larger, non-rural hospitals? 	<ul style="list-style-type: none"> • Accelerated closure of rural hospitals in 1980s. 206 rural community hospitals closed between 1980 and 1988, with the rate increasing over that period • A major cause of rural facility closure is changes to reimbursement. “Cost-plus” system was replaced in 1983 with “Prospective-Payment” mechanism by Medicare • Rural hospitals in particular have a greater share of low-reimbursement patients, and less ability to defray costs with other payers 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • Authors argue that rural hospitals often the core of the other health care activities in a community as the emergency care facility, a centre of physician recruitment, and help to catalyze development of other care and social services • Authors also claim that local hospitals are critical for local economies, in part by providing services required to attract other employers

<p>Hart L, Hart LG, Dobie SA, Baldwin LM, Pirani MJ, Fordyce M, Rosenblatt RA: Rural and urban differences in physician resource use for low-risk obstetrics. <i>Health Serv Res</i> 1996;31(4):429–52.</p>	<p>Statewide study- Washington State, USA</p>	<ul style="list-style-type: none"> Do rural obstetricians and family physicians utilize fewer resources during the care of low-risk women than their urban counterparts of the same specialties? 	<ul style="list-style-type: none"> By way of background, it was shown for Washington state that the rural resident population had overall obstetrical outcomes similar to those of their urban counterparts, and that no differences in outcomes were noted for less complex surgical procedures, including caesarean deliveries. However, it was also shown that rural communities with limited access to care produce higher perinatal costs. 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> The findings of this study support the hypothesis that rural physicians use fewer overall resources in the care of non-referred low-risk obstetric patients than do their urban colleagues.
<p>Hays RB, Evans RJ, Veitch C: The determinants of quality in procedural rural medical care. <i>Rural Remote Health</i> 2005a, 5(4):473.</p>	<p>Rural and remote Australia</p>	<ul style="list-style-type: none"> What constitutes quality of care in a rural procedural medical practice? 	<ul style="list-style-type: none"> In rural Australia, most anaesthetic, obstetrical and surgical services are provided by non-specialist medical practitioners The quality of these services have been debated despite very little evidence There is a fundamental disagreement on what constitutes quality of care in rural procedural care 	<p>Cross-sectional study and qualitative interviews</p>	<ul style="list-style-type: none"> The perceptions of quality of care provided in rural hospitals varies between rural health professionals and rural patients There is a need for procedural medicine services in rural hospitals
<p>Hays RB, Evans RJ, Veitch C: The quality of procedural rural medical practice in Australia. <i>Rural Remote Health</i> 2005b, 5(4):474.</p>	<p>Rural Australia</p>	<ul style="list-style-type: none"> How does the quality of care differ for patients in a rural setting compared to care expected for patients in urban settings? 	<ul style="list-style-type: none"> Rural Australians are less healthy, have less access to healthcare services, and have a limited range and insufficient numbers of health professionals. Rural generalist doctors are falling in numbers due to: <ul style="list-style-type: none"> Lack of procedural training (hard to arrange) Smaller rural hospitals are closing or are starting to exclude acute procedural care from services There are high costs associated with professional indemnity coverage There is concern that patient transfers to larger hospitals will result in a lack of skill maintenance by hospital staff. People in rural settings are known to choose delayed or no care if they must travel far and for a long time from home. Urban facilities cannot always accommodate increased workload The rising cost of emergency transport is 	<p>Prospective cohort study with questionnaire and qualitative interviews</p>	<ul style="list-style-type: none"> Overall, 83% of patients indicated that they were “very satisfied” with care at the rural hospital. Perceptions include: less pressure for discharge, comfort in closeness to family and friends. Many positives attributed to care in the rural setting however there was concern about availability issues such as staffing and a sense of fear about losing services.

			not sustainable.		
Heller G, Richardson DK, Schnell R, Misselwitz B, Künzel W, Schmidt S: Are we regionalized enough? Early-neonatal deaths in low-risk births by the size of delivery units in Hesse, Germany 1990-1999. <i>Int J Epidemiol</i> 2002 31(5) :1061–8.	Hesse, Germany	<ul style="list-style-type: none"> Is the size of delivery units associated with early-neonatal death among low-risk births? 	<ul style="list-style-type: none"> There is little evidence for the benefits of regionalization of maternity care for low-risk births 	Population-based retrospective cohort study	<ul style="list-style-type: none"> Birthweight-specific mortality rates were highest in the smallest delivery units and lowest in the largest delivery units The mortality rates however were low for all size categories among low-risk births (6 per 1000 for the smallest centres and 1.9 per 1000 for the largest centres)
Hemminki E, Heino a, Gissler M: Should births be centralised in higher level hospitals? Experiences from regionalised health care in Finland. <i>BJOG</i> 2011 118(10) :1186–95.	Finland	<ul style="list-style-type: none"> What are the trends in centralization and unplanned out-of-hospital births? Is place of birth associated with perinatal mortality? What health and birth outcomes are associated with hospitals of different levels of service? 	<ul style="list-style-type: none"> Maternal care in Finland is universal, and pre and post natal care are decentralized and run by local communities Births are part of specialist care 	Hospital-based retrospective cohort study	<ul style="list-style-type: none"> For normal birth weight babies, there was no difference in mortality rates by hospital size The perinatal mortality rate for unplanned out-of-hospital births was seven times higher than that for hospital births These findings do not support the closing of small rural hospitals in a regionalized system with a functioning referral system
Heneghan SJ, Bordley J, Dietz P a, Gold MS, Jenkins PL, Zuckerman RJ: Comparison of urban and rural general surgeons: motivations for practice location, practice patterns, and education requirements. <i>J Am Coll Surg</i> 2005 201(5) :732–6.	National USA	<ul style="list-style-type: none"> How do general surgeons in rural and urban areas differ in their motivations for practice, practice patterns and education requirements? 	<ul style="list-style-type: none"> The recruitment of physicians to rural areas is market and choice driven There is a diminishing rural surgical workforce 	Cross-sectional survey	<ul style="list-style-type: none"> Complications in defining 'rural.' The US gov't has 8 different definitions used by various bodies of administration This study uses postal coding, but many use averages of community size or population density by county, missing rural areas in metropolitan counties and counting urban areas in otherwise low density counties
Hogenbirk JC, Mian O, Pong RW: Postgraduate specialty training in northeastern Ontario and subsequent practice location. <i>Rural Remote</i>	Northeastern Ontario Postgraduate Specialty training (NOPS)	<ul style="list-style-type: none"> Is longer placement in northern and/or rural settings associated with rural practice choice in anesthesiology, 	<ul style="list-style-type: none"> Research shows that rural placement can affect practice location in family practice NOPS providers post-grad training located in Northeastern Ontario 50 participants went through the 	Case-control study, where 50 non-NOPS participant were	<ul style="list-style-type: none"> A longer rotation in Northeastern Ontario (>4 weeks) is associated with lesser likelihood of metropolitan practice Shorter rotations in NE Ontario are associated with greater likelihood of practicing in the Southern, urban areas of Ontario

<p>Health 2011, 11(1):1603.</p>		<p>internal medicine and surgery?</p>	<p>program between its inception in 2000 and 2006</p>	<p>selected randomly and matched along demographic and descriptive characteristics</p>	<ul style="list-style-type: none"> • Participants in the program were significantly more likely to practice in Northeastern Ontario than non-participants
<p>Homan FF, Olson AL, Johnson DJ: A comparison of cesarean delivery outcomes for rural family physicians and obstetricians. <i>J Am Board Fam Med</i> 2013, 26(4):366–72.</p>	<p>2 rural community hospitals in New England, USA - one where cesarean sections are performed by a family physician (FMH), the other where cesarean sections are done by an obstetrician (OBH)</p>	<ul style="list-style-type: none"> • How do outcomes of caesarean sections performed by family physicians compare to those performed by obstetricians in two comparable rural hospitals? 	<ul style="list-style-type: none"> • The number of family physicians who perform cesarean deliveries in the United States has declined, as has the availability of obstetricians in many underserved areas. • Well-trained family physicians report difficulties in securing hospital privileges to do cesarean deliveries. 	<p>Retrospective chart review</p>	<ul style="list-style-type: none"> • Patients did not have increased risk when cesarean delivery was performed by a family doctor rather than an obstetrician. • Rates of intraoperative complications and infectious complications were similar for both hospitals. Neonatal outcomes were similar, and there were no differences in pre-term deliveries. • There were fewer postoperative complications at the FMH than the OBH.
<p>Hueston WJ, Murry M: A three-tier model for the delivery of rural obstetrical care using a nurse midwife and family physician copractice. <i>J Rural Health</i> 1992, 8(4):283–90.</p>	<p>Kentucky, USA</p>	<ul style="list-style-type: none"> • Describe the formation and operation of a hospital-sponsored nurse midwife and family physician copractice. 	<ul style="list-style-type: none"> • Unavailability of local prenatal care creates hardship and stress for women who are most likely to develop complications of pregnancy. • Over the past decade, family physicians have started to stop obstetrical practice due to concern over malpractice, adequacy of obstetric training and lifestyle issues. • The primary reason cited by midwives for not locating to rural areas was the lack of physicians to serve as their sponsors; thus a cooperative venture of nurse midwives and family physicians would not work. 	<p>Hospital-based retrospective chart review</p>	<ul style="list-style-type: none"> • Evidence shows that the maternity center patient's received care comparable to other patients at the St. Claire Medical Center. • There was a small increase in the percentage of newborns who were cared for in the special care nursery; however, this increase was not statistically significant and may be secondary to the decline of patients who needed to be transferred to tertiary care centers. • The three-tier model of care outlined utilizes obstetricians for the tasks that are most consistent with their training, i.e. surgical intervention and consultation in the care of the high risk pregnancy. Thus, this system is more cost effective than employing obstetricians to care for low-risk women.

<p>Hueston WJ, Rudy M: A comparison of labor and delivery management between nurse midwives and family physicians. <i>J Fam Pract</i> 1993 37(5):449.</p>	<p>Rural northeast Kentucky</p>	<ul style="list-style-type: none"> • What are the differences in practice patterns between nurse-midwives and family physicians in rural settings? 	<ul style="list-style-type: none"> • A unique model of maternal care in which midwives and GPs share rotation and on-call duties in a single hospital maternity unit. Midwifery students and GP residents are also used to keep costs low. Referral made to obstetrician for surgery (unknown distance) • Model developed specifically for cost savings in rural area with low SES users 	<p>Hospital-based retrospective chart review</p>	<ul style="list-style-type: none"> • Authors claim that practice patterns between GPs and midwives more similar than between GPs and obstetricians, don't provide evidence or specific reference
<p>Hueston WJ, Lewis-Stevenson S: Provider distribution and variations in statewide cesarean section rates. <i>J Community Health</i> 2001, 26(1):1-10.</p>	<p>United States</p>	<ul style="list-style-type: none"> • How does the volume of obstetric care provided by obstetricians, nurse midwives and family physicians vary by state? • How does this influence rates of Cesarean section? 	<ul style="list-style-type: none"> • Rising cesarean rates in the US in 1997 and 1998, and wide variation in cesarean rates between states prompted an examination of the non-clinical factors influencing cesarean decisions in different states. The concern was that a previous rise in cesarean section rates (between 1965 and 1988) was found to be accompanied by increases in medical costs, greater risk of maternal morbidity, and no corresponding decrease in neonatal mortality or long-term neurological impairment. 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • This article claims that the relationship between the percentage of family physicians who offer obstetric care and state cesarean rates is likely a result of an environment that both supports primary care physician involvement in obstetrics and promotes vaginal delivery. • Malpractice fears and higher malpractice insurance rates may also be influencing higher rates of cesarean section.
<p>Hulme PA, Blegen MA: Residential status and birth outcomes: is the rural/urban distinction adequate? <i>Public Health Nursing</i> 1999, 16(3):176-81.</p>	<p>University of Iowa Hospital and Clinics</p>	<ul style="list-style-type: none"> • Do rural, rural-adjacent and urban women differ by birth outcomes? • What is the relationship between maternal characteristics and birth outcomes between these groups? 	<ul style="list-style-type: none"> • Concerns over access to maternal health in rural areas of the United States • Contested categorization of urban/rural • This study uses the categorization proposed by the Iowa Governor's Task Force on Rural Health, based on population and commuting patterns: rural, rural-adjacent (to urban), and urban 	<p>Interviews and retrospective chart reviews</p>	<ul style="list-style-type: none"> • Rural women had the shortest gestations, lowest birthweights, longest length of stay, and highest costs • Higher comorbidity and longer travel distance were associated with lower gestational age, birthweight, and Apgar scores, and with higher resource use (length of hospital stay, costs of hospital care). Distance traveled was correlated with overall complications
<p>Humber N, Iglesias S: <i>Position Paper on Training for Family Physicians in General Surgery.</i> 1999.</p>	<p>Rural Canada</p>	<ul style="list-style-type: none"> • What is the current status in rural Canada with respect to access to surgical services? 	<ul style="list-style-type: none"> • Centralization is expensive to the patient and the health care system (cost of ambulance, air evacuation, accommodation, stress, implications for family members) and this is often born by the elderly, young, culturally sensitive or those of low SES • specific procedures currently being performed in rural communities depends on the needs of the community and the training of the GP 	<p>Review article</p>	<ul style="list-style-type: none"> • Rural communities should be served by family physicians with a broad base of skills who reside in the community • Close to home access for essential surgical services such as c/s and appendectomy: "the presence of a GP-surgeon in the community allows more mothers to deliver in the own communities" and "surgical coverage decreases the number of intrapartum transfers 'en route'". • Training programs should produce a

			<ul style="list-style-type: none"> • Australia and South Africa have training programs for rural GPs with enhanced skills and Wonca supports this training 		<p>sufficient number of graduates to meet the needs of rural Canada and should be accredited by the CFPC and the RCPSC</p>
<p>Humber N, Frecker T: Delivery models of rural surgical services in British Columbia (1996-2005): are general practitioner-surgeons still part of the picture? <i>Canadian Journal of Surgery</i> 2008a, 51(3): 173-178.</p>	<p>British Columbia; rural care areas with no general surgeon or specialist support, where General Practitioner Surgeons are the primary surgical care providers</p>	<ul style="list-style-type: none"> • How have models of surgical service delivery in rural areas changed over the past decade? • What influence does the loss of surgical services have on a rural community? 	<ul style="list-style-type: none"> • Communities of less than 15,000 people cannot recruit and maintain specialist surgeons, relying instead on GP-Surgical care for both elective and emergency surgery • There is no specific training program for rural surgical specialists/rural general or GP surgeons 	<p>Retrospective study</p>	<ul style="list-style-type: none"> • “Communities that wish to consistently provide full-service maternity care to 85%–90% of women but are more than 100 km from a referral centre need to maintain a local surgical program.” (p. 175) • Even with closures (25% loss of GP only surgery sites in BC between 1996 and 2004), GP Surgeons continue to play important role in rural acute care, emergency care, and obstetrics/maternal surgical care • A training program for GP surgeons is needed to replace aging workforce before rural surgical services are lost
<p>Humber N, Dickinson P: Rural patients’ experiences accessing surgery in British Columbia. <i>Canadian Journal of Surgery</i> 2010. p. 373–8.</p>	<p>Lillooet Health Area, a rural community in BC operating with one single GP-surgeon and GP-anesthesiologist</p>	<ul style="list-style-type: none"> • How does the presence or absence of rural surgical services influence patients psychosocially? 	<ul style="list-style-type: none"> • Over the decade of 2000-2010, the delivery of surgical services became increasingly centralized. Small-volume surgical sites (5,000-20,000 residents) that were traditionally supported by family doctors with enhanced surgical skills decreased by nearly 50% in British Columbia. • This was driven by the aim to optimize cost- and resource-effectiveness, volumes, and outcomes, but does not consider the qualitative emotional, psychosocial, and cultural impacts of these closures on patients and communities. • Lillooet Health Area is one of the more socioeconomically disadvantaged local health areas in BC. Figures for the number of individuals receiving income assistance, as well as alcohol consumption, are double the provincial average. 	<p>Unstructured-interviews</p>	<ul style="list-style-type: none"> • Rural patients are different than their urban counterparts; a rural population has different challenges in accessing health care and its own disparities and determinants of health. Multiple shared experiences create a unique doctor-patient relationship in rural areas. This relationship influences the way rural residents make health care decisions. • To all rural residents interviewed in this study, receiving care in their own communities from familiar health care providers took precedence over perceived quality of surgical care.
<p>Humber, N, Frecker, T: Rural Surgery in British Columbia: Is There Anybody out There? <i>Canadian Journal of</i></p>	<p>British Columbia, Canada</p>	<ul style="list-style-type: none"> • What surgical procedures were performed at rural hospitals in BC with no resident 	<ul style="list-style-type: none"> • Health care policy makers know little about what goes on at small hospitals in rural settings. • Moreover, other health care professionals know little about the scope 	<p>Case study</p>	<ul style="list-style-type: none"> • The presence of a local elective surgical program is necessary to allow an emergency and operative obstetrical program to continue.

<p><i>Surgery</i>. 2008b, 51(3):179–84.</p>		<p>specialist surgeons between 1996 and 2001?</p> <ul style="list-style-type: none"> • What was the scope of practice of GP surgeons at these small rural hospitals? 	<p>of practice of GP-surgeons and thus, many surgical and maternity care delivery decisions continue to be made without accurate knowledge of the volumes, types of and differences between surgical programs or of their community importance.</p>		
<p>Humphreys JS, Jones MP, Jones J a, Mara PR: Workforce retention in rural and remote Australia: determining the factors that influence length of practice. <i>Med J Aust</i> 2002, 176(10):472–6.</p>	<p>Non-Metropolitan Australia</p>	<ul style="list-style-type: none"> • Which factors are most significant in a general practitioner's decision to stay in rural practice? • Do these retention factors vary in importance according to the geographical location of the practice and GP characteristics? 	<ul style="list-style-type: none"> • Undersupply of general practitioners in rural and remote communities in Australia despite recruitment initiatives. 	<p>Cross-sectional, qualitative</p>	<ul style="list-style-type: none"> • Professional considerations, overwhelmingly, on-call arrangements, are the most important factors determining GP retention in rural and remote areas. • Rural doctors consistently ranked on-call arrangements, professional support and variety of rural practice as the top three issues, followed by local availability of services and geographical attractiveness.
<p>Iglesias, S., Bott, N., Ellehoj, E., Yee, J., Jennissen, B., Bunnah, T., & Schopflocher, D. (2005). Outcomes of maternity care services in Alberta, 1999 and 2000: a population-based analysis. <i>Journal of obstetrics and gynaecology Canada</i>, 27(9): 855.</p>	<p>Alberta, Canada</p>	<ul style="list-style-type: none"> • How do maternal and perinatal birth outcomes compare for communities with limited or no local intrapartum care to those with regional and tertiary care? 	<ul style="list-style-type: none"> • Only 22.1% of women from communities with limited maternity care programs (without CS capability; 1A) delivered in their home community • This contrasts to a study by Black and Fyfe (1984) that found women in Northern Ontario delivered at home at a rate of 57-80% when without CS capability. Authors argue that this is a clear sign of centralization in Canadian maternity services over the 20 year period between studies. • Authors note that while regionalization has created equitable results across various levels of service provision, increased centralization threatens to undermine that. Communities without local services are possible only because of nearby communities with 1A and 1C services. 	<p>Population-based (cohort) retrospective study</p>	<ul style="list-style-type: none"> • Authors contend that services in any given community have to be considered within the eco-system of care as a whole. Though good health outcomes have been found in communities without Cesarean section, and even those without any local service, increased centralization could have cascading effects on outcomes and travel remains problematic.
<p>Iglesias S, Burn R, Saunders LD. Reducing the cesarean section</p>	<p>Hinton General Hospital,</p>	<ul style="list-style-type: none"> • What was the impact of a 	<ul style="list-style-type: none"> • The cesarean section rate in Canada increased 5.7 to 15.9 per 100 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • The cesarean section rate decreased from 23% in 1985 to 13% in 1989 after the

<p>rate in a rural community hospital. CMAJ. S. 1991. p. 1459–64.</p>	<p>Alberta</p>	<p>program designed to reduce the rate of cesarean sections in a rural community hospital?</p>	<p>deliveries between 1970 and 1980</p> <ul style="list-style-type: none"> • The National Consensus Conference on Aspects of Cesarean Birth released a guideline in 1986 for the appropriate management of prior cesarean section and breech presentation, and discussed the criteria for diagnosing dystocia • The cesarean section rate at the Hinton General Hospital rose to a peak of 23% when several doctors made a commitment to follow the guidelines to reduce the rate 		<p>introduction of an intervention in 1985 on how to manage VBAC, breech presentation and diagnosis of dystocia requiring cesarean section</p> <ul style="list-style-type: none"> • The rate of attempted VBACs increased, and the rate of successful VBACs remained unchanged • Rural hospitals with facilities for cesarean section should consider a similar program
<p>Iglesias A, Iglesias S, Arnold D. Birth in Bella Bella: emergence and demise of a rural family medicine birthing service. Canadian family physician ca; 2010. p. e233–40.</p>	<p>Bella Bella, British Columbia</p>	<ul style="list-style-type: none"> • What were the factors surrounding the closure of the once successful rural maternity care program? 	<ul style="list-style-type: none"> • Due to the specialization of family practitioners in primary care, secondary services, including anesthesia and surgery, became part of the scope of the Royal College of Physicians and Surgeons of Canada • Access to training in procedural skills became increasingly difficult for rural physicians • The maternity service in Bella Bella had been supported by generalist physicians for nearly a century. But closed in 2001 due to difficulties in recruiting generalist physicians and physicians who would provide intrapartum services 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • Perinatal and maternal mortality rates, as well as rates of intervention were comparable to Canadian data • When the skillset of family doctors changed, rural communities suffered because of the inability to recruit doctors with the necessary skills to sustain rural maternity services
<p>Inglis F: Surgical care in rural Canada: Training and planning for the future - editorial. <i>Can Med Assoc J.</i> 1995, 153(10):1453–4.</p>	<p>Western Canada (rural)</p>	<ul style="list-style-type: none"> • Describe the recent guidelines proposed by the CFPC and RCPSC (Royal College of Physicians and Surgeons of Canada surrounding surgical care) 	<ul style="list-style-type: none"> • NA 	<p>Editorial</p>	<ul style="list-style-type: none"> • In the author's experience, most rural GPs confine themselves to a few surgical procedures for which they feel they are adequately trained, though sometimes feel forced into more complex procedures: suitable guidelines are necessary surrounding what procedures should and shouldn't be attempted in rural and remote settings • CFPC & RCPSC guidelines advise: • training GPs in resuscitative interventions, certain diagnostic surgical services, safe transfer of seriously ill patients to specialist facilities • the need for c/s and orthopedic services will vary by region, depending on distance to nearest referral centre • national policy

					<ul style="list-style-type: none"> • Formal training program for rural GPs with enhanced surgical skills: new curriculum for rural GPs overseen by directors of General Surgery and Family Practice residency training programs • Each hospital to have emergency protocol for care and transfer • Healthy supply of general surgeons needed
Johnson D, Jin Y: Low-volume obstetrics. Characteristics of family physicians' practices in Alberta. <i>Canadian family physician</i> 2002, 48 : 1208–15.	Alberta, Canada	<ul style="list-style-type: none"> • How do rates of obstetric intervention and birth outcomes compare for low-volume family practice (LVFP) and high-volume family practice (HVFP)? 	<ul style="list-style-type: none"> • The Society of Obstetricians and Gynecologists of Canada has taken the position that physicians are not required to participate in a certain number of deliveries per year to maintain competence; however they recommend that those who attend fewer than 25 births/year should be restricted to low-risk practice and should update their skills. • The SOGC also recommends that the standard of care for low risk maternity patients should be equivalent to that in tertiary care centres as in small rural hospitals. • The number of rural and remote hospitals that offer obstetric services has decreased over the last decade and centralization has occurred and many remote and rural communities are left with no local access to maternity care services. 	Retrospective cohort study	<ul style="list-style-type: none"> • The authors speculate that LVFPs have been replaced by HVFPs in smaller hospitals and that high-volume family practice does not result in higher-risk obstetrical practice. • High-risk women are usually cared for by obstetricians in urban centers and thus even when HVFPs offer local obstetric services, they are not always used. • The closing of small hospitals would have detrimental effects on rural and aboriginal women. • The authors suggest that 25 deliveries/year is arbitrary and there is no evidence that suggests that quality of care and volume are directly linked.
Kirke AB: How safe is GP obstetrics? An assessment of antenatal risk factors and perinatal outcomes in one rural practice. <i>Rural and remote health</i> 2010 10(3) :1545.	Kalgoorlie, Western Australia	<ul style="list-style-type: none"> • What outcomes are associated with a small rural obstetric practice run by nonspecialist GP obstetricians? 	<ul style="list-style-type: none"> • Nearly one quarter of pregnant women in Western Australia are from rural or remote regions, and about 80% of women living in these areas deliver locally. The medical workforce attending to these patients is predominantly made up of general practitioner obstetricians. • The challenge is for GP obstetricians to quickly refer high-risk patients to an appropriate facility, and to develop and maintain the skills necessary to adequately deal with whatever else occurs. 	Hospital-based retrospective chart review	<ul style="list-style-type: none"> • The isolated and scattered nature of rural health provision often means that there are fewer resources per person in rural and remote populations than those in urban areas. However, rural people still need access to adequate and appropriate health care. This study supports that argument that obstetric care can be safely provided by appropriately trained general practitioners in areas where specialist services are less accessible.

<p>Klein MC, Spence A, Kaczorowski J, Kelly A, Grzybowski S: Does delivery volume of family physicians predict maternal and newborn outcome? CMAJ 2002 166(10):1257–63.</p>	<p>BC Women's Hospital and Health Centre, Vancouver, BC</p>	<ul style="list-style-type: none"> • Do the practice-volume relations that have been shown in other fields of medical practice also exist in maternity care practice by family doctors? 	<ul style="list-style-type: none"> • Better outcomes have been associated with higher patient volumes in some instances, but not others. Most of the studies on volume have focused on surgical or oncology specialties. 	<p>Cross sectional Analysis-Physicians grouped into 3 categories based on # of births the attended each year (low, medium, high volume)</p>	<ul style="list-style-type: none"> • Family Physicians delivery volumes were not associated with adverse outcomes for mothers or newborns. • Low-volume family physicians referred patients and transferred deliveries to obstetricians more frequently than high- or medium-volume family physicians.
<p>Klein M, Johnston S, Christilaw J, and Carty E. Mothers, babies, and communities: Centralizing maternity care exposes mothers and babies to complications and endangers community sustainability. Canadian Family Physician. 2002. Vol 48 (Jul). 1177-1179</p>	<p>Rural communities of Canada</p>	<ul style="list-style-type: none"> • What are the effects of the centralization of maternity services in Canada? 	<ul style="list-style-type: none"> • The authors argue that maternity care is a lynchpin in small communities, providing a procedure base that – together with emergency, surgery, and anaesthesia – maintains rural health systems that provide economic and social benefits to their community. • Having local services can be important in attracting other employers to the area and in keeping desirable, reproductive-age workers/community members in a rural place • Maternity care often faces cuts and centralizing pressures because of apparent inefficiencies, with larger units maximizing practitioner time and hospital resource usage. 	<p>Editorial</p>	<ul style="list-style-type: none"> • Consequences of centralization foretold by the authors include: greater travel times and costs for women and their families, high-outflow with worse health outcomes, increased health care costs per birth, midwifery is made precarious without rural physician-based maternity back-up and unregulated midwifery takes its place, other aspects of women's health care begin to degrade and centralize, new students choose not to take on this field of practice, community businesses struggle to recruit people, and the economy of rural regions become more unstable.
<p>Kornelsen JA, Grzybowski SW: Obstetric services in small rural communities: what are the risks to care providers? Rural Remote Health 2008, 8(2):943.</p>	<p>Provincial study- rural communities in British Columbia, Canada.</p>	<ul style="list-style-type: none"> • What are the risks to care providers who practice obstetric services in small rural communities? 	<ul style="list-style-type: none"> • In communities with an elective maternity service without local access to surgical capability, practitioners must be prepared to respond to obstetrical emergencies and arrange urgent transfer if a cesarean section is indicated. Although there is an emerging understanding of the stressors faced by rural physicians, little is known about the experience of care providers offering maternity care in low-resourced environments 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> • A balanced approach to risk management grounded in a comprehensive understanding of the values that influence • Decision-making, including acknowledgement of the social risks care providers incur, is a necessary step towards better health services for rural parturient women and their babies. Additional strategies may include community-based identification of the risks and benefits of local care, and programs of professional support for rural obstetrical care providers experiencing stress.

<p>Kornelsen J, Grzybowski S: Cultures of risk and their influence on birth in rural British Columbia. <i>BMC Fam Pract</i> 2012, 13:108.</p>	<p>Provincial study- rural communities in British Columbia, Canada</p>	<ul style="list-style-type: none"> • What are the maternity care experiences of rural care providers and parturient women including their perspectives on risk? 	<ul style="list-style-type: none"> • A significant number of Canadian rural communities offer local maternity services in the absence of caesarean section back-up to parturient women. These communities are witnessing a high outflow of women leaving to give birth in larger centres to ensure immediate access to the procedure. A minority of women choose to stay in their home communities to give birth in the absence of such access. In this instance, decision-making criteria and conceptions of risk between physicians and parturient women may not align due to the privileging of different risk factors. 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> • When birth was planned locally, physicians expressed an awareness and acceptance of the clinical risk incurred. Likewise, when birth was planned outside the local community, most parturient women expressed an awareness and acceptance of the social risk incurred due to leaving the community. The tensions created by these contrasting approaches relate to underlying values and beliefs. • As such, an awareness can address the impasse and work to provide a resolution to the competing prioritizations of risk.
<p>Kornelsen J, Grzybowski S: <i>Rural women's experiences of maternity care: Implications for policy and practice.</i> Ottawa: Status of Women Canada 2005:4–12.</p>	<p>Rural British Columbia</p>	<ul style="list-style-type: none"> • What are the maternity care experiences of rural women? • What is the impact of regionalization on women and their families? 	<ul style="list-style-type: none"> • Despite a lack of evidence, or knowledge of the consequences, decisions are being made to close small rural maternity services • This does not align with the national policy on rural maternity care which states that women should be able to birth in their communities whenever possible 	<p>Cross-sectional design using in-depth qualitative interviews</p>	<ul style="list-style-type: none"> • Care providers, administrators and local leaders expressed an awareness of how difficult it can be for rural physicians to maintain their skills with low volume practices with regards to childbirth • The question of the safety of maternity care where local cesarean section is not available influences the sustainability of rural services • The participants acknowledged that collaborative decision-making was essential regarding community birth services • Birthing women participants of the study reported stress over the uncertainties of the specifics of their care, difficulties in receiving continuity of care provider, and the financial implications of having to leave their community for care • The participants acknowledged the importance of community birth
<p>Kornelsen J, Grzybowski S, Iglesias S. Is rural maternity care sustainable without general practitioner surgeons? <i>Canadian journal of rural medicine.</i> 2006. p. 218–20.</p>	<p>Canada</p>	<ul style="list-style-type: none"> • Is rural maternity care sustainable without general practitioner surgeons? 	<ul style="list-style-type: none"> • Many rural maternity services in North America have closed and the consequences are not well understood • Maternity services without cesarean section capability are vulnerable to closure • Studies have reported psychosocial costs to women who do not have local access to maternity services • Canada has not actively pursued an approach to train, certify and provide 	<p>Expert opinion piece</p>	<ul style="list-style-type: none"> • Evidence suggests that GP surgeons are critical to the sustainability of rural maternity and surgical services • There are significant challenges for GP surgeons to access local training and mentorship • There is a current lack of acknowledgement of the importance of GP surgeons in rural areas

			quality assurance for GP surgeons (as has occurred for GP anesthesia and advanced maternity skills)		
Kornelsen J, Hutton E, Munro S: Influences on decision making among primiparous women choosing elective caesarean section in the absence of medical indications: findings from a qualitative investigation. <i>J Obstet Gynaecol Can</i> 2010, 32(10):962–9.	Provincial study- British Columbia, Canada	<ul style="list-style-type: none"> • What are women's experiences with the decision-making process leading to elective operative delivery without medical indication? 	<ul style="list-style-type: none"> • In 2006/2007, a survey performed by the Public Health Agency of Canada revealed that 8.1% of new mothers in Canada had requested a Caesarean section without medical intervention. 	Cross-sectional study	<ul style="list-style-type: none"> • Research indicates that while many factors are complicit, the decision to have a patient-initiated elective Caesarean section with no absolute indicators is most often a combination of patient preference and obstetric reasons that alone would not necessarily indicate the need for a Caesarean section. Findings from qualitative interviews indicate that complex social, psychological, and cultural factors had an impact on the decision to undergo an elective Caesarean section in the absence of medical indication.
Kornelsen J, Iglesias S, Humber N, Caron N, & Grzybowski S: GP surgeons' experiences of training in British Columbia and Alberta: a case study of enhanced skills for rural primary care providers. <i>Canadian Medical Education Journal</i> 2012, 3(1): 33-41.	British Columbia and Alberta	<ul style="list-style-type: none"> • What are the training experiences of rural GP surgeons in BC and Alberta? 	<ul style="list-style-type: none"> • The number of family physicians with enhanced surgical skills is decreasing in rural areas • There are a number of challenges for GP surgeons, including a lack of collegial and health authority support, a lack of regulatory structure, a lack of formal training, and a lack of continuing education opportunities 	In-depth qualitative interviews	<ul style="list-style-type: none"> • Mentors and role models were influential for rural GP surgeons during training, however the interprofessional tension existed at times between specialist and generalist mentoring relationships • The participants identified motivations for acquiring advanced skills, the resources required for training, and the most efficacious context for training • Contemporary training and mentorship opportunities for GP surgeons are scarce due in part to the sub-specialization of general surgery • To sustain rural services, collaboration between GP surgeons, general surgeons, obstetricians, academic leaders, and rural health services planners is needed
Kornelsen J, Iglesias S, Humber N, Caron N, & Grzybowski S: The Experience of GP Surgeons in Western Canada: The Influence of Interprofessional Relationships in Training and Practice. <i>Journal of Research in Interprofessional Practice & Education</i> 2013, 3(1).	Western Canada	<ul style="list-style-type: none"> • How do interprofessional relationships influence the experiences of GP surgeons? 	<ul style="list-style-type: none"> • The sustainability of health services in rural Canada is at risk • To ensure that care is received as close to home as possible, a generalist approach to care is needed • The decrease in numbers of GP surgeons is due in part to a lack of interprofessional support throughout training and practice 	Qualitative semi-structured interviews	<ul style="list-style-type: none"> • Reducing interprofessional tension between generalists and specialists is crucial to improving the care of rural residents • Professions must work together to create a supportive context for training and practice of GP surgeons • A generalist approach requires appropriate training including continuing education, rigorous evaluation of the trainee and the training program, and a supportive and encouraging practice environment

<p>Korne Kornelsen J, Moola S, Grzybowski S: Does distance matter? Increased induction rates for rural women who have to travel for intrapartum care. <i>J Obstet Gynaecol Can</i> 2009, 31(1):21–7.</p>	<p>Provincial study- British Columbia, Canada</p>	<ul style="list-style-type: none"> • How do intervention rates and outcomes differ between women who live adjacent to maternity service with specialist (surgical) services and women who must travel for this care? 	<ul style="list-style-type: none"> • In Canada, between 3% and 23.5 % of parturient women undergo induction of labour. Although Canadian data for calculating the rate of inductions that are not performed for medical or obstetrical indications are limited, international research indicates that there is significant variation in induction rates between hospitals in th same jurisdiction, indicating that multiple, contextual variables affect the decision to induce labour. 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> • Rural parturient women who have to travel for care are 1.3 times more likely to undergo induction of labour than women who do not have to travel. Further research is required to determine why this is the case.
<p>Kozhimannil KB, Law MR, Virnig BA: Cesarean Delivery Rates Vary Tenfold Among US Hospitals; Reducing Variation May Address Quality and Cost Issues. <i>Health Aff</i> 2013, 32(3):527–35</p>	<p>United States-National Study</p>	<ul style="list-style-type: none"> • How can we reduce the large variation of Cesarean section rates among US hospitals to address important health and cost implications? 	<ul style="list-style-type: none"> • In the US, caesarean section increased from 20.7 % of all deliveries in 1996 to 32.8 % in 2011. Caesarean delivery is much more costly than vaginal delivery, and is also associated with worse outcomes and complications for women. 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> • It was found that rates of caesarean section in US hospitals vary 7.1% to 69.9%. This large variation indicates that clinical risk factors probably do not provide a full explanation for these differences. It is likely that practice patterns are a likely driver of variations in delivery mode and ought to be the focus of policy interventions to slow or reverse the rise in caesarean delivery rates overall and to decrease variation across hospitals.
<p>Landercaasper J, Bintz M, Cogbill TH, Bierman SL, Buan RR, Callaghan JP, et al: Spectrum of general surgery in rural America. <i>Arch Surg</i> 1997, 132(5):494–8.</p>	<p>Rural community hospitals in the Midwest, USA.</p>	<ul style="list-style-type: none"> • What types of surgery are performed by rural surgeons and how does their experience compare to that of graduating US surgical residents? 	<ul style="list-style-type: none"> • 25% of the US population lives in rural areas, but fewer than 15% of physicians practice there. Questions of who will meet the surgical needs of rural America are pertinent because the number of rural surgeons is declining and current residency programs may not optimally train graduates for the spectrum of surgical practice seen in rural America. 	<p>Case study</p>	<ul style="list-style-type: none"> • This study only begins to highlight the differences between rural and urban surgical practices. We recommend a rural surgical track be developed for selected training programs to optimize the training of surgical residents who are interested in a rural practice. Increased experience in endoscopy, gynecologic, obstetric, and orthopedic surgery would be emphasized. Residency rotations with rural surgical mentors may further enhance the qualifications and interest of prospective rural surgeons.
<p>Larimore WL, Davis A: Relation of infant mortality to the availability of maternity care in rural Florida. <i>J Am Board Fam Pract</i> 1991, 8(5):392–9.</p>	<p>Rural counties in Florida</p>	<ul style="list-style-type: none"> • What is the impact of the availability of maternal care services on infant mortality rates in rural counties in Florida? 	<ul style="list-style-type: none"> • Forty-seven counties in Florida were lacking in maternity care services at the time of the study. 	<p>Cross-sectional study; hypothetical model</p>	<ul style="list-style-type: none"> • Access to maternity care in rural Florida is a problem that could be hampering Florida's ability to reduce its infant mortality rate. • Family physicians appear to be the most geographically distributed health care providers in Florida; therefore, strategies should be developed to recruit Florida's rural family physicians into maternity care.

<p>Larson EH, Murowchick E, Hart LG: <i>Poor Birth Outcome in the Rural United States : 1985-1987 to 1995-1997</i>. The University of Washington Rural Health Research Centre; 2008.</p>	<p>United States-National Study</p>	<ul style="list-style-type: none"> • How can we narrow the gap between rural and urban birth outcomes? What factors contribute to poor birth outcomes in rural areas? 	<ul style="list-style-type: none"> • Rural residents in US were experiencing higher rates of postneonatal mortality and inadequate prenatal care than urban residents. 	<p>Cross-sectional study/analysis</p>	<ul style="list-style-type: none"> • Residents of rural persistent poverty counties experienced higher risk of low birthweight and postneonatal mortality than residents of rural nonpoverty counties. While progress was made in closing rural/urban gaps in risk of poor outcome and inadequate prenatal care, rural residence and residence in a persistent poverty county remained independent risk factors for inadequate care and some adverse birth outcomes, especially postneonatal mortality.
<p>Laven, G, Wilkinson, D: Rural Doctors and Rural Backgrounds: How Strong Is the Evidence? A Systematic Review. Aust J Rural Health 2003, 11(6):277–84.</p>	<p>International Study-based in Australia</p>	<ul style="list-style-type: none"> • Is there an association between rural background and rural medical practice? 	<ul style="list-style-type: none"> • It is widely perceived that doctors with a rural background are more likely to return to work in rural areas and major policy initiatives in Australia rely on this assumption. It is recognized that other factors such as location, rural medical training, and spouse or partner background may also be influential. 	<p>Expert Opinion-based upon studies of a case-control or cohort design</p>	<ul style="list-style-type: none"> • There is consistent evidence that the likelihood of working in rural practice is approximately twice greater among doctors with a rural background. There is a smaller body of evidence in support of other rural factors studied (having a rural partner, rural medical training, etc), and the strength of association is similar to that for rural background.
<p>Leeman L, Leeman R: A Native American community with a 7% cesarean delivery rate: does case mix, ethnicity, or labor management explain the low rate? Ann Fam Med 2003, 1(1):36–43.</p>	<p>Predominantly Native American region of northwestern New Mexico, USA.</p>	<ul style="list-style-type: none"> • Can studying communities with low rates of cesarean delivery help identify practices that can lower the cesarean rate? 	<ul style="list-style-type: none"> • Cesarean delivery rates can vary widely among different population groups; known risk factors include age, parity, weight, socioeconomic status, ethnicity, and other obstetrical risk factors. Studying communities with low rates of cesarean delivery may help to identify practices that lower the cesarean delivery rate. This study focused on births at the Zuni-Ramah Hospital to identify factors associated with the low c-section rate of 7.3% in this predominantly Native American population. 	<p>Population-based cohort study</p>	<ul style="list-style-type: none"> • The low rate of caesarean delivery in the Zuni-Ramah community can be attributed to a number of factors including, but not limited to: the predominant involvement of family physicians and nurse-midwives attending births, lower birth weights, and cultural attitudes towards childbirth.

<p>Leeman L, Leeman R: Do all hospitals need cesarean delivery capability? An outcomes study of maternity care in a rural hospital without on-site cesarean capability. <i>J Fam Pract</i> 2002, 51(2):129–34.</p>	<p>Zuni Pueblo and Ramah Navajo communities of North-western New Mexico (predominantly Native American region)</p>	<ul style="list-style-type: none"> • What birth outcomes are associated with maternity care services provided at a small rural hospital without Cesarean section capability? 	<ul style="list-style-type: none"> • Guidelines for Perinatal Care developed by the American College of Obstetricians and Gynecologists and the American Academy of Pediatrics include the statement “all hospitals that offer labor and delivery should be able to perform emergency cesarean deliveries”. 	<p>Population-based retrospective cohort study</p>	<ul style="list-style-type: none"> • Perinatal outcomes and care in rural communities produce better outcomes than systems that require women to travel to distant urban areas for maternity care. • The study purports that the use of oxytocin in rural hospital units without operative facilities should be considered under well-defined clinical guidelines or research protocol. Moreover, it calls for guidelines to be developed to permit rural hospitals without cesarean capability to provide maternity care as part of integrated perinatal systems with well-developed transport protocols and supportive referral institutions.
<p>Lisonkova S, Sheps SB, Janssen PA, Lee SK, Dahlgren L, Macnab YC: Birth outcomes among older mothers in rural versus urban areas: a residence-based approach. <i>J Rural Health</i> 2011, 27(2):211–9.</p>	<p>British Columbia</p>	<ul style="list-style-type: none"> • Are maternal and newborn birth outcomes among older mothers associated with rural residence? • How do parity and distance to nearest hospital influence the association between rural residence and birth outcomes? 	<ul style="list-style-type: none"> • In the developed world, delayed childbirth has become increasingly common • It is unknown if outcomes differ for older women based on geographic barriers to accessing advanced obstetric care 	<p>Population-based retrospective cohort study</p>	<ul style="list-style-type: none"> • Among older women, the cesarean section rate was lower and there was an increased risk of perinatal mortality in rural compared to urban areas
<p>Lynch N, Thommasen H, Anderson N, Grzybowski S: Does having cesarean section capability make a difference to a small rural maternity service? <i>Can Fam Physician</i> 2005, 51:1238–9.</p>	<p>Bella Coola General Hospital (with cesarean section capability) in Bella Coola Valley, BC; Queen Charlotte Islands General Hospital (without</p>	<ul style="list-style-type: none"> • How does access to Cesarean section in an isolated rural community influence rates of adverse maternal and newborn birth outcomes? 	<ul style="list-style-type: none"> • The practice of obstetrics in rural Canadian communities is changing, towards offering less and less obstetric care in the form of anesthesia, epidural, and cesarean section. • Bella Coola Valley Hospital had cesarean section capability throughout most of 1986-2000. Queen Charlotte Islands General Hospital offered obstetric services, but not cesarean section deliveries. Both hospitals are otherwise similar in population size, Northern and Isolation Allowance program designation, type of hospital, and availability of local obstetric services. 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • Comparing local births only, there was no difference between both hospitals in rates of episiotomy for vaginal delivery or adverse outcomes. • No maternal deaths were reported in either population. • There was a significantly higher rate of premature delivery at the Queen Charlotte Islands General Hospital (without cesarean capability) than the Bella Coola General Hospital. This was not explained by differences in ethnicity. This increased prematurity is likely linked to increased outflow. • Over the study period, almost 20% more women were able to remain in their home

	cesarean section capability) in Queen Charlotte City, BC.		<ul style="list-style-type: none"> The referral hospitals closest to Bella Coola Valley are in Williams Lake (more than 450 km by road) or in Vancouver (2-hour flight). The referral hospital closest to Queen Charlotte City is in Prince Rupert (6-hour ferry or 2-hour float plane trip); the nearest centre with obstetricians and pediatricians is in Vancouver (4-hour flight). For both centres, inclement weather can complicate transport. 		communities to deliver when local operative delivery was available
Lynge DC, Larson EH, Thompson MJ, Rosenblatt R a, Hart LG: A longitudinal analysis of the general surgery workforce in the United States, 1981-2005. <i>Arch Surg</i> 2008, 143(4) :345–50.	United States-National Study	<ul style="list-style-type: none"> How can we explain the decline in the number of general surgeons in the USA over the past two decades? 	<ul style="list-style-type: none"> The overall supply of general surgeons per 100,000 population has declined in the past two decades, and small and isolated rural areas of the United States continue to have relatively fewer general surgeons per 100,000 population than urban areas. 	Retrospective longitudinal analysis	<ul style="list-style-type: none"> The overall number of general surgeons per 100,000 population has declined by 25.91% during the past 25 years. The decline has been most marked in urban areas, but more remote rural areas continue to have significantly fewer general surgeons per 100,000 population. These findings have implications for training, recruiting, and retaining general surgeons.
Lynge DC, Larson EH: Workforce issues in rural surgery. <i>Surg Clin North Am</i> 2009 89(6) :1285–91, vii.	United States-National Study	<ul style="list-style-type: none"> How are rural surgeons distributed among rural and urban areas in the United States? 	<ul style="list-style-type: none"> Although the overall proportion of general surgeons working in rural areas is approximately proportional to the population of rural America, closer examination reveals significant maldistribution of general surgeons across regions and different types of rural areas. 	Expert Opinion	<ul style="list-style-type: none"> Large rural areas are well supplied with general surgeons compared to urban or isolated rural areas. Small or isolated areas may have only two to three general surgeons per 100,000 population, and many small town and rural hospitals have no surgeons at all. There is a need for a number of recruitment strategies and initiatives to make rural surgery more attractive to the modern surgical graduate.
MacDowell M, Glasser M, Fitts M, Fratzke M, Peters K: Perspectives on rural health workforce issues: Illinois-arkansas comparison. <i>J Rural Health</i> 2009, 25(2) :135–40.	Rural Illinois and Arkansas	<ul style="list-style-type: none"> How do rural hospital CEOs' perspectives differ in with respect to health care professional shortages in Illinois and Arkansas? 	<ul style="list-style-type: none"> Research has documented shortages in rural health care professionals 	Cross-sectional survey	<ul style="list-style-type: none"> Physician shortages were reported by 83.6% of rural CEOs who participated in the survey There were similarities in shortages and attributes that influence recruitment between the two states The top three health care professional shortages were family physicians, obstetrics-gynecology and general internal medicine physicians
MacDowell M, Glasser M, Fitts M, Nielsen K, Hunsaker M: A national view of rural health workforce issues in the	United States	<ul style="list-style-type: none"> What are rural hospital CEOs' perspectives of health care professional 	<ul style="list-style-type: none"> 65% of US rural counties lack an adequate number of health professionals Recruitment and retention of rural health professionals remains a challenge 	Nationwide cross-sectional survey	<ul style="list-style-type: none"> There are similarities in shortages and factors influencing recruitment across regions This suggests that major policy and program changes are needed to increase the rural health workforce

USA. <i>Rural Remote Health</i> 2010, 10(3) :1531.		shortages and factors influencing recruitment and retention?			<ul style="list-style-type: none"> An overall finding with respect to recruitment and retention was that communities need to be open, helpful and supportive of healthcare professionals
MacLennan AH, Spencer MK: Projections of Australian obstetricians ceasing practice and the reasons. <i>Med J Aust</i> 2002, 176(9) :425–8.	Australia-National Study	<ul style="list-style-type: none"> What are the intentions of Australia's specialist obstetricians to cease practice and why do they choose to abandon this specialty? 	<ul style="list-style-type: none"> The cessation of obstetric practice has been particularly high among general practitioners and rural specialists. 	Cross-sectional study	<ul style="list-style-type: none"> The main reasons given for ceasing obstetrics were intention to specialize in gynecology, fear of litigation, high indemnity costs, family disruption, and long working hours. Based on the data collected, researchers are able to conclude that there will soon be a shortage of practicing obstetricians in Australia.
Magann EF, McKelvey SS, Hitt WC, Smith MV, Azam GA, Lowery CL: The use of telemedicine in obstetrics: A review of the literature. <i>Obstet Gynecol Surv</i> 2011, 66(3) :170–8.	NA	<ul style="list-style-type: none"> In what ways has telemedicine been adapted for various obstetrical and clinical scenarios? 	<ul style="list-style-type: none"> NA 	Literature review	<ul style="list-style-type: none"> Telemedicine is currently being explored in many different areas including pregnancy termination and foetal anomaly management. Telemedicine is also being explored to obtain and provide second opinions for congenital heart abnormalities found after foetal autopsy.
Mahoney SF, Malcoe LH: Cesarean delivery in Native American women: are low rates explained by practices common to the Indian health service? <i>Birth</i> 2005, 32(3) :170–8.	Santa Fe Indian Hospital	<ul style="list-style-type: none"> What is the rate of cesarean section among Native American women and what risk factors are associated? 	<ul style="list-style-type: none"> Cesarean section rates in the US are among the highest of all industrialized countries Native American women have one of the lowest cesarean section rates (24.2%) in the US when analyzed by ethnicity Studies have found that the low rates are not explained by demographic or obstetric risk factors 	Nested case-control study	<ul style="list-style-type: none"> The cesarean section rate among Native American women at the Santa Fe Indian Hospital (9.6%) was well below the rate in New Mexico (16.4%), and the national rate (21.2%) The only observed correlates of cesarean delivery were medical and practice-related factors
Maouris P, Jennings B, Ford J, Karczub A, Kohan R, Butt J, et al: Outreach obstetrics training in Western Australia improves neonatal outcome and decreases caesarean	Western Australia; rural and remote areas	<ul style="list-style-type: none"> What were the impacts on perinatal outcomes of a 1-day outreach Training and education program for multi-professional 	<ul style="list-style-type: none"> 26,000 births annually in Western Australia (WA), 1/5th in rural or remote areas 2/3 of aboriginal pregnant women reside and give birth in rural and remote areas Aboriginal women have documented ~double perinatal mortality rate 	Retrospective cohort study	<ul style="list-style-type: none"> Authors argue that sites with lowest negative outcomes are those with best working relationships between professionals Obvious implication that specialist education can improve outcomes in lower resource environments without the centralization of maternal care, even in surgical cases

<p>sections. <i>J Obstet Gynaecol</i> 2010, 30(1):6–9.</p>		<p>practitioners doing obstetric care in rural and remote areas?</p>	<p>compared to non-Aboriginal women</p> <ul style="list-style-type: none"> • Just 15% of specialist obstetricians practice in rural and remote areas in Australia, and fewer in WA than Australia as a whole • In WA, just 6.9 OB specialists were 100,000 rural/remote females vs 12.7 Aust. average • 28.5% of female population lives in rural and remote areas • WA Enquiry into stillbirths (Perinatal and Infant Mortality Committee, 2005) reported that >1/3 of perinatal deaths had at least one preventable factor and recommended support for clinical knowledge/skills 		
<p>McGrail MR, Humphreys JS: The index of rural access: an innovative integrated approach for measuring primary care access. <i>BMC Health Serv Res</i> 2009, 9:124.</p>	<p>Australia</p>	<ul style="list-style-type: none"> • How was the Index of Rural Access developed and how can it be best applied in health services research? 	<ul style="list-style-type: none"> • Access to health care is a growing concern in rural and remote areas • Currently, simplistic classifications are used to assess rurality and access to care • A new method of classification was created based on spatial accessibility, population health needs and mobility 	<p>Methodology paper</p>	<ul style="list-style-type: none"> • The Index of Rural Access is a sensitive and appropriate measure of access • This index can be used by policy makers to identify areas of low and high access and to appropriately distribute health care funding
<p>Merlo J, Gerdtham U, Eckerlund I, Håkansson S, Pakkanen M, Lindqvist P, et al: Hospital Level of Care and Neonatal Mortality in Low- the Question in Sweden by Multilevel Reassessing Analysis. <i>Med Care</i> 2014, 43(11):1092–100</p>	<p>Sweden</p>	<ul style="list-style-type: none"> • How do rates of neonatal mortality differ by hospital level of care in low and high risk births? 	<ul style="list-style-type: none"> • For high-risk births, studies have reported increased survival rates when maternity services are regionalized to concentrate resources in larger hospitals • Some recent studies have suggested that regionalization is also beneficial for low-risk deliveries 	<p>Retrospective population-based cohort study</p>	<ul style="list-style-type: none"> • From a medical point of view the findings suggest that the regionalization of birth for low-risk pregnancies is justified (ie. The regional centres had decreased mortality rates) • From a public health perspective, the closure of small maternity unit may prevent a noticeable number of deaths, however this change would not make a substantial difference at the individual level due to the low neonatal mortality rate in Sweden
<p>Miewald C, Procyk A: “You don’t know what you’ve got till it’s gone”: the role of maternity care in community sustainability. <i>Can J Rural Med</i> 2011, 16(1):7–12.</p>	<p>British Columbia</p>	<ul style="list-style-type: none"> • What is the role of maternity care in sustaining rural communities in northern BC? 	<ul style="list-style-type: none"> • Many small rural hospitals have altered or closed maternity services • It is hypothesized that maternity care plays an important role in communities and that the closure of maternity services results in a cascade of negative outcomes 	<p>Qualitative case study</p>	<ul style="list-style-type: none"> • The role of maternity care in community sustainability is complex. A decline in birth rates may cause a physician to stop providing intrapartum services, which results in women being referred out of the community. A lack of maternity services may impact young families’ decisions when choosing where to live. • Decision makers should consider the community-wide consequences of changing

<p>Miller KJ, Couchie C, Ehman W, Graves L, Grzybowski S, Medves J: Rural maternity care. <i>J Obstet Gynaecol Canada</i> 2012, 34(10):984–91.</p>	<p>Rural Canada</p>	<ul style="list-style-type: none"> • What are the current issues with regards to maternity care in rural Canada? 	<ul style="list-style-type: none"> • This article builds on the 1998 Joint Position Statement on Rural Maternity Care by adding new evidence 	<p>Position paper</p>	<p>the function of maternity care facilities</p> <ul style="list-style-type: none"> • “Women who reside in rural and remote communities in Canada should receive high-quality maternity care as close to home as possible.” • “While local access to surgical and anaesthetic services is desirable, there is evidence that good outcomes can be sustained within an integrated perinatal care system without local access to operative delivery. There is evidence that the outcomes are better when women do not have to travel far from their communities. Access to an integrated perinatal care system should be provided for all women.” • Generalist skills in maternity care, surgery, and anaesthesia are valued and should be supported in training programs in family medicine, surgery, and anaesthesia as well as nursing and midwifery.
<p>Monk AR, Tracy S, Foureur M, Barclay L: Australian primary maternity units: Past, present and future. <i>Women and Birth</i> 2013, 26(3):213–8.</p>	<p>Australia</p>	<ul style="list-style-type: none"> • What are the drivers and barriers to the sustainability of midwifery-led primary maternity units in Australia? 	<ul style="list-style-type: none"> • Government policies since the 1990s, following a market-driven approach, promoted the centralization and privatization of maternity services as a way to minimize costs. This led to the closure of many smaller maternity units in rural and remote Australia, and the amalgamation of smaller country hospitals with larger regional and metropolitan hospitals. Concurrently, the private health insurance scheme introduced incentivized the use of obstetricians in childbirth. Safety concerns with respect to the lack of obstetric back-up in midwife-led maternity units further influenced closures of these centres. This has left a large gap in the provision of readily accessible maternity care. 	<p>Narrative literature review</p>	<ul style="list-style-type: none"> • Negative impacts of centralization: • Maternity services are a component of the socio-economic capital of small rural communities, and are often central to their primary health infrastructure as well as an entry point to further perinatal care. • There are financial costs for women and their families to travel great distances to access care. • Women forced to travel to deliver risk giving birth in their car prior to arrival at the hospital. In 2009, there were 1766 babies classified as “born before arrival”, versus 863 homebirths. • For women who choose not to relocate, there is risk associated with having an unaccomplished birth at home. • Transferring to larger hospitals to await labour is associated with emotional cost and isolation. For Aboriginal and Torres Strait Islander women especially, it is culturally inappropriate to relocate as their health is linked to birthing on their land and surrounded by family. • There is debate over the maximum distance

					PMUs can safely operate from their tertiary counterparts with specialist support.
Mooney SE, Ogrinc G, Steadman W: Improving emergency caesarean delivery response times at a rural community hospital. <i>Qual Saf Heal Care</i> 2007, 16(1) :60–6.	A rural hospital in Lebanon, New Hampshire, USA	<ul style="list-style-type: none"> • How has the Improvement Project impacted the cesarean delivery response times in one rural hospital? • How have birth outcomes been affected by the Improvement Project? 	<ul style="list-style-type: none"> • National organizations suggest that obstetric services should be able to initiate a cesarean section within 30 minutes of making the decision to operate • The Alice Peck Day Memorial Hospital recognized that it could not meet the suggested 30 minutes from decision to incision guideline, thus initiated an improvement project with the goal of decreasing the decision-to-incision time 	Hospital-based prospective cohort study	<ul style="list-style-type: none"> • A small rural hospital can meet the suggested guideline of 30 minutes for decision-to-incision time for cesarean section delivery • The mean decision-to-incision time dropped from 31 minutes to 20 minutes • There was no change in overall cesarean delivery rates or other birth outcomes
Moster D, Lie RT, Markestad T: Relation between size of delivery unit and neonatal death in low risk deliveries: population based study. <i>Arch Dis Child Fetal Neonatal Ed</i> 1999, 80(3) :221–5.	Norway	<ul style="list-style-type: none"> • Is the size of a hospital delivery unit associated with neonatal mortality for low risk pregnancies? 	<ul style="list-style-type: none"> • There is no consensus on the optimal conditions for low risk pregnancies • As there are no antenatal screening procedures that can ensure an uncomplicated delivery, it can be argued that a well-equipped hospital is the safest place for all deliveries • Alternatively, low-risk deliveries may be at increased risk for medical attention when they may benefit from limited intervention 	Retrospective population-based cohort study	<ul style="list-style-type: none"> • The risk of neonatal death increased as the number of deliveries at an institution decreased to less than 2000/year • The risk of neonatal death was double in hospitals with less than 100 deliveries/year compared to hospitals with more than 3000 • However, the neonatal mortality rate for low risk pregnancies is extremely low irrespective of birth place
National Health Service Scotland: <i>Implementing a Framework for Maternity Services in Scotland.</i> http://www.scotland.gov.uk/Resource/Doc/47021/0013919.pdf	Scotland	<ul style="list-style-type: none"> • How should NHS resources, including workforce, be deployed to achieve the best balance between: a) ensuring choice for women on where, how and by whom their maternity care is provided b) reducing risk to mother and baby c) ensuring high quality services that offer value for money? 	<ul style="list-style-type: none"> • Scotland has a declining birth rate and a higher maternal age, meaning less pregnancies overall, and a greater proportion of complex ones • Much greater use of elective/emergency c/s since the 1970's (c/s rate 19.7% in 1999) • 35% of babies born in 4 major hospitals (Glasgow, Edinburgh, Aberdeen) and the rest are born in small regional hospitals, or Community Maternity Units (CMUs), especially in rural and remote. • Pressure on maternity system comes from: increasing specialization, restrictions on working time, demands to meet clinical competence • As such, current system is no longer sustainable 	Report	<ul style="list-style-type: none"> • Regional approach: Regional Service Planning Groups (RSPGs) from existing NHS boards should plan and provide local access to appropriate levels of maternity services including: care as close to home for the woman as possible, continuity of care, balance between women's choice and risk, one-to-one care (by a midwife) when in labour, multidisciplinary approach to care. RSPGs should involve stakeholders in planning. Led by Regional Maternity Service Coordinators who meet with each other regularly nationwide. • Networks of maternity services should be established locally, regionally and nationally for innovation and practice development, research agendas, networking of professionals from different service levels and work that meets the needs of their population. Network at each level will

				<p>provide: professional advice, vehicles for communication, specialist outreach and criteria for transfer, escalation of service level, specialist referral</p> <ul style="list-style-type: none"> • Risk management strategies: emphasis on training practitioners in CMUs in rural, and developing risk management protocols for midwife-led services for homebirth and CMUs • “In exceptional circumstances, remote and rural island hospitals may offer caesarean section if appropriate facilities and trained personnel are available” • Mid-wife managed care ensures good outcomes for low-risk pregnancies: planned homebirth is identified as its own level of service: “Ia” • Levels of service include Ia-d (Midwife or GP at home, at CMU, at CMU adjacent to hospital), IIa-c (OB led with varying facilities on site) and III (OB – Maternal Fetal medicine specialist) • Rural and remote competency training: collaborate with larger units , provide rural staff opportunity to take placements in larger units to update skills or use video-conferencing. Professionals should have a different range of skills. Maternity courses for midwives, OBs GPs, paramedics and other health professionals who work in rural and remote. • NHS Boards and Trust and Education for Scotland should establish national, post-registration multidisciplinary curriculum for maternity services reflecting the required competencies for each type of service delivery • GPs: particularly important for rural and remote intrapartum care. New contract will designate maternity care as “additional” or “enhanced” service. • Involve stakeholders: commissioners, providers, users of service, in the planning, delivery and evaluation of maternity services
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<p>Nesbitt, TS, Connell, FA, Hart, FA, and Rosenblatt, RA: Access to Obstetric Care in Rural Areas: Effect on Birth Outcomes <i>American Journal of Public Health</i> 1999, 80(7):814–18.</p>	Rural area of Washington State	<ul style="list-style-type: none"> • How do birth outcomes compare for women residing in low-outflow communities (where >2/3 of deliveries occurred in the local hospital) and women residing in high-outflow communities (where <1/3 of deliveries occurred in the local hospital?) 	<ul style="list-style-type: none"> • A decline in the number of physicians offering routine obstetrical care in US • In rural areas, the number of physicians offering routine obstetrical care drop by 23% to 43% since 1980 • The proportion of rural physicians who offered obstetrical care is higher than national average (43% vs. 29%) • This decline was largely due to the cost of liability insurance and the feat of law suits • Women from areas with limited obstetrical service had to travel long distance to obtain basic prenatal care and delivery 	Hospital-based retrospective cohort study	<ul style="list-style-type: none"> • Women living in rural Washington state communities with little or obstetrical care availability locally tend to deliver in hospitals outside the community. These women are more likely to have complicated labor and premature deliveries, and their infants are more likely to have longer and more expensive hospital stays than the children of their rural counterparts who deliver in local facilities communities with greater access to care. • The authors suggested that the long travel distance to hospitals with obstetrical services may be a barrier associated with poorer prenatal compliance, particularly for low income women or women without adequate transportation. • Birth associated complications in high-outflow communities may be due to delays in presentation to the hospital after the onset of labor and increased physiological and psychological stress associated with traveling long distance to unfamiliar settings.
<p>Nesbitt, TS, Larson, EH, Rosenblatt, RA, and Hart, LG: Access to Maternity Care in Rural Washington: Its Effect on Neonatal Outcomes and Resource Use. <i>American journal of public health</i> 1997 87(1):85–90.</p>	Washington State	<ul style="list-style-type: none"> • How do rates of neonatal death, low birth weight and premature birth vary by women residing in low-outflow communities versus high-outflow communities? 	<ul style="list-style-type: none"> • There had been a 20% decrease in the number of rural obstetric providers in the United States between 1984 and 1989. This had resulted in a decrease in local availability of maternity service in rural areas. • In rural communities where there was limited obstetrical service, women often had to travel long distance to near-by hospitals for basic prenatal care 	Hospital-based retrospective cohort study	<ul style="list-style-type: none"> • No difference in the number of neonatal death, low birth weight or prematurity between high-outflow and low-outflow communities • The results of the study suggested that women with poor local access to obstetric service are less likely to bear a normal neonate, as measured by DRG codes. • Local providers of obstetric services in rural area serve as the entry point to the regionalized system of perinatal care. Without access to local obstetric service, patients with complications may experience delays in access to the neonatal intensive care services, thus impacting the neonatal outcomes. The physical and psychological stress triggered by long distance travel may

<p>Norris TE, Reese JW, Pirani MJ, Rosenblatt RA: Are rural family physicians comfortable performing cesarean sections? <i>J Fam Pract</i> 1996, 43(5):455–60</p>	<p>Washington State, USA</p>	<ul style="list-style-type: none"> Who performs Cesarean section in small rural hospitals and how comfortable are non-obstetricians with performing Cesarean sections? 	<ul style="list-style-type: none"> Economic fragility of rural health systems, closure of many rural hospitals, persistent shortages of providers in some rural areas, and a decline in the proportion of general practitioners offering obstetric care have contributed to the disappearance of obstetric services in some rural communities of the United States. Washington State has a large number of small rural towns that are relatively isolated from larger urban areas. Hospitals providing routine obstetric services are normally required to maintain staff capable of performing cesarean sections. Because smaller rural hospitals may have no obstetricians on staff, the responsibility to perform cesarean sections often falls on family physicians. Although previous studies have demonstrated the comparable quality of care offered by GP obstetricians, it is unclear which physicians actually perform the cesarean sections or how comfortable they are doing so. 	<p>Cross-sectional survey and questionnaire</p>	<p>also interfere with the normal birth process.</p> <ul style="list-style-type: none"> When the chief obstetric nurses were asked to assess the quality of obstetric care in their hospitals, they tended to award relatively high ratings to their hospitals (4 on a scale of 1 to 5), which was fairly consistent across the four quartiles of hospital obstetric volumes. This study suggests that the number of cesarean sections performed during formal obstetrical training in residency may be critical in ensuring that rural family physicians are comfortable providing this service, even with low case volumes.
<p>Norum J, Heyd A, Hjelseth B, Svee T, Murer FA, Erlandsen R, et al: Quality of obstetric care in the sparsely populated sub-arctic area of Norway 2009-2011. <i>BMC Pregnancy Childbirth</i> 2013, 13:175</p>	<p>Norway</p>	<ul style="list-style-type: none"> How do birth outcomes in northern Norway (decentralized care) compare to all of Norway? 	<ul style="list-style-type: none"> Northern Norway has a decentralized model of maternity care with midwives providing care for lowest risk women Intermediate risk women deliver in local hospitals and women with high risk deliver in regional hospitals There are no obstetricians in the midwife administered maternity units, however there is a general practitioner on duty in the community The Ministry of Health and Care Services recently launched a plan to improve maternity services which would involve centralizing care 	<p>Population-based retrospective cohort study</p>	<ul style="list-style-type: none"> Women in Northern Norway received a similar quality of care as Norwegians in general There were significantly more low birth weight newborns in Northern Norway
<p>Northern Neonatal Network, Northern Regional Health Authority. (1993).</p>	<p>Northern region of England</p>	<ul style="list-style-type: none"> How many cots are needed to accommodate a specified caseload 	<ul style="list-style-type: none"> The population of the Northern region (3 million people) is distributed in small widely scattered communities. Partially decentralized model: all 	<p>Prospective survey</p>	<ul style="list-style-type: none"> The level of provision of special care costs (excluding those used for high dependency care) is relatively generous in this region. Overall provision varies from 3.4 per 1000

Requirements for neonatal cots. Archives of Disease in Childhood 68: 544-549.		<p>of neonatal care?</p> <ul style="list-style-type: none"> • What are the consequences of centralized or decentralized patterns of provision of neonatal cots? 	<p>specialist obstetric units in the Northern region (dealing with at least 1000 births per year) should be able to provide high dependency care for short periods, and to deal with transient problems. The care of infants requiring longer term high dependency support should be concentrated in the larger centres, operating on a flexible and collaborative basis. At the time of study, there were 19 specialist obstetric units, of which five constituted referral centres. Note: specialized surgical and cardiological care for neonates is provided at hospitals that do not contain obstetric units</p>		<p>in one of the larger referral units to 7.9 per 1000 in one of the smallest units. As a consequence, “spare capacity” in many neonatal nurseries may lead to a number of infants being accommodated in special care nurseries, without in fact receiving special care.</p> <ul style="list-style-type: none"> • The region’s own internal audit found that, for districts without facilities for prolonged high dependency neonatal care, the transfer system affords clinical outcomes no different from those experienced in the referral districts. Data from the Regional Perinatal Mortality Survey showed that properly conducted interhospital transfer immediately before or after birth does not expose the baby to any increased risk of death or disability.
New South Wales Ministry of Health: <i>Rural Surgical Futures 2011-2021</i> [Internet]. 2012.	New South Wales, Australia	<ul style="list-style-type: none"> • Objective: To guide the development of public sector surgery in rural NSW for the next 5-10 years. 	<ul style="list-style-type: none"> • Current infrastructure/referral patterns are no longer sustainable due to economic/demographic/social changes in NSW 	Report: Consultations and site visits	<ul style="list-style-type: none"> • The report recommends: • creating a Rural Surgical Networks Model • engaging stakeholders in Clinical Service Planning • promoting a Rural Workforce through more training • improving rural infrastructure to adopt contemporary surgical procedures
Odibo IN, Wendel PJ, Magann EF: Telemedicine in obstetrics. <i>Clin Obstet Gynecol</i> 2013, 56(3): 422–33.	NA	<ul style="list-style-type: none"> • What are the trends and applications of telemedicine as it pertains to obstetric care? 	<ul style="list-style-type: none"> • Telemedicine has proven to be an effective method of supporting postpartum mothers. • Setting up a high-quality telemedicine network is expensive and barriers include: licensing and credentialing rules, reimbursement policies, data security and confidentiality of patient information, legal issues, and malpractice liability. • In 2007, according to the CDC there were 12.7 maternal deaths per 100,000 live births, 12.7% of live births were preterm and only 70.5% of pregnancy females received early and adequate prenatal care. • Research topic issues include: technical feasibility, quality control, and diagnostic accuracy 	Literature review	<ul style="list-style-type: none"> • Decentralization in the form of telemedicine is a viable form of medicine. • Additional uses of mobile phones could be used for monitoring where rural outcome tracking is necessary. • Important questions for more evaluation: feasibility of a remote sonographer to acquire good volumes, the feasibility of transferring these volumes, and the adequate remote interpretation of this data. • Further applications should be investigated for the identification of rhythm irregularities in the fetus, monitoring of uterine contractions and prediction of preterm labor. • There is limited evidence for certain applications in obstetrics that it provides comparable health outcomes when compared with traditional methods of health care delivery.

			<ul style="list-style-type: none"> • Teleechocardiography: The availability of qualified operators at the referring site and a pediatric cardiologist at a tertiary center is a limitation. 		<ul style="list-style-type: none"> • Obstetrical telemedicine may have an important role to play in ensuring equitable distribution of health care to all women.
Office of Rural Health and Primary Care-Minnesota Dept of Health. <i>Rural Health Advisory Committee Report on Obstetric Services in Rural Minnesota</i> . 2013. http://www.health.state.mn.us/divs/orhpc/rhac/obrpt.pdf	Minnesota	<ul style="list-style-type: none"> • What are some recommendations to address equal access to maternity services across the state of Minnesota? 	<ul style="list-style-type: none"> • Rural Health Advisory Committee comprised of: Physicians, nurses, nursing home rep, ambulance services rep, academics, community health workers, doula rep, House of Representatives member, Senators, “consumers” = community members 	Report	<ul style="list-style-type: none"> • Encourage collaboration between rural obstetric providers and public health nurses to maximize use of local resources, especially for new parents (women should be able to easily access a range of support from prenatal care to breastfeeding) • Educate rural providers and hospital staff about ways to better serve American Indian women (in particular the importance of birthing traditions, the role of tribal doulas – should have statewide training on this) • Support a system for medical school admissions that considers rural provider perspectives and a prospective student’s inclination towards a rural obstetrics practice. • Provide more opportunities for rural family physicians to receive training in natural births and c/s (expand GP training in obstetric, rural elective programs and fellowships, ongoing c/s training to rural GPs with refresher courses)
The Ontario Joint Policy and Planning Committee. (2006). <i>The Core Service Role of Small Hospitals in Ontario</i> .	Ontario, Canada (rural)	<ul style="list-style-type: none"> • What are the current services provided by small hospitals? • What are the expectations for the provision of services at small hospitals? • What is the future potential of small hospitals? 	<ul style="list-style-type: none"> • NA 	Summary report	<ul style="list-style-type: none"> • FOR ALL SMALL HOSPITALS(<1500 weighted cases): The following core services should be provided: <ul style="list-style-type: none"> • Emergency services • Medicine program with inpatient medical beds • General Practice/Family Practice • Inpatient allied health services (physio, nutrition, OT, speech path, pharm and tailored needs of specific population) • Diagnostic services • FOR LARGER SMALL HOSPITALS (1500-4000 weighted cases) the following services should be provided: <ul style="list-style-type: none"> • General and day surgery (inpatient and ambulatory) • Obstetrics: <ul style="list-style-type: none"> • currently only 83% of these hospitals

					<ul style="list-style-type: none"> provide obstetrical care • 100% of hospitals that are >1hour drive from other maternity service provide obstetrical care • Some small hospitals that are close can agree to focus obstetrics on one site to increase critical mass and provide appropriate access • Internal medicine • Special Care Units • Accommodate temporarily ventilated patients • Site-specific core services
The Ontario Rural Council. (2009). The TORC Report on Rural Health. In Discussion and Recommended Actions toward an Integrated and Comprehensive Rural Health Strategy.	Rural Ontario	<ul style="list-style-type: none"> • Objective: To inform The Ontario Rural Council (TORC)'s submission to the Ontario Government's Rural and Northern Healthcare Panel 	<ul style="list-style-type: none"> • TORC: a venue for rural engagement in dialogue, collaboration, action and advocacy to shape and influence policy, programs and research development in rural Ontario. Includes not-for-profits, public, private sector representatives from across the province. 	Report	<ul style="list-style-type: none"> • Rural communities can't do everything, nor do we want them to, but they need to provide some of the most beneficial services close to home (maternity, dialysis) • In order to have evidence-based practice, more rural data is needed • Innovations across the province need to be encouraged and shared • Changes to the qualification criteria make it harder to attract physicians to rural communities. • The designation of a certain # of procedures needed for competency seems arbitrary. Rural doctors who do Emergency or Call rotations cannot have the same patient roster as general practitioners who do not have extra commitments beyond their practice.
Pollett W, Harris K: The future of rural surgical care in Canada: a time for action. <i>Can J Surg</i> 2002, 45(2) : 88-89.	Canada (rural and remote)	<ul style="list-style-type: none"> • What is the future of rural surgical care in Canada? 	<ul style="list-style-type: none"> • Impending crisis in surgical care in Canada, most imminently in rural and remote areas where general surgeons are aging/retiring and there is no system to replace them with other broadly trained surgeons who are willing to work in rural conditions 	Report	<ul style="list-style-type: none"> • Recommendations: • Immediately increase the # of training positions for general surgeons • Recruit for rural placements early in the training process such that a physician's training can be tailored to community-specific needs • Recognition of rural/community surgery as a distinct specialty with academic infrastructure from Royal College of Phy & Surg of Canada, University depts and specialist societies to train this group • Role for GPs and other health care

					<p>providers to take on a limited amount of surgical procedures if these providers have appropriate certification from the Royal College or its equivalent</p> <ul style="list-style-type: none"> • Develop regional centres/networks that provide appropriate infrastructure and critical mass of cases to maintain competence • Locum support to address lifestyle issues
<p>Powell J, Dugdale AE: Obstetric outcomes in an aboriginal community: a comparison with the surrounding rural area. <i>Aust J Rural Health</i> 1999, 7(1):13-7.</p>	<p>Cherbourg Aboriginal Community and service area of Kingaroy Base Hospital, Australia</p>	<ul style="list-style-type: none"> • How do perinatal outcomes compare for Aboriginal and non-Aboriginal mothers delivering at Kingaroy hospital? 	<ul style="list-style-type: none"> • There are two competing views regarding the delivery of obstetric services to mothers in Aboriginal communities in Australia: on one hand, a concern over the poorer outcomes for Aboriginal mothers compared with the general Australian population, and on the other, the desire of some Aboriginal mothers to give birth in their own communities through domiciliary obstetrics. • Up to 1990, most mothers at Cherbourg Aboriginal Community had their antenatal care and delivery at the hospital in the community (15 beds, 1 full-time medical officer, registered and enrolled nurses, and a health team). Since then, they began to receive early antenatal care at Cherbourg, and late antenatal care and deliveries at Kingaroy Base Hospital (about 45 km away). 	<p>Hospital-based retrospective cohort study</p>	<ul style="list-style-type: none"> • In spite of antenatal differences, there were no significant increases in the complications of pregnancy between the two groups. • Aboriginal mothers had more abnormal deliveries, but this was biased by the increased number of elective repeat cesarean sections.
<p>Power R: General practitioner obstetric practice in rural and remote Western Australia. <i>Australian and New Zealand journal of obstetrics and gynaecology</i> 1995, 35(3): 241-244.</p>	<p>Western Australia</p>	<ul style="list-style-type: none"> • What rates of obstetric intervention and perinatal outcomes are associated with rural and remote GPs who practice obstetrics? 	<ul style="list-style-type: none"> • 25% of women confined in hospital in Western Australia in 1992 were confined in country/rural hospitals. A further 6% were from rural addresses but delivered in metropolitan hospitals • 90% of 138 obstetric practicing GPs in study were male • Those practicing in Isolated and Remote and Isolated areas (i.e. all solo practice physicians) were all male • For 6 out of 7 health regions, close to 80% of women delivered locally (range 78.4% to 87.7%). In remaining country health region, rate was 48.3%. That region is proximate to Perth 	<p>Cross-sectional survey</p>	<ul style="list-style-type: none"> • 54% (75 of 138) had not performed a c-section in the last year • C-sections represented just 8% of all deliveries done by GPs in the last year. This compares to a Western Australia state-wide c-section rate of 21% in 1993 • Remote and isolated GPs less likely to have performed a c-section than those in regional centres • As well, state-wide analgesia use is at 80.7%, where rural rate was just 66%.

<p>Powers JR, Loxton DJ, O'Mara AT, Chojenta CL, Ebert L: Regardless of where they give birth, women living in non-metropolitan areas are less likely to have an epidural than their metropolitan counterparts. <i>Women and Birth</i> 2013, 26(2):77–81.</p>	<p>Australia</p>	<ul style="list-style-type: none"> • Can rates of obstetric intervention in Australia be explained by women's residence at time of birth? 	<ul style="list-style-type: none"> • Maternity units have been in decline in Australia, especially in non-metropolitan areas, due to shortage of general practitioners, midwives, and obstetricians. • A previous study found that non-metropolitan women had fewer interventions during birth than metropolitan women, especially if giving birth at their local hospital. Regional differences were not explained by differences in pregnancy risk or maternal demographic risk factors. 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • Women residing in metropolitan areas have greater access to obstetric or medical models of care, which can impact birthing intervention rates. • Midwifery-led models of care have been reported to reduce the use of regional analgesia and the rate of episiotomies and instrumental births, with higher maternal satisfaction. The model of care received by rural women may therefore also impact birthing intervention rates. • Women's expectations of birth can also impact birth intervention rates. In areas where choice of interventions such as pain relief are limited, women may not consider pain relief options to be important. Women living in rural areas where epidurals are not the norm for pain relief in labour may be less likely to request or expect such an option. They are also more likely to be satisfied with the options available, reinforcing the existing modes of care and pain relief options.
<p>Prior M, Farmer J, Godden DJ, Taylor J: More than health: the added value of health services in remote Scotland and Australia. <i>Health Place</i> 2010, 16(6):1136–44.</p>	<p>Remote highland region of Scotland and rural South Australia</p>	<ul style="list-style-type: none"> • What is the nature of value-added contributions to the rural health sector? • What is lost to communities that lose in-situ healthcare? 	<ul style="list-style-type: none"> • In addition to the role as health service providers, rural health services are thought to contribute added-value to communities • There is little evidence to support this concept of added-value 	<p>Qualitative case-study</p>	<ul style="list-style-type: none"> • The added value of the rural health sector was categorized into economic, social, and human contributions from both an institutional and human level • These assets may be lost to a community should local health services be removed
<p>Queensland Government: <i>Clinical Services Capability Framework for Public and Licensed Private Health Facilities version 3.1 - Maternity Services Module.</i> 2012. http://www.health.qld.gov.au/cscf/</p>	<p>Queensland, Australia</p>	<ul style="list-style-type: none"> • Objective: To guide health service planning by setting minimum capability criteria by service level. 	<ul style="list-style-type: none"> • Framework established based on evidence, legislative and non-legislative standards/benchmarks/policies and relevant college standards • The framework does not prescribe, but suggests based on local decision the use of Service networks: hub and spoke models – “one site acts as a principal base providing centralized support or activities to satellite sites, which are connected to the principal site” to ensure continuity of care (ex: telehealth, transfer pathways, communication pathways, documentation of 	<p>Framework and module</p>	<ul style="list-style-type: none"> • Women receiving continuous midwifery care are reported to have higher satisfaction and improved birth outcomes (Hatem et al., Enkin et al.)

			transfer/referral) <ul style="list-style-type: none"> Suggested consultation (for transfer vs. treatment) with higher level of service throughout mandate of all service levels 		
Rabinowitz HK, Diamond JJ, Markham FW, Wortman JR: Medical school programs to increase the rural physician supply: a systematic review and projected impact of widespread replication. <i>Acad Med</i> 2008, 83(3) :235–43	United States	<ul style="list-style-type: none"> What are the outcomes of medical school programs that have a goal of increasing the number of rural physicians? What is the projected impact on the supply of rural physicians if every medical program were to adopt this type of approach? 	<ul style="list-style-type: none"> There is a shortage of rural physicians in the United States and it is likely to decline further Several medical programs have attempted to address this concern by increasing the supply and retention of rural physicians, however the overall impact of these programs has not been evaluated Furthermore, these programs have not been widely replicated 	Systematic literature review	<ul style="list-style-type: none"> Six medical school programs were identified that have a goal of increasing the number of rural physicians Of students participating in the rural programs, the percentage who worked in rural communities ranged from 26-92% Using a conservative estimate of 53%, the projected impact on the rural physician shortage if 125 medical school replicated the rural program would be an addition of 1139 rural physicians yearly This is double the number produced if the rural programs were not created
Ravelli a CJ, Jager KJ, de Groot MH, Erwich JJHM, Rijninks van Driel GC, Tromp M, et al: Travel time from home to hospital and adverse perinatal outcomes in women at term in the Netherlands. <i>BJOG</i> 2011, 118(4) :457–65	The Netherlands	<ul style="list-style-type: none"> What is the effect of travel time during labour from home to hospital on perinatal death and adverse outcomes? 	<ul style="list-style-type: none"> Access to maternity care is decreased in rural areas and travel times to hospital may be longer Women in the Netherlands often stay at home until the signs of labour are obvious to the midwife, contrary to other countries where women are admitted to the hospital upon the first signs of labour 	Population-based cohort study	<ul style="list-style-type: none"> A travel time of greater than 20 minutes from home to hospital is associated with statistically significant increased risk of mortality and adverse outcomes This finding should be considered alongside centralization of maternity services
Renwick MY: Caesarean section rates, Australia 1986: variations at state and small area level. <i>Aust N Z J Obstet Gynaecol</i> 1991, 31(4) :299–304	Australia-National Study	<ul style="list-style-type: none"> What is the variation of cesarean section rates at the state and small area level? 	<ul style="list-style-type: none"> There has been a progressive rise in Cesarean births in many Western countries, including Australia, over the last 20 years with considerable controversy over the reasons for the variations that exist, as well as controversy over the indications for cesarean section. 	Population-based cohort study	<ul style="list-style-type: none"> With high rates of c-section in all the capital cities and the differentials between rates for insured and uninsured women, cesarean delivery appears to have been strongly influenced by the availability of resources. The increasing rate of cesarean section and the variations reported here have important implications for health expenditure.
Roberts CL, Algert CS, Peat B, Henderson-Smart D: Differences and trends in obstetric interventions at term among urban and rural women in New South Wales: 1990-1997. <i>Aust New Zeal J Obstet Gynaecol</i> 2001,	New South Wales, Australia	<ul style="list-style-type: none"> Do rates of obstetric intervention differ for indigenous women, rural women, and urban non-indigenous women? 	<ul style="list-style-type: none"> In New South Wales, 24% of women giving birth live in rural areas. These rural mothers are most likely to be teenagers, indigenous, multiparous, public patients, and smokers, but less likely to have pre-existing medical conditions or obstetric complications. Infants born to mothers in remote communities are more likely to be 	Retrospective cohort study	<ul style="list-style-type: none"> Rural and indigenous women had lower rates of obstetric interventions both before birth (e.g induction of labor or planned cesarean section) and at time of birth (e.g. cesarean delivery after labour, instrumental delivery) than urban women. This was especially true for women delivering in their local area. The differences in intervention rates do not

41(1):15–22.			<p>stillborn and have lower Apgar scores, and when born to indigenous mothers as well, be smaller for gestational age.</p> <ul style="list-style-type: none"> Declining rural maternity services, including a shortage of GPs offering obstetric care, obstetricians, and midwives, is likely to affect access to obstetric services and the management of term births for rural women. 		<p>appear to be explained by differing pregnancy risk profile. Increasing remoteness was associated with lower rates of operative birth, even when the analysis was limited to low-risk women;</p> <ul style="list-style-type: none"> Lower intervention rates likely reflect different access to care, but could also reflect cultural attitudes to childbirth or the general model of birth care.
<p>Robinson M, Slaney GM, Jones GI, Robinson JB: GP Proceduralists: “the hidden heart” of rural and regional health in Australia. <i>Rural Remote Health</i> 2010, 10(3):1402.</p>	<p>Bogong region, Australia</p>	<ul style="list-style-type: none"> What is the extent, type, and frequency of procedural medicine in the area? What is the estimated supply and demand for the GP proceduralist workforce in the future? 	<ul style="list-style-type: none"> Small rural towns throughout Australia are dependent on GP’s and GP proceduralists (GP’s who do one or more of obstetrics, anesthetics, and surgery) for procedural and after-hour medical services. In rural Australia, there is a trend towards retirement and an increasingly poor GP: population ratio. Even as medical studies intake increases, the increase unlikely to meet the doctor demand due to changing demographics and community expectations as well as part-time work preferences for doctors and a preference towards a decreased work hours/week. Centralization of services has resulted in many small hospital closings; between 1983 and 2005 in Victoria, 72% of small rural obstetrics units were disbanded. 	<p>Qualitative case study</p>	<ul style="list-style-type: none"> If GPs skills decline because of lowering volume and decreasing complexity, their confidence will decrease potentially leading to adverse outcomes or necessity to travel long distances for patients. Declining services in rural settings shifts the costs to larger hospitals and reduces the availability in rural regions. Health sector has changed both nationally and internationally; however, the need for basic care in rural and remote communities has not. Even if one GP proceduralists leaves a rural, there is a detrimental effect to the rest of the system. The future of procedural practice in the Bogong region depends on numerous factors including: demand, sufficient interest of new doctors, and funding.
<p>Rodney WM, Martinez C, Collins M, Laurence G, Pean C, Stallings J: OB fellowship outcomes 1992-2010: where do they go, who stops delivering, and why? <i>Fam Med</i> 2010, 42(10):712–6</p>	<p>Memphis and Nashville, Tennessee, USA</p>	<ul style="list-style-type: none"> What are the characteristics and the evolution of the careers of graduates from a 1-year post-residency fellowship program whose primary objectives included clinical skills in cesarean section? 	<ul style="list-style-type: none"> For 18 years, the authors maintained contact with all 80 physician completing 1-year fellowships in family medicine obstetrics in Memphis and Nashville. The founding chair of these programs surveyed each physician and maintained a network of contacts to study outcomes such as graduation, service location, hospital privileges, retention, and career changes. 	<p>Cohort study</p>	<ul style="list-style-type: none"> The data demonstrates the weakness of workforce planning without longitudinal follow-up. For recent graduates, retention of obstetrical services appears to be 90%, but for rural fellows completing at least 9 post-fellowship years, the retention is 39%. Overall, the major reason for discontinuation of deliveries over time is failure to obtain written guarantees of hospital commitment, hospital privileges, and OB call coverage.
<p>Roos N, Black C, Wade J, and Decker K: How Many General Surgeons Do You Need</p>	<p>Southern Manitoba, Canada</p>	<ul style="list-style-type: none"> In comparing three models of surgeon allocation, how 	<ul style="list-style-type: none"> The three models of physician resource planning are: The ratio model which uses a population 	<p>Retrospective review of medical charts</p>	<ul style="list-style-type: none"> Authors note that rural south has an average number of elderly, a typical rate of pre-mature (before 74) death, have low socio-

<p>in Rural Areas? Three Approaches to Physician Resource Planning in Southern Manitoba. <i>Canadian Medical Association Journal</i> 1996, 155(4): 395-400.</p>		<p>many general surgeons are needed in rural Manitoba?</p>	<p>to surgeon ratio,</p> <ul style="list-style-type: none"> • The repatriation model which is based on the number of patients currently leaving their community to access surgery, and the number of surgeons that could be supported by the region, and • The population-needs-based model which looks at the age and health structure of the community and the current rate of surgery. 		<p>economic risk, and an above average state of health. Thus, they may be exposed to a higher rate of surgery than is necessary. The obvious implication for health care planning is that the region doesn't need to add general surgeons.</p> <ul style="list-style-type: none"> • Authors further argue that needs-based and repatriation approaches are the most meaningful as they are based in the actual number of surgeries being performed. • Authors argue that overlap in who does procedures makes ideal ratios misleading, as many general surgery procedures are already being done by non-general surgeons. • Authors argue the need for resource planning that examines population characteristics known to be related to the need for care
<p>Rosenthal TC: Outcomes of rural training tracks: A review. <i>J Rural Health</i> 2000, 16(3):213–6</p>	<p>United States-National review</p>	<ul style="list-style-type: none"> • Do rural training tracks prepare graduates for rural practice, produce an adequate number of graduates, and serve rural communities? 	<ul style="list-style-type: none"> • Rural training tracks (RTTs) have developed as a strategy to encourage family medicine resident entrance into rural practice. The theoretical basis for rural training tracks is that the skills, knowledge and values of rural practice can best be nurtured in rural communities. 	<p>Case study</p>	<ul style="list-style-type: none"> • Several studies over the last decade reveal that 76 percent of RTT graduates are practicing in rural America and that graduates describe themselves as prepared for rural practice. Unfortunately, there are too few RTT positions to meet the need of rural communities. It will take adoption of a social mission by the entire educational system to produce more rural primary care physicians.
<p>Rosenthal TC, Ferrara E, Hesler E: Providing birthing services in rural health networks: coping with change in New York State. <i>J Rural Health</i> 1996, 12(2):137–45</p>	<p>New York, USA</p>	<ul style="list-style-type: none"> • Which care models would make prenatal and birthing services accessible in rural communities in New York state? 	<ul style="list-style-type: none"> • Like much of America, many of New York's rural communities are underserved for prenatal and Obstetrical care. In 1990 there were six rural New York counties that had no practicing obstetricians and 17 that had three or fewer. The closure and service curtailment of many rural hospitals has further aggravated this shortage, forcing rural families to seek distant hospital care, often resulting in delayed prenatal care. 	<p>Expert opinion</p>	<ul style="list-style-type: none"> • The development of formal licensed rural networks provides an opportunity for community planning, risk definition, and risk management for health care services. States should consider using the emerging rural networking model to assure the quality of prenatal, birthing, and postpartum services specifically tailored to the unique needs of rural communities.
<p>Rosenthal DR: <i>The achievement and maintenance of emergency medicine standards in rural</i></p>	<p>Rural Australia</p>	<ul style="list-style-type: none"> • What the infrastructure issues that underlie the practice of emergency 	<ul style="list-style-type: none"> • In seeking to minimize liability, Australian hospitals have adopted a risk management approach, including assessment of the competence of medical practitioners, particularly in 	<p>Review article</p>	<ul style="list-style-type: none"> • This mandatory retraining in obstetrics, anesthesia and surgery is meant to improve the safety and quality of maternity care provided by rural general practitioners.

<p>practice. 2001. http://www.hinz.org.nz/journal/2001/06/The-Achievement-and-Maintenance-of-Emergency-Medicine-Standards-in-Rural-Practice/543</p>		<p>medicine in rural areas of Australia?</p>	<p>procedural skills.</p> <ul style="list-style-type: none"> • For approximately 15 years leading up to the year of publication, in order to maintain clinical privileges, rural doctors in South Australia have been required to complete periodic retraining in obstetrics, anesthesia, and surgery. • Shortages of rural nurses and doctors are a major health provision challenge in Australia, as it can be difficult to construct an attractive working environment for health professionals. 		<ul style="list-style-type: none"> • The costs involved in attending retraining programs include transport, accommodation, registration, opportunity costs of being absent from their practice (lost earnings), on top of the costs associated with the practice remaining open (fixed costs, staff costs, and locum costs). These costs must be balanced against the financial benefits of continuing to practice in those disciplines. • In the practice of obstetrics specifically, medical indemnity insurance is a major contributor to costs of practicing. In 1994, it was calculated that a general practitioner in Victoria needed to deliver 13.5 obstetric cases per year before making any financial profit. • The government may therefore need to materially support rural practitioners in their educational efforts to maintain clinical competence. The main way this could be done is by relieving the practitioners' costs and providing locum relief for them during their absences from their practices.
<p>Rourke J, Frank JR: Implementing the CanMEDSTM physician roles in rural specialist education: the Multi-Speciality Community Training Network. <i>Rural Remote Health</i> 2005, 5(4):406</p>	<p>University of Western Ontario-London, Ontario, Canada</p>	<ul style="list-style-type: none"> • How can innovations in medical education and medical training help to prepare physicians for rural settings? 	<ul style="list-style-type: none"> • Advanced training in rural settings to prepare physicians to better serve rural areas has received particular attention around the world. Such initiatives are usually targeted at primary care practitioners. Few initiatives have been designed to enhance specialist training in a rural setting, let alone adapt special competency frameworks such as the CanMEDSTM roles of the Royal College of Physicians and Surgeons of Canada to non-urban medical education. 	<p>Expert Opinion</p>	<ul style="list-style-type: none"> • Competency-based frameworks like CanMEDS are important because they provide a comprehensive tool to organize outcome-based curricula. The CanMEDS roles framework has been very useful in developing educational goals for rural/regional specialty resident rotations as well as forming a constructive basis for resident, preceptor, and program evaluations. Our experiences with this program may provide lessons for others planning training for specialists in rural settings, and those adopting the CanMEDS competency framework.
<p>Royal Australasian College of Surgeons: <i>Training for GP Surgical Proceduralists.</i> 2010. http://www.surgeons.org/media/8524/FES_RS_E_2360_P_Position_Paper_Training_for_GP_Surgical_Proceduralists.pdf</p>	<p>New Zealand and Australia</p>	<ul style="list-style-type: none"> • Objective: Recommendations for the curriculum and training of GP Surgical Proceduralists 	<ul style="list-style-type: none"> • Currently a maldistribution of surgical services between metropolitan and rural areas, divide will only worsen as rural practitioners retire • Traveling several hours to see a referral surgeon poses great risk to the patient, or risks that they will forgo care because of the inconvenience 	<p>Training manual</p>	<ul style="list-style-type: none"> • Where surgical services cannot be provided by a fully trained surgeon, it is in the best interest of the community to have a GP equipped with skills to provide the level of surgical service required • GP surgical proceduralists must be supported by a network that is based on CME/CPD from a fully trained surgeon

			<ul style="list-style-type: none"> • Output of trained Fellows willing to work in rural is not sufficient to provide comprehensive service • Strong trend towards GPs not providing any surgical procedure (even in metropolitan areas) leading to unnecessary referral to specialist 		<ul style="list-style-type: none"> • 1 year general training program – commonly agreed curriculum • Site-specific training provided by supervising fully trained surgeon • General surgeons should see the network of GP proceduralists as an extension of their surgical service, visit these sites regularly to operate with GP • Procedures above and beyond the 1 year curriculum (such as c/s) must be agreed upon and taught by supervising surgeon
Sariego J: Patterns of surgical practice in a small rural hospital. <i>J Am Coll Surg</i> 1999, 189(1):8–10	Newton Regional Hospital, Mississippi, USA	<ul style="list-style-type: none"> • What is the surgical experience of a rural surgeon and how does this correlate to the training of surgical residents? 	<ul style="list-style-type: none"> • Rural areas are typically underserved with respect to surgical and medical specialists • The surgical experience of a rural surgeon is often different than that of a surgeon practicing in an urban centre • There is debate over whether surgical residents are being adequately trained for rural areas 	Case study	<ul style="list-style-type: none"> • The surgical experience (and distribution of patients seen) in rural areas is significantly different from urban areas and different from what is taught in training • There is a need to broaden the experience of surgical residents • Without changes to residency training it will become more difficult to attract and retain surgeons to rural areas
Schauer RW, Schieve D: Performance of medical students in a nontraditional rural clinical program, 1998-99 through 2003-04. <i>Acad Med</i> 2006, 81(7):603–7	University of North Dakota School of Medicine and Health Sciences, USA	<ul style="list-style-type: none"> • How does the knowledge acquisition of students in nontraditional clinical clerkships compare to students in traditional urban hospital-based clerkships? 	<ul style="list-style-type: none"> • Knowledge acquisition was measured by test scores (MCAT, NBME, USMLE). Test scores were measured over a six year period, and compared for third year students in non-traditional (rural) and traditional (urban) clerkships. 	Cohort study	<ul style="list-style-type: none"> • The research found that academic outcomes for participants of non-traditional (rural) clerkships are comparable to outcomes for students in traditional clerkships. Clinical proficiency scores were significantly better among students in remote, rural, longitudinal, integrated learning environments (non-traditional clerkships).
Scherman S, Smith J, Davidson M: The first year of a midwifery-led model of care in Far North Queensland. <i>Med J Aust</i> 2008, 188(2):85–8.	Mareeba (64km southwest of Cairns), Far North Queensland, rural Australia	<ul style="list-style-type: none"> • What birth outcomes were associated with the first year of rural midwifery-led model of care? 	<ul style="list-style-type: none"> • Community had maternity unit in community hospital, with 196 deliveries per year on average from 2000-2004 • 2005 unit closed due to inability to recruit sufficiently skilled personnel • Six weeks later, unit re-opened led by midwives • At that point, Cairns hospital became referral maternity surgical ward 	Hospital-based prospective cohort study	<ul style="list-style-type: none"> • Raises potential of hierarchical care model where primary care is delivered by midwives without surgical training • Of 158 women to deliver at midwife-led unit, 146 (92%) had spontaneous vaginal delivery • Rate of emergency lower segment c-section was 1.2% including intrapartum transfers (n=2) • A further 4.4% (7) elective LSCS (total c-section of 5.6%) • 2004 Queensland State average of all LSCS is 30.7% • Rate of perinatal injury almost half of state

					<p>average: Total injury rate = 27%. State Avg = 55.3%</p> <ul style="list-style-type: none"> • 1.3% episiotomy (state avg=12.4%); 0% 3rd/4th degree (1.1% avg); 8.7% 2nd degree (21.3%); 17.3% 1st degree (20.5%). • Analgesia use also roughly half of state average: 66.7% took none, compared to 36.4% state average • Average apgar scores of delivered babies at midwife led unit were 8 at 1 minute, 9 at 5 minutes. None had a score of less than 7 at 5 minutes. 89% required no resuscitative measures • Concern that some women are presenting at midwifery unity despite high risk categorization and being advised to deliver at the referral hospital in Cairns
Schultz R, Lockey R, Oats JJ: Birth in the Barkly: births to Barkly women in 2010. <i>Rural Remote Health</i> 2013, 13(3):2396	Barkly region, Northern Territory, Australia	<ul style="list-style-type: none"> • What birth outcomes are associated with women from the Barkly region of the Northern Territory who do not have local access to birth services? 	<ul style="list-style-type: none"> • Women and families in the Barkly region do not have the option of birthing in their region • While some clinicians express concern over about the safety of initiating birthing services for low-risk women in Tennant Creek Hospital, community members express concern over having to travel further South for birthing services 	Retrospective cross-sectional study	<ul style="list-style-type: none"> • A policy of routine transfer of women during labour and after the birth exists regardless of the presence of absence of clinical indication • Women in the Barkly region may benefit from local midwifery services similar to the Indigenous midwife-led maternity service in northern Canada
Serenius F, Winbo I, Dahquist G, Källén B: Cause-specific stillbirth and neonatal death in Sweden: a catchment area-based analysis. <i>Acta Paediatr</i> 2001, 90(9):1054–61	Sweden	<ul style="list-style-type: none"> • How do rates of stillbirth and neonatal mortality differ for geographical area of mother's residence grouped by degree of hospital specialization? 	<ul style="list-style-type: none"> • The development of intensive neonatal care has improved the survival rates of very small newborns • Studies have reported an effect of hospital size on the survival of preterm infants • However, it can be argued that the reduced facilities in small hospitals can be compensated for by referral of high risk pregnancies • A catchment based analysis using the mother's area of residence is needed to study this question 	Population-based cohort study	<ul style="list-style-type: none"> • Total mortality was not increased when comparing areas with the lowest level of neonatal care to areas with the highest level of care • There was a difference when the analysis was repeated for cause-specific deaths, specifically death due to obstetric complication (which increased with decreasing level of care of the catchment hospital)
Shively EH, Shively S: Threats to rural surgery. <i>Am J Surg</i> 2005, 190(2):200–5	South Central Kentucky	<ul style="list-style-type: none"> • What are the issues surrounding rural surgery in America? 	<ul style="list-style-type: none"> • There are many health disparities between rural and urban populations • Rural hospitals and primary care physicians are dependent on rural 	Literature review and case study of one	<ul style="list-style-type: none"> • The need for general surgeons in rural America is increasing • A specialty in rural surgery should be created in training programs

			general surgeons for stability	rural hospital in Kentucky	
Simmers D: The few: New Zealand's diminishing number of rural GPs providing maternity services. <i>New Zealand Medical Journal</i> 2006, 119(1241)	New Zealand	<ul style="list-style-type: none"> • Can the New Zealand maternity service afford to lose the services of general practitioner obstetricians? 	<ul style="list-style-type: none"> • There are 54 general practitioner obstetricians providing intrapartum services in New Zealand • The role that the general practitioner obstetricians play in supporting rural maternity services must be recognized • Evidence supports rural women to give birth in their own communities 	Commentary	<ul style="list-style-type: none"> • Planning is underway for a specialist vocational training program for rural hospital doctors • This program should include a maternity skill set • Training in technical skills that have been considered secondary care, as well as the ability to know when to refer care, are needed for rural primary maternity care providers
Smith et al. (2009) 'Ontario Care Providers' Considerations Regarding Models of Maternity Care.' <i>Journal of Obstetrics and Gynaecology Canada.</i> 31(5):401-408	Ontario	<ul style="list-style-type: none"> • What are care providers' opinions regarding seven proposed models of maternity care? • What are the barriers to collaborative interprofessional practice? • What factors encourage the practice of intrapartum care? 	<ul style="list-style-type: none"> • The decline in the number of professionals who provide intrapartum care is declining, creating a crisis in the delivery of maternity care in Canada; projections demonstrate that these numbers will continue to decline in the next coming years. • One of the greatest concerns to sustainability of maternity care is the scarcity of maternity care providers. • Interprofessional collaboration has been presented as a potential solution to the crisis in maternity care. 	Cross-sectional survey	<ul style="list-style-type: none"> • Midwives and obstetricians were most likely to consider uniprofessional models of care than involved little to no interaction with other professional groups. • The multi-professional and interprofessional models of maternity care were the second most likely to be considered by many participants. • There was a stronger interest from midwives and obstetricians in the multiprofessional model whereby professionals would consult if necessary but would not be required to attend team meetings • Interprofessional collaboration was negatively received by midwives because of reasons such as different philosophies of care (60.7%) and resistance to change (56.1%) • Obstetricians cited liability and insurance issues as main barriers (60.3) and differing philosophies of care (46.5)
Sticca RP, Mullin BC, Harris JD, Hosford CC: Surgical specialty procedures in rural surgery practices: Implications for rural surgery training. <i>Am J Surg</i> 2012, 204(6):1007-13	North and South Dakota, USA	<ul style="list-style-type: none"> • Is general surgery training adequate preparation for rural surgery practice? 	<ul style="list-style-type: none"> • Specialty procedures constitute one eighth of rural surgery practice. Currently, general surgeons intending to practice in rural hospitals may not get adequate training for specialty procedures, which they will be expected to perform. Better definition of these procedures will help guide rural surgery training. 	Case study	<ul style="list-style-type: none"> • Data from this study indicate that specialty procedures are an important part of a rural surgeon's practice, helping fulfill the health care needs of their communities. Optimal training for rural surgeons should include experience in the appropriate specialty areas determined by the location and needs of the community but in most cases should include either new or additional experience in endoscopy, obstetrics and gynecology, orthopedics, urology and otolaryngology.

Stratigos S, Nichols A: <i>Procedural Rural Medicine: Strategies towards solutions: A paper prepared for the AHMAC National Rural Health Policy</i> . 2002. http://www.rdaa.com.au/Uploads/Documents/PROCEDURAL%20RURAL%20MEDICINE%20strategies%20towards%20solutions%20FINAL.%202%20pdf_20101012034305.pdf	Rural and remote Australia	<ul style="list-style-type: none"> What are some strategies to increase the procedural medicine workforce in rural areas? 	<ul style="list-style-type: none"> There has been a decline in procedural practice offered by general surgeons This decline causes delays in accessing treatment, possible sub-optimum health outcomes and increased costs to consumers and small rural centres 	Report	<ul style="list-style-type: none"> Six priority areas were identified where urgent action is needed: recruitment; training; indemnity; local facilities and equipment; social and financial issues; and retention and continuing medical education and upskilling. Indemnity issues and social and financial factors are the two most important determinants in the decline of rural procedural practice Inadequate remuneration is often cited as a factor in the withdrawal of practitioners from procedural rural medicine
Swindlehurst HF, Deaville JA, Wynn-Jones J, Mitchenson K: Rural Proofing for Health: A commentary. <i>Rural Remote Heal.</i> 2005, 5(411)	United Kingdom	<ul style="list-style-type: none"> What is the 'rural proofing framework' and how can it benefit rural communities? 	<ul style="list-style-type: none"> Health service policies in the UK have traditionally followed a 'one size fits all' approach This can be problematic for primary care services in rural communities The rural proofing framework will assess the impact that new policies may have in rural areas 	Commentary	<ul style="list-style-type: none"> With the development of new health care policies it is imperative that these policies are 'rurally sensitive' Rural proofing is a systematic methodology to help policy-makers take into account the health needs of the rural population
Tucker J, du V. Florey C, Howie P, McIlwaine G, Hall M: Is antenatal care apportioned according to obstetric risk? The Scottish antenatal care study. <i>J Public Health Med</i> 1994, 16(1):60–70.	Scotland	<ul style="list-style-type: none"> What is the current (1990) provision of antenatal care in Scotland? What are some recommendations for planners about what type of care/frequency of care is appropriate for different risk pregnancies? 	<ul style="list-style-type: none"> (1929) Government made recommendations about number and timing of antenatal visits – this had become traditional pattern These patterns of care have been deemed excessive, especially for low-risk pregnancies, no longer most effective or efficient (1982) Royal College of OBs and GYNs Working Party on antenatal & Intrapartum care recommended shared care b/w OB, GP, midwife, and that midwives should play a greater part in antenatal for normal pregnancies (This study examines if this recommendation was truly implemented) 	Hospital-based retrospective cohort study	<ul style="list-style-type: none"> Recommendations that midwives play the major role in normal birth has not been implemented: 49% of women had no visits attributed to a midwife Authors recommend that antenatal care be shared between GPs and midwives, despite the House of Commons recommendation for the central role of midwives, because there is such a large volume of GPs currently providing antenatal care who are unlikely to relinquish this practice
Thommasen H V, Klein MC, Mackenzie T, Lynch N, Reyes R, Grzybowski S: Obstetric maternal outcomes at Bella Coola General	Bella Coola General Hospital	<ul style="list-style-type: none"> What are the obstetric procedures and maternal outcomes in an isolated rural 	<ul style="list-style-type: none"> Study population was based on women beyond 20 weeks gestation between the March 7 1940 and June 9 2001. C-sections were not routinely performed before 1970 	Cohort study	<ul style="list-style-type: none"> The total rates of C-sections performed rose to 11% in the 1990s. In the 1940s 28% of deliveries involved an episiotomy. This increased to 47% in the 1970s and then decreased to 4% in the

<p>Hospital: 1940 to 2001. <i>Canadian Journal of Rural Medicine</i> 2005, 10(1):13–21.</p>		<p>hospital?</p>	<ul style="list-style-type: none"> • Obstetrical practice in rural Canada is declining, and this makes it difficult to attract new families to rural towns • When maternity care is not available locally and women must travel for that care, negative outcomes are common. 		<p>1990s.</p> <ul style="list-style-type: none"> • The use of forceps first increased, then decreased with the advent of vacuum extraction. The changes in procedure rates seem to reflect best practice guidelines of the times. • Rates of all procedures tended to be lower than those reported elsewhere in Canada and the US. This difference seems to be correlated to a lower technological environment in BCGH. These births with low obstetric procedural rates experienced excellent outcomes.
<p>Thompson MJ, Lyng DC, Larson EH, Tachawachira P, Hart LG: Characterizing the general surgery workforce in rural America. <i>Archives of Surgery</i> 2005, 140(1):74–9</p>	<p>Rural America</p>	<ul style="list-style-type: none"> • What are the numbers, characteristics and distribution of general surgeons practicing in the rural United States? 	<ul style="list-style-type: none"> • General surgeons are a crucial part of the rural medical workforce in the United States • A decline in the numbers of rural general surgeons could profoundly affect access to adequate health care in rural areas 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> • The size of the rural general surgical workforce has remained the same over the past decade • However, the demographic of this group suggests that the numbers will decline • Steps are needed to reverse this trend to preserve rural health care services
<p>Tracy SK, Sullivan E, Dahlen H, Black D, Wang YA, Tracy MB: Does size matter? A population-based study of birth in lower volume maternity hospitals for low risk women. <i>BJOG</i> 2006, 113(1):86–96</p>	<p>Australia</p>	<ul style="list-style-type: none"> • How do birth outcomes for low risk women differ by volume of hospital births per year? 	<ul style="list-style-type: none"> • Small maternity hospitals are closing in Australia and internationally based on the belief that lower-volume hospitals may have a decreased quality of care • For normal-weight babies of women who have an uneventful pregnancy, it is unknown where the safest place to birth is • There is a balance between the need for safety and the preservation of primary level birth facilities 	<p>Population-based cohort study</p>	<ul style="list-style-type: none"> • Lower hospital volume is not associated with adverse birth outcomes for low risk women
<p>Tucker J, Hundley V, Kiger A, Bryers H, Caldwell J, Farmer J, et al: Sustainable maternity services in remote and rural Scotland? A qualitative survey of staff views on required skills, competencies and training. <i>Qual Saf</i></p>	<p>Scotland</p>	<ul style="list-style-type: none"> • What are the staff's views on required skills, competencies, and training? 	<ul style="list-style-type: none"> • Scant evidence about the quality of care in remote and rural acute maternity services • 30% of Scotland's population lives in rural areas 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> • Rural professionals, including midwives in dual and triple duty posts, must maintain a broad range of skills as generalists. • Medical coverage appears increasingly unsustainable due to the current trend towards subspecialization which makes general practice more difficult • Staff in rural hospitals reported sufficient competence and confidence to perform maternity services. The quality of local

<p>Health Care 2005 14(1):34–40.</p>					<p>services is threatened due to the loss of medical cover rather than a lack of staff preparedness.</p> <ul style="list-style-type: none"> • Tele-health technologies were reported as being rarely used, but enthusiasm was shown for the possibility of using it to offset the reduced access to care in rural areas
<p>Tucker, J., McVicar, A., Pitchforth, E., Farmer, J., & Bryers, H. (2010). Maternity care models in a remote and rural network: assessing clinical appropriateness and outcome indicators. Quality and safety in health care, 19(2), 83-89.</p>	<p>Remote and rural maternity units in North of Scotland</p>	<ul style="list-style-type: none"> • How do service levels, clinical appropriateness and birth outcomes compare for 3 rural staffing models of care? 	<ul style="list-style-type: none"> • Scotland was said to be among Europe's most centralized systems of maternity care (Wildeman et al., 2003) • At the same time, concern exists that centralization of obstetric and neonatal services is limiting access of rural and remote women to intrapartum care • Staffing in small hospitals is difficult to sustain • Tiered services, including midwife led intrapartum care for low risk women has been recommended by the National Service Framework in England and Wales, the Framework for Scotland, and the Expert Group on Acute Maternity Services in Scotland 	<p>Population-based retrospective cohort</p>	<ul style="list-style-type: none"> • The findings describe a health care model in which the needs of rural women are the same regardless of what care is available (to be expected) and in which services without surgical support are far less likely to provide local birthing options in a risk management policy environment • The authors call for further research into the lower rate of c-section and higher rate of NNU >48hrs among births from low-service catchments.
<p>Tulloch B, Clifforth S, Miller I: Caseload in rural general surgical practice and implications for training. ANZ J Surg 2001, 71(4):215–7.</p>	<p>Rural Victoria, Australia</p>	<ul style="list-style-type: none"> • What was the spectrum of surgery encountered by 3 rural general surgeons? • How can this inform general surgical training? 	<ul style="list-style-type: none"> • Increased specialization in surgeons has occurred over the last 50 years. • In rural areas, truly general surgeons continue to practice as a necessity. Their caseloads are defined not only by their training, but by the availability of other, specialist surgeons in their region. • For example, all surgeons did just over 2,500 surgeries in the 5 year period. However, where one surgeon performed 96 gynaecological or obstetrical procedures, a second performed just 32 because of a visiting specialist during part of the review period, and the third performed zero as a result of having a specialist serving the same catchment. • Rural Surgical Training Programme created in 1998 by Royal Australian College of Surgeons, allowing registrants to rotate through specialty 	<p>Retrospective review of 3 rural surgeons' case-loads</p>	<ul style="list-style-type: none"> • Case mix shows that even the Training Programme/Fellowship may not be enough preparation for the variety and complexity of the procedures done by rural GPs. Surgeons must strive to gain training in the areas most needed in their specific communities.

			<p>posts in preparation for a career in rural general surgery.</p> <ul style="list-style-type: none"> • Programme tries to match skills with the needs of the community the surgeon will serve • For established rural surgeons, rotations through specialty units also available as upgrading, and the RACS Ramsay Fellowship provides funding 		
<p>Urbach DR, Croxford R, MacCallum NL, Stukel T: How are volume-outcome associations related to models of health care funding and delivery? A comparison of the United States and Canada. <i>World J Surg</i> 2005, 29(10):1230–3</p>	<p>The United States and Canada</p>	<ul style="list-style-type: none"> • How are volume-outcome associations related to models of health care funding and delivery? 	<ul style="list-style-type: none"> • Many studies have found that surgical outcomes are better when done by hospitals or providers who do them more frequently—which has led to the regionalization of certain procedures • Some studies suggest that the volume-outcome associations are artifacts of underlying variation in hospital outcomes • Little research has been conducted to examine how health care delivery and financing affect procedure volumes, outcomes and volume-outcome associations 	<p>Systematic literature review</p>	<ul style="list-style-type: none"> • Canadian analyses were substantially less likely to find a statistically significant volume-outcome association than US studies
<p>VanBibber M, Zuckerman RS, Finlayson SRG: Rural versus urban inpatient case-mix differences in the US. <i>Journal of the American College of Surgeons</i> 2006, 203(6): 812–6.</p>	<p>United States</p>	<ul style="list-style-type: none"> • What is the specific difference between surgical practice in rural vs. urban settings? 	<ul style="list-style-type: none"> • Rural and Urban surgical practices are anecdotally known to be very different, but quantifiable evidence of the difference is lacking • Rural surgeons tend to indicate a stronger desire for additional training. This has led to the suggestion that rural and urban surgical practice should have separate residency training tracks 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> • Distribution of the frequencies of certain surgeries varies between rural and urban hospitals. • General surgery accounted for a far greater proportion of inpatient cases in rural hospitals. Specialized procedures (neurosurgical, cardiothoracic, vascular) accounted for a much smaller proportion in rural hospitals than in urban centers. • Bowel, appendix, and gallbladder operations constitute 61% of procedures in rural hospitals, compared to 46% in urban hospitals. Rural practices have fewer operations on the stomach, esophagus, liver, and pancreas • Rural general surgeons must be more broadly trained
<p>Viisainen K, Gissler M, Hartikainen A L, Hemminki E: Accidental out-of-hospital births in</p>	<p>Finland</p>	<ul style="list-style-type: none"> • Are hospitals with different levels of maternity care equally safe places 	<ul style="list-style-type: none"> • The question of safety of small primary maternity hospitals has provoked the closing of many small maternity hospitals • The benefits of tertiary care for low- 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> • In a regionalized system of care with proper referral systems in place, small local hospitals are as safe for childbirth as tertiary care hospitals

<p>Finland: incidence and geographical distribution 1963-1995. <i>Acta Obstet Gynecol Scand</i> 1999, 78(5):372-8</p>		<p>to give birth in a regionalized system of care?</p>	<p>birth weight babies has been shown, however for normal birth weight babies studies have indicated that outcomes at small primary centres are the same, if not better, than tertiary centres</p>		
<p>Viisainen K, Gissler M, Hemminki E: Birth outcomes by level of obstetric care in Finland: a catchment area based analysis. <i>J Epidemiol Community Health</i> 1994 48(4):400-5</p>	<p>Finland</p>	<ul style="list-style-type: none"> • What is the incidence and geographical distribution of accidental out-of-hospital births in Finland? • How do perinatal outcomes from accidental births compare to hospital births? 	<ul style="list-style-type: none"> • Many small rural maternity units have closed as a consequence of centralization of maternity services • Centralization results in an increase in travel time and therefore an increased risk of birth in transit or accidental home birth 	<p>Retrospective cohort study</p>	<ul style="list-style-type: none"> • The birthweight adjusted risk of perinatal death was significantly higher in accidental births than in hospital births (OR 3.11, CI 1.42-6.84) • There was an increase in accidental births in the 1990s that correlates with the closing of small hospitals • Centralization policies in sparsely populated areas should include measures to prevent accidental out-of-hospital births
<p>Wadland WC, Havron AF, Garr D, Schneeweiss R, Smith M: National survey on hospital-based privileges in family practice obstetrics. <i>Archives of family medicine</i> 1994, 3(9): 793-800.</p>	<p>United States</p>	<ul style="list-style-type: none"> • What are the regional variations of hospital-based privileges among members of the AAFP? 	<ul style="list-style-type: none"> • Maternal and neonatal health indicators are worsening in the US despite spending more money per capita on maternal and neonatal care than any other developed country • The US ranks 16th in the world in infant mortality, most likely due to poor accessibility to primary prenatal care • Family physicians who continue to offer obstetrical care usually provide full prenatal and intrapartum care. Family physicians who stop caring for pregnant women tend to give up all obstetrical care and never resume • Due to the large-scale withdrawal of family physicians from maternity care, it is important to know what hospital-based privileges FPs can obtain 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> • Obstetrical care by family physicians is one possible solution to the growing inadequacy of maternal and neonatal care • Rural physicians were significantly more able to perform the three most restrictive procedures: vaginal delivery with forceps, c-section, and amniocentesis • Most physicians (>95%) were satisfied with their level of privilege • A considerable number of obstetrical privileges are granted to family physicians, but there is no uniformity in privilege due to regional variation. • Teaching hospitals reportedly restrict obstetrical care by family physicians more than other hospitals • In larger hospitals where specialists are available, privileges in obstetrics for family physicians are more limited
<p>Wakerman J, Humphreys JS, Wells R, Kuipers P, Entwistle P, Jones J: Primary health care delivery models in rural and remote Australia: a systematic</p>	<p>Australia</p>	<ul style="list-style-type: none"> • What is the overall effectiveness of innovative models and comprehensive 	<ul style="list-style-type: none"> • One third of all Australians live outside of its major cities • Health outcomes and access to health services are poorer in rural settings than urban centers • Although there have been initiatives 	<p>Systematic Review</p>	<ul style="list-style-type: none"> • Five broad groupings: discrete services, integrated services, comprehensive PHC, outreach models and virtual outreach models. • Different model types assume prominence with increasing remoteness and

<p>review. <i>BMC Health Serv Res</i> 2008, 8(1):276.</p>		<p>primary health care in rural/remote Australia?</p>	<p>to improve rural health services, inadequate evaluation of the initiatives has resulted in a lack of knowledge on which to establish evidence-based service models</p>		<p>decreasing population density</p> <ul style="list-style-type: none"> •The various PHC models proved to be successful in providing sustainable solutions for providing care in rural and remote areas
<p>Watts RW, Marley JE, Beilby JJ, MacKinnon RP, Doughty S: Training, skills and approach to high-risk obstetrics in rural GP obstetricians. <i>Aust New Zeal J Obstet Gynaecol</i> 1997, 37(4):424–6.</p>	<p>Rural GP obstetrics practice in the Southern part of Australia</p>	<ul style="list-style-type: none"> • What is the comfort level of rural GPs in providing obstetric services? 	<ul style="list-style-type: none"> • Number of GPs offering obstetric services is declining • Most rural obstetrics services are performed by GPs, and so declining availability is threatening access to low-risk obstetric care close to home • Most GPs doing obstetrics are very experienced, well trained, and perform surgical procedures and manage complications as well as doing low-risk obstetrics 	<p>Cross-sectional questionnaire</p>	<ul style="list-style-type: none"> • Comfort was correlated significantly with length of obstetric training and number of deliveries per year. • The authors report that those with >12 months training were more confident, and those who delivered <10 deliveries were “significantly less comfortable.”[Those seem to be their inductively derived cut-offs for where the scale tips, but other levels are not discussed, and the authors don’t explain how their p values are calculated] • Number of years experience had no correlation with comfort • GPs are practicing a wide variety of obstetric procedures and feel comfortable doing so. • Authors found that 10 deliveries a year seemed to be indicative of comfort and advise that number as the threshold for practice quality. • Authors also found that GPs were increasingly leaving obstetric practice, and encourage policy that will address their concerns as a means of maintaining essential service to rural women.
<p>Welch R, Power R: General practitioner obstetric practice in rural and remote Western Australia. <i>Aust New Zeal J Obstet Gynaecol</i> 1995, 35(3):241–4.</p>	<p>Western Australia</p>	<ul style="list-style-type: none"> • How can we describe the practice of obstetrics by General Practitioners in rural and remote areas of Western Australia? 	<ul style="list-style-type: none"> • One-quarter of women confined in Western Australia hospitals during 1992 were confined in country hospitals. Rural and remote general practitioners are responsible for providing obstetric services to the majority of women living in non-metropolitan communities. It has been argued that obstetric practice in rural and remote areas is just as safe as in the city. 	<p>Cross-sectional study</p>	<ul style="list-style-type: none"> • Of all GPs currently practicing obstetrics in rural and remote areas, 90% were male. GPs in rural and remote areas reported an average of 28 deliveries per year, and had lower rates of performing Caesarean section, using forceps and ventouse compared to Western Australia as a whole. Reasons for GPs decision to cease practice of obstetrics include fear of litigation and increasing medical insurance premiums.

<p>Williams TE, Ellison EC: Population analysis predicts a future critical shortage of general surgeons. <i>Surgery</i> 2008, 144(4):548–54.</p>	<p>United States</p>	<ul style="list-style-type: none"> • Will there be a future shortage of general surgeons? 	<ul style="list-style-type: none"> • Care models remain constant, while the population size is increasing • There was no increase in medical school enrollments between 1980 and 2005 • Funding of all postgraduate positions including general surgery was capped at 1996 levels 	<p>Ideas, opinions</p>	<ul style="list-style-type: none"> • There will be a potential shortage of 1300 general surgeons by 2010, 1875 by 2020, and 6000 by 2050 • Shortfall is predicted based on a linear projection which compares surgeon/population ratios in each decade • This model is static and assumes that demand for surgical treatment (per capita) will remain constant over time. It does not account for mitigating factors such as increased technological intervention or disease prevention. • Potential solutions to the predicted shortfall of surgeons include an increase of funding, increasing scholarships for medical schools, increasing residents' wages
<p>Williams Jr. TE, Satiani B, Ellison EC: A comparison of future recruitment needs in urban and rural hospitals: The rural imperative. <i>Surgery</i> 2011; 150(4):617–25</p>	<p>United States</p>	<ul style="list-style-type: none"> • What are the recruitment requirements of rural and urban hospitals to ensure adequate access to surgical care for the US population by 2030? • What are the challenges to recruitment? 	<ul style="list-style-type: none"> • It is estimated that the USA will have a surgeon shortfall of 30,000 by the year 2030 • Rural populations have been disproportionately affected by the decline in surgeon to population ratio 	<p>Expert opinion piece</p>	<ul style="list-style-type: none"> • Using a population ratio of 7.5 General surgeons per 100,000, est. GS required in 2030 will be 27,300. These ratio estimates are repeated for Ortho and OBGYN, but not listed <ul style="list-style-type: none"> ○ Authors estimate a Rural Need of 13,953 surgeons in those three areas between 2011 and 2030 ○ That is 698 hires per year across 1,998 rural hospitals ○ Over the total period, the authors estimate that each rural hospital will have to recruit 7 total surgeons (3.4 OBGYN, 1.6 ortho, and 2 GS). That is roughly 1 recruited surgeon every three years to keep up with population growth and erase the surgeon deficit over that time • Existing maldistribution is obvious: using population ratio analysis, 18% of surgeons should be in rural areas. Currently, 16.4% of GS are rural and just 10.7% of OB-GYN surgeons are rural
<p>Williams TE, Ellison EC: Population analysis predicts a future critical shortage of general surgeons. <i>Surgery</i></p>	<p>The United States</p>	<ul style="list-style-type: none"> • What is the projected shortage of general surgeons in the United States by 2010, 2020 	<ul style="list-style-type: none"> • There is a general understanding that there will be a shortage of physicians by 2020 • There was no increase in the number of medical school enrollments between 	<p>Expert opinion piece</p>	<ul style="list-style-type: none"> • There will be an insufficient number of surgeons to care for the American population if the number of surgical trainees does not increase and the care model remains constant

2008, 144(4):548–54		and 2050?	1980 and 2005. <ul style="list-style-type: none"> The United States has experienced population growth without a proportionate increase in the number of surgeons 		<ul style="list-style-type: none"> There will be a predicted shortage of surgeons by 1300 in 2010, 1875 by 2020, and 6000 by 2050
Woollard LA, Hays RB: Rural obstetrics in NSW. <i>Aust N Z J Obstet Gynaecol</i> 1993, 33(3):240–2.	New South Wales, Australia	<ul style="list-style-type: none"> How does the quality of intrapartum care in rural hospitals compare to non-rural standards? 	<ul style="list-style-type: none"> Rural GPs are responsible for providing obstetric services to the majority of rural women 	Cross-sectional survey and retrospective cohort study	<ul style="list-style-type: none"> Authors note that because of referral patterns of high-risk patients, rural delivery outcomes cannot be said to be better than metropolitan Still, the overall health and safety are considered “good” by the authors In light of so many current GPs being interested in training future GP obstetricians, authors suggest that more training should take place in rural units.
Worley P: Flinders University School of Medicine, Northern Territory, Australia: Achieving Educational Excellence along with a Sustainable Rural Medical Workforce. <i>MEDICC Rev</i> 2008;10(4):30–4. imperative. <i>Surgery</i> 2011; 150(4):617–25.	Australia	<ul style="list-style-type: none"> Will there be a future shortage of general surgeons 	<ul style="list-style-type: none"> Medical schools are struggling to educate doctors who are willing and able to practice in rural/remote settings Significant disparity in health outcomes between people living in rural and urban settings 33% of Australia’s population lives outside of metropolitan centers, and only 20% of doctors practice in those areas The Flinders Parallel Rural Community Curriculum (PRCC) was introduced in 1997 The PRCC is a longitudinal integrated curriculum which challenges the dogma that clinical medicine is best learned in a series of rotations One entire year of the PRCC is spent in a rural setting 	Case report	<ul style="list-style-type: none"> PRCC students improved their academic performance compared to tertiary trained peers 70% of PRCC students have chosen to practice in rural locations, compared to 18% of tertiary-trained students. The program has proven to be sustainable in its 12-year history The PRCC has proven to be a viable tool in addressing the maldistribution
Zelev B, Orrantia E, Poole H, Strike J. Home or away? Factors affecting where women choose to give birth. <i>Can Fam Physician</i> 2007, 53(1):78–9.	Marathon, Ontario. A community of 4,500 with low risk obstetric services and no c-section capability.	<ul style="list-style-type: none"> What is the role of patient beliefs in their decision to birth in their home community? 	<ul style="list-style-type: none"> Most respondents aware of the limitations to maternity services in home community No surgical capability, no midwives, no epidural, no neonatal intensive care 	Cross-sectional survey	<ul style="list-style-type: none"> Input / control of decision making in own experience part of distrust for centralized maternal care. Patient preference an important part of changing clinical pathways. Preference for in-community care implies a possible need for improved service delivery in Marathon, though this isn’t discussed by

	The closest referral centre is 300kms away.				the authors
Zuckerman R, Doty B, Gold M, Bordley J, Dietz P, Jenkins P, et al: General surgery programs in small rural New York State hospitals: a pilot survey of hospital administrators. <i>J Rural Health</i> 2006, 22(4) :339–42.	Rural hospitals in New York State	<ul style="list-style-type: none"> • What are the perceptions of hospital administrators with respect to the current state of general surgery programs? And with respect to the impact of surgical services on hospital financial viability? 	<ul style="list-style-type: none"> • Hospitals have a central role in the economy of rural communities • Surgical services account for a large portion of revenue for small hospitals • The financial viability of small hospitals and rural communities may be threatened by the shortage of rural general surgeons 	Cross-sectional survey	<ul style="list-style-type: none"> • Hospital administrators report that the financial viability of rural hospitals depends largely on their ability to provide surgical services • 40% of the surveyed administrators reported that the hospital would have to close if the surgical program was closed
Zust BL, Briggs NB: Labor induction practices in a rural midwestern hospital. <i>Online J Rural Nurs Heal Care</i> 2006, 6(2) .	One rural hospital, Midwest USA	<ul style="list-style-type: none"> • What are the induction practices in small rural hospitals? 	<ul style="list-style-type: none"> • Induction of labour increased from 9.5% in 1990 to 20.6% in 2003 in the United States • Growing shortage of staff in rural areas 	Retrospective analysis of hospital data	<ul style="list-style-type: none"> • High induction rate (37.7%) compared to national average (20.6%) • Prominent reason for induction was to ensure availability of qualified staff, leading to many unnecessary inductions