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Résumé

Résultats en matière de santé maternelle et infantile et pratique infirmière dans une communauté des Premières Nations en région éloignée au Canada

Denise S. Tarlier, Joy L. Johnson, Annette J. Browne, Sam Sheps

Notre article présente des conclusions touchant la santé maternelle et infantile obtenues dans le cadre d'une étude ethnographique sur la pratique infirmière, la continuité des soins et les résultats de santé dans une communauté autochtone éloignée située au nord du Canada. L'usage de sources de données multiples suivant une méthode ethnographique a permis d'interpréter les résultats de santé quantitatifs en les situant dans le contexte particulier de la communauté à l'étude. L'échantillon comprenait les dossiers médicaux de 65 mères et de 63 nourrissons sélectionnés aléatoirement aux fins d'une étude rétrospective. On constate des résultats sous-optimaux en matière de santé maternelle et infantile pour plusieurs des critères indicateurs retenus. Les auteurs abordent les séquelles à long terme de l'état de santé de la mère et de l'enfant relativement au diabète et à d'autres maladies chroniques chez les Premières Nations. Ils explorent les implications découlant de ces observations en ce qui a trait à la préparation des infirmières en matière de prestation des soins primaires pré- et postnataux dans les communautés autochtones éloignées.

Mots clés : Autochtones, Premières Nations, communauté éloignée, soins primaires, continuité des soins, santé maternelle, santé infantile

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Maternal-Infant Health Outcomes and Nursing Practice in a Remote First Nations Community in Northern Canada

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This article reports those findings related to maternal-infant health outcomes of an ethnographic study that explored nursing practice, continuity of care, and health outcomes in one remote First Nations community in northern Canada. Use of multiple data sources within an ethnographic design ensured that quantitative health outcomes data were interpreted within a contextualized understanding of the remote First Nations community. The sample comprised the charts of 65 mothers and 63 infants randomly selected for retrospective chart review. The findings suggest suboptimal maternal-infant health outcomes on several of the health indicator criteria identified for the purposes of this study. The authors discuss long-term sequelae of prenatal and infant health in terms of diabetes and other chronic health conditions in First Nations populations. They explore the implications of these findings in relation to nurses' preparation to offer prenatal and infant primary care in remote First Nations communities.

Keywords: Aboriginal, First Nations, remote communities, nursing practice, primary care, continuity of care, maternal health, infant health, health outcomes, health indicator conditions

The exponential increase of type 2 diabetes and other chronic health conditions in Canadian Aboriginal populations (Adelson, 2005; Romanow, 2002; Shah, Hux, & Zinman, 2000; Young, Reading, Elias, & O'Neil, 2000) demands a close examination of factors experienced during pregnancy and infancy that potentially contribute to the development of these conditions. Ensuring optimal maternal-infant health care is a key strategy for decreasing risk factors that predispose individuals to chronic health challenges in later life (Cianfarana, Germani, & Branca, 1999; Eriksson, Forsén, Tuomilehto, Osmond, & Barker, 2000; Weindrich, Jennen-Steinmetz, Laucht, & Schmidt, 2003). Indeed, improved maternal-infant health care may help to break the cycle of diabetes as well as other chronic health conditions being perpetuated in successive generations (Health Council of Canada, 2011).

The purpose of this article is to report the findings related specifically to maternal and infant health outcomes in one remote First Nations community in the northern region of a western Canadian province. We discuss some of the long-term sequelae of maternal and infant health in terms of prevalent chronic health conditions in First Nations populations, and we explore the implications of these findings in relation to nurses' role as providers of maternal and infant primary care.

Our intent is not to contribute to the growing body of health literature that tends to pathologize Aboriginal people and health concerns. Also, we wish to be clear that nurses' practice is but one of several complexly interwoven factors that influence health outcomes in the "bigger picture" of the context, structure, and processes of health-service delivery at the study site. The policies and structures that have shaped health services for Aboriginal people in Canada, including the preparation of nurses to provide primary care in remote Aboriginal communities, demand critical examination (Tarlier & Browne, 2011). Significant maternal-infant health inequities persist within some Aboriginal populations (Luo et al., 2004, 2010; Wassimi et al., 2010). Nurses, as the main providers of primary care in remote communities, have an important role to play in redressing such inequities (Tarlier, Browne, & Johnson, 2007).

Background

Nurses employed in remote First Nations communities are responsible for not only the provision of primary care but also for community health nursing, public health care, and, often, the non-nursing health services that in more urban centres are generally provided by an interdisciplinary team of health providers (Tarlier & Browne, 2011). Historically, nurses working in remote northern settings were recognized for the quality of their care (Robertson, 1973), although there have been no evaluative outcome studies conducted to substantiate this claim.

The World Health Organization (1978) has long recognized maternal and infant health as a cornerstone of healthy communities and the primary health care model. Improving maternal and infant health outcomes remains one of the key United Nations Millennium Development Goals (United Nations, 2010). Providing primary care for infants and women has traditionally been an integral component of nursing practice in remote Aboriginal communities (Tarlier et al., 2007). First Nations women carry a disproportionate burden of prenatal and perinatal risk compared to other Canadian women (Reading, 2009), further suggesting that primary prenatal care is a critical element of health services in First Nations communities. For example, framing these within a context of socio-economic and geographic inequity, Reading identifies gestational diabetes, obesity, smoking, and alcohol use as maternal risk factors of particular relevance to the development of chronic disease in First Nations populations.

Two recent studies of birth outcomes and infant mortality in rural and remote populations in the Canadian provinces of Manitoba (Luo et al., 2010) and British Columbia (Luo et al., 2004) found that, in these provinces, the risk of infant mortality in First Nations populations is almost twice that of non-First Nations populations. In a study of community remoteness, perinatal outcomes, and infant mortality in First Nations communities in the province of Quebec, Wassimi et al. (2010) found similar results:

> Living in more remote First Nations communities was associated with a substantially higher risk of fetal and infant death, especially postnatal death, indicating a need for more effective perinatal and infant care programs, as well as improvement in the underlying social determinants of health in such communities. (p. 37)

In light of these gaps, an ethnographic study was undertaken for the purpose of examining nursing practice, maternal-infant health outcomes, and continuity of care within the context of one remote First Nations community in northern Canada. Recognizing that nurses do not work in a vacuum, but within a community context and a structure of health-services delivery that predictably influences continuity of care and patient health outcomes, we also explored aspects related to the context of the local community and health-services system. Thus, the research was guided by two secondary research objectives: (a) to explore how specific aspects of the community and the health-care delivery system at the study site supported or hindered informational, management, and relational continuity of care (Reid, Haggerty, & McKendry, 2002),[1] as well as nurses' ability to influence clinical health outcomes; and (b) to explore the clinical, procedural, and cultural core knowledge that nurses demonstrated in the process of providing primary care to mothers and infants.

The findings related to clinical health outcomes presented in this article represent only one component of the broad, mixed-method ethnographic study. This study was informed by critical perspectives of social justice and equity in health care (Anderson et al., 2009; Browne, Smye, & Varcoe, 2005; Browne & Tarlier, 2008; Reimer-Kirkham & Browne, 2006). As discussed in Browne and Tarlier (2008), a critical social justice lens draws attention to why certain individuals and groups bear a disproportionate burden of illness and suffering, what social conditions contribute to disparities in health and social status, and what role nurses can play in responding to these inequities (p. 83).

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[1] "Relational continuity" refers to ongoing patient-provider relationships and consistency of providers. "Informational continuity" refers to the transfer of information and the accumulated knowledge of a patient. "Management continuity" refers to coordination and consistency in treatment approaches, and flexibility, or an individualized approach to care (Reid et al., 2002).

In a previous article (Tarlier et al., 2007), we describe how nursing practice and continuity of care were influenced by the geographical and social location of the study site: a nursing station located in a remote First Nations community. Nurses were often challenged to provide primary health care within the historical and sociopolitical context of health-service delivery to Aboriginal people in Canada, as well as in the context of remoteness, isolation, difference, and inequity. For example, nurses' experiences were shaped by First Nations community and cultural contexts and the need to respond to the social and economic circumstances of people's lives, including inequitable access to the social determinants needed to support good health. The nurses' lack of preparation for these differences and for the social inequities and burden of ill health they encountered contributed to a process of social distancing and relational disengagement (Tarlier et al., 2007).

When this study was conceptualized, collecting data from a variety of sources was considered key to our understanding of the social and community context that influenced not only continuity of care and health outcomes, but also nurses' practice at the study site. Exploring health outcomes specific to the study site offered one window onto the contextual, structural, and process issues at the site that influenced nurses' practice and the continuity of patient care.

Methods

In order to examine the key health outcomes of mothers and their infants, we collected qualitative and quantitative data through a systematic chart review. The practice setting was a primary health care facility serving a First Nations population living on a reserve in a northern region of a western Canadian province.

This research was guided by the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans,* and in particular by Section 6, Research Involving Aboriginal Peoples (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, & Social Sciences and Humanities Research Council of Canada, 1998).[2] Prior to commencement of the study, ethical approval was obtained from an accredited University Behavioural Research Ethics Board. Approval to conduct the research at the site was obtained from the appropriate stakeholders at the regional administrative level as well as from the band council on behalf of the community.

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[2] The version of the *Tri-Council Policy Statement* in effect at the time this study received ethical approval was the 1998 first edition, prior to the 2005 amendment. A more recent edition is now in effect.

Sample

The charts of 65 mothers and 63 infants ($N = 128$) were randomly selected for retrospective chart review based on infant delivery date. The intention was to review the charts of mother-infant dyads. However, early in the chart-review process, data had already been extracted from the charts of two mothers when it was determined that the charts of their two infants could not be located. The data extracted from the two maternal charts was retained in the sample on the basis that each provided rich data at the individual level. However, future sampling ensured that both charts for a mother-infant dyad were available prior to reviewing either one. A dyad was eligible for inclusion in the study if the infant had been delivered within the 2-year period preceding data collection, in fall 2004, and if the mother was a "treaty" member of the local First Nations band and a resident of the study site community. Each of the 65 women had received some or all of her prenatal care at the nursing station, which was operated by the First Nations and Inuit Health Branch (FNIHB),[3] the branch of Health Canada responsible for providing health services to First Nations people living on rural and remotely located reservation lands in Canada. Of the 63 infants in the sample, approximately half were male (33) and half female (30).

Data Abstraction and Analysis

Data collection and analysis were directed and guided by the research objectives and the adaptation of the Nursing Role Effectiveness Model (NREM) (Irvine, Sidani, & McGillis Hall, 1998) conceptual framework that guided this study. The adapted NREM, itself an adaptation of Donabedian's (1980) work, specified structure, process, and outcome factors identified in the literature that were thought to influence the practice of nurses working in remote First Nations settings. It was further adapted to the purposes of this study by incorporating conceptual work on relational, informational, and management continuity of care (Reid et al., 2002). Specific questions designed to target the collection of data addressing each identified factor were explicated in the data-collection protocol.

Two data-abstraction tools were developed to guide extrapolation of clinical health outcomes data, one for each of two health indicator conditions: (a) maternal prenatal care, and (b) care of the infant through the first year. The decision to base chart data collection on these two indicator conditions was founded on the expectation (confirmed during pilot

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[3] Since renamed First Nations and Inuit Health (FNIH). For the purposes of this article we will continue to refer to this branch of Health Canada by the name in use when the study was conducted.

testing) that these two groups of patients would provide a sufficiently large sample for the purpose of this study. Each indicator condition was managed primarily by nurses at the study site, although referral to a physician or other health-care provider as an appropriate intervention was an option, allowing us to explore continuity of care as well as clinical health outcomes. Moreover, as discussed above, maternal-infant health is considered one of the core activities of nurses' practice in remote primary health care settings.

Data-abstraction tools were based on health indicator conditions and criteria originally developed for the Burlington Randomized Trial of nurse practitioner practice (Sibley et al., 1975). Subsequent studies supported the validity of using these health indicator conditions and criteria to assess the effectiveness of primary care delivered by physicians (Sheps & Robertson, 1984; Sibley, 1976) and midwives (Buhler, Glick, & Sheps, 1988). The criteria were further updated and modified to reflect current evidence-based clinical practice guidelines (e.g., Canadian Medical Association guidelines) and clinical practice expectations of nurses providing primary care in FNIHB health centres. Each data-abstraction tool included items related to patient demographic variables as well as criteria-based items related to completeness of chart documentation, routine and non-routine interventions, referrals and follow-up, and prenatal and infant clinical outcomes. The prenatal data-abstraction tool contained 50 items; the infant tool contained 22 items. Data were manually abstracted from patient charts in accordance with data-abstraction instrument protocols developed for this study.

Descriptive statistics related to outcomes of maternal prenatal health were collected on four clinical health outcomes: (a) gestational age at delivery, (b) birth weight, (c) labour and/or delivery complications, and (d) postpartum follow-up. Descriptive statistics related to outcomes of infant care through the first year were collected on three clinical health outcomes: (a) up-to-date routine immunizations at 12 months (or at the time of the chart review if an infant was under 12 months at the time of the review), (b) satisfactory weight gain at 12 months (or at the most recent documented weight if under 12 months at the time of the chart review), and (c) a documented hemoglobin within normal parameters between 6 and 12 months of age. Data related to health outcomes were collected nominally; that is, the criteria for each outcome were met or not met. The adapted and modified instruments were pilot tested with a small sample ($n = 20$) of patient charts that were sampled from a time outside of the defined study period. These charts were identical, in format and type of content, to the charts of patients later included in the sample. Findings of the pilot study were consistent with the findings of the larger study.

Quantitative data related to patient demographics and health outcomes were extracted from patient charts and analyzed using both Excel and SPSS 10 software. Statistical data were primarily categorical and ordinal; therefore, statistical analysis was limited to descriptive and comparative statistics. This analytic approach was sufficient to meet the purposes of the study, which was to describe patient health outcomes on the two indicator conditions and to complement and enrich the qualitative data analysis related to continuity of care and nursing practice (Tarlier et al., 2007).

Qualitative data were abstracted from patient charts in narrative form, as "contextual notes": a brief synopsis of each chart based on review of the chart as a whole. The meaning of a contextual note was reflected upon in an accompanying interpretive memo. The contextual notes and interpretive memos provided context and an analytical strategy to help "explain" the quantitative data and missing or unclear chart information. The quantitative data described what was found on chart review; the contextual notes created the possibility for also understanding the *how* and *why* of the quantitative data. While a full report on the narrative data is beyond the scope of this article, two examples of how the contextual notes informed and enriched the quantitative data analysis are offered in Figure 1.

Figure 1 ***Contextual Notes Data***

Example A: Maternal Health Outcomes

27-year-old grand multip. Pregnancy diagnosed about 7 weeks gestational age, initial work-up done at 18 weeks. Seen by four different RN providers on a total of four visits for prenatal care. Gestational diabetic. Anemic throughout pregnancy: hemoglobin less than 80 g/L at 30 weeks despite iron therapy. Induced vaginal delivery at 40 weeks due to gestational diabetes. Babe weighed less than 3500 grams. "Small" postpartum hemorrhage: hemoglobin 86 g/L after delivery. Developed unspecified postpartum infection requiring IV antibiotics prior to hospital discharge [to home community]. No evidence of postpartum follow-up re: infection or anemia, or of a routine postpartum check at 6 weeks.

This patient had requested a referral for tubal ligation [TL] prior to this pregnancy. A referral was sent to a gynecologist at about the same time that the patient became pregnant again. There is no evidence that options to terminate the pregnancy were discussed with the patient at the time she had the pregnancy diagnosed at 7 weeks' gestation. An RN documented during a routine prenatal visit that the patient stated she did not desire further pregnancies. The referral gynecologist was also the attending obstetrician [i.e., at delivery]. There was no evidence in the chart of postpartum follow-up or of a postpartum check at 6 weeks. [At the time of chart review] this woman is currently pregnant again, having conceived about 9 months post delivery. Did the communication re: desired TL fall through a gap and if so, where and how?

INTERPRETIVE MEMO: This case is an exemplar of fragmented care between providers, with very significant consequences. This woman was at-risk for further [high risk] pregnancies due to several risk factors, including diabetes, anemia, and parity, and had requested a TL. Yet she has gone through at least 2 further pregnancies since her initial request, due to fragmented care. Why was no one listening and acting to expedite her request?

Example B: Infant Health Outcomes

Infant delivered at term, 3200 grams, healthy. Adolescent mom. No maternal prenatal care until 35 weeks' gestation. Followed by Public Health Nurse in [urban referral centre] during first two weeks. Referred infant for close follow-up when back in home community due to slow weight gain in the first 2 weeks and also concerns noted re: parenting. Referral letter from PHN was on the patient chart. The infant was rarely seen at the nursing station during the first ten months but then marked increase in frequency of visits for minor illnesses. Poor weight gain was evident by the 3-month visit; MD advised monthly follow-up of growth, which was not done. Hemoglobin was not checked in the first year. Some chart entries note "well child," yet failure to thrive was diagnosed at 13 months. Child was eventually referred to a pediatrician before age 17 months due to growth concerns and a draining ear. By the time the referral took place, weight had reached the 10th percentile, which was interpreted by pediatrician as an improvement. Hemoglobin was 109 g/L (i.e., low) when checked at 17 months.

INTERPRETIVE MEMO: It was difficult to reconstruct the sequence of care experienced by this infant due to the quality of documentation available. However, what was clear was that this infant was identified as at-risk at age 2 weeks and a referral was made which was evidently not followed through on in the community. I suspect the growth chart was not completed at all until a visit for minor illness at age 9 months. It looks like one nurse then transferred previous chart entries (i.e., from the narrative notes and the Child Health Record) of the infant's weight to a growth chart, and determined that the infant was not gaining weight satisfactorily. Significantly, the infant had been seen by the community PHN about 2 weeks prior to this visit; she had not noted any concern re: weight gain, and had noted that the child could be seen "after 1st birthday for MMR vaccine." Thus, this was an at-risk infant, identified as such early on at 2 weeks yet somehow fell through the cracks time after time, and received care that might be most generously characterized as haphazard. This was likely due to a combination of factors, one of which was possibly caregiver compliance. However, it seems that health providers dropped the ball on several occasions as well. There is no evidence of a proactive approach being taken.

Results

Maternal Health Outcomes

Maternal age and gravida status are presented in Table 1. The rate of births to adolescent mothers (i.e., 19 years and younger) in the sample was high (almost 31%). Close to 28% of the mothers were primigravid, while 6% had experienced five or more previous viable births.

Table 1 *Maternal Age and Gravida Status (*N *= 65)*

Variable	**%**	**Range**	**Median**
Age (years)		14–39	22
14–19	30.8		
20–25	41.5		
26–29	21.5		
30–39	6.2		
Gravida status		1–12	2
Primiparous	27.7		
Para 2–4	66.1		
Grand multiparity (5+)	6.2		

The data related to maternal health outcomes are presented in Table 2. Notably, while close to three quarters (73%) of the women in the sample achieved satisfactory perinatal outcomes on two or more of the criteria, only four (6%) achieved a satisfactory outcome on all four criteria.

Premature births (i.e., births occurring before 37 completed weeks gestation) accounted for 21.5% of births in the sample. Births past 42 weeks gestation accounted for 3% of births.[4]

Birth weight ranged from 1,347 to 4,936 grams, with a mean of 3,498 (*SD* = 642) and a median of 3,577. Of the sample, 6% had low birth weight (under 2,500 grams) and 19% had high birth weight (over 4,000 grams). Thus, while 75% of birth weights fell within the desirable range of 2,500 to 3,999 grams (i.e., the range associated with better long-term health outcomes; Health Canada, 2011), 25% fell outside the desirable range.

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[4] Planned interventions such as induction of labour or Caesarean section were routinely implemented past 42 weeks gestation. It should also be noted that since sample selection was dependent on recorded live births, any premature or post-date births that resulted in fetal death would not have been included in the chart review; therefore, the number of pregnancies that terminated in premature or post-date delivery may be higher than indicated by these data.

Table 2 ***Maternal Health Outcomes (*N *= 65)***

Clinical Health Outcome Criteria	**Range**	**Median**	***SD***	**Frequency**	**%**
Gestational age at delivery between 38 and 41 completed weeks	34–42	39	1.98	49/65	75.4
Birth weight between 2,500 and 3,999 grams	1,347–4,936	3,577	642	49/65	75.4
Delivery free of complications				39/65	60.0
Postpartum visit made				10/65	15.4
3 outcomes achieved (100%)				4/65	6.2
2 outcomes achieved (67%)				32/65	49.2
1 outcome achieved (33%)				12/65	18.5
0 outcomes achieved (0%)				13/65	20.0
Gestational age at delivery (completed weeks)					
< 37				14/65	21.5
38–41				49/65	75.4
> 41				2/65	3.1
Birth weight (grams)					
< 2,500				4/65	6.2
2,500–3,999				49/65	75.4
> 3,999				12/65	18.5

Table 3 ***List of Complications of Pregnancy, Labour, and Delivery (*n *= 29)***

Description of Complication	**Age**	**Para**
Postpartum hemorrhage, anemia postpartum	22	★
Multiple gestation, premature delivery at 36 weeks	20	★
Multiple gestation, premature labour, C-section at 34 weeks	20	2
Postpartum hemorrhage	23	★
DM, macrosomia, 2-degree tear, hemoglobin 55 postpartum	21	0
Type 1 diabetes, multiple gestation, C-section at 34 weeks	24	★
Uncontrolled HTN, type 1 diabetes, macrosomia, C-section at 37 weeks	26	2
Persistent anemia, low birth weight, C-section for failure to progress	19	0

Anemia, HTN, induced at 37 weeks	17	0
Renal failure, multiple gestation, HTN > PIH, SVD at 37 weeks	27	4
Persistent UTIs, septic infant, NICU x < 1 week	17	1
Anemia, elevated BP, macrosomia, C-section at 41 weeks for failure to progress	24	1
Grand multiparity, anemia, GDM, induced 2° GDM, postpartum hemorrhage, infection	27	8
Uncontrollable postpartum hemorrhage > hysterectomy, anemia, wound infection	18	1
Untreated UTI > premature delivery at 34 weeks in nursing station	17	1
C-section at 34 weeks for PIH and GDM > infant NICU x < 1 week	34	4
Primiparous SVD in nursing station at 37 weeks (39 weeks per fetal assessment)	17	0
Anemia, *DM,* macrosomia, induced at 41 (42) weeks 2° oligohydramnios, C-section for failure to progress, CPD	27	0
PIH, induced at 39 weeks	18	1
Anemia, PROM at 36 weeks, induction	29	1
GDM, elevated BP, C-section (breech)	18	1
Type 1 diabetes, delivery at 35 weeks, infant had significant congenital abnormalities	30	3
DM, premature delivery at 36 weeks, C-section	23	0
Anemia, PROM, premature delivery at 37 weeks, medevac	20	0
Anemia, *DM,* elevated BP	29	3
Anemia, spotting at 34 weeks, labour at 41 weeks, C-section for failure to progress, fetal distress > anesthetic complications (GA) > ongoing maternal sequelae	23	3
Postpartum hemorrhage	17	0
Persistent UTIs, PIH, pre-eclampsia, failed induction, C-section at 36 weeks	20	0
Grand multiparity, renal failure, anemia, premature delivery at 36 weeks	29	6

Note: * indicates missing data.

Table 4 *Infant Health Outcomes (N = 63)*

	Frequency	**%**	
Clinical health outcome criteria			
Weight gain satisfactory at 12 months (or for age)	37/63	59	
Hemoglobin within normal limits (6–12 months)	23/58	40	
Immunizations up to date for age[a]	24/63	38	
Number of infant health outcomes achieved by each infant			
3 (100%)	7/63	11	
2 (67%)	21/63	33	
1 (33%)	21/63	33	
0 (0%)	14/63	22	
Infant immunization rates		**Immunized %**	**Unimmunized %**
Up to date at			
2 months	23/63	36.5	63.5
4 months	7/60	11.7	88.3
6 months	3/59	5.1	94.9
12 months[a]	17/51	33.3	66.7

[a] The apparent discrepancy in the data related to "up to date for age" (38%) and rate at 12 months (33.3%) is explained by the fact that a few infants in the second round of sampling had not reached their first birthday at the time of the study. In these cases, infants were deemed to have up-to-date immunization status if their immunizations were up to date for their age at the time of the chart review.

The Prenatal Data Abstraction Protocol defines several specific "complications" of pregnancy, labour, and delivery. Review of the descriptive data related to perinatal complications revealed that pre-existing health conditions (e.g., diabetes, hypertension) and conditions that developed during pregnancy (e.g., infections, anemia, pregnancy-induced hypertension, gestational diabetes mellitus, macrosomia) were frequently associated with premature labour and delivery and with interventions such as induction of labour and Caesarean section (see Table 3). These interventions in turn carried a higher degree of risk of poor outcome, such as wound infection and anesthetic complications.

Of the 65 women in the sample, 29 (44.6%) experienced a complication of pregnancy, labour, or delivery. Caesarean section was included as a complication only if there was reasonable evidence in the patient's chart to suggest the procedure was related to a complication of pregnancy or labour. For instance, elective C-sections or planned C-sections for certain malpresentations (e.g., breech, transverse lie) were not included as complications, whereas C-sections for macrosomia or fetal distress were. Of the 65 women, 11, or just under 17%, underwent C-section as a complication of pregnancy, labour, or delivery. However, because of the inclusion of planned C-sections, the C-section rate in this sample increased to 24.6%.

Complications of pregnancy were often found in conjunction with pre-existing maternal chronic health conditions or illnesses such as diabetes or renal disease. Of the 65 women, 10 (15%) had a diagnosis of diabetes during pregnancy, either pre-existing, gestational, or undetermined. Similarly, nine (13.8%) were identified as having elevated blood pressure in pregnancy, either pre-existing or pregnancy-induced. Anemia during pregnancy was not included as a complication unless it appeared to be persistent or profound. Thus the prevalence of anemia in the sample was in fact higher than indicated in Table 3.

Health Outcomes in Infancy

Data on infant health outcomes are presented in Table 4. At age 2 months, 36.5% of infants were fully immunized. However, by 4 months less than 12% were fully immunized and by 6 months only 5% were fully immunized. While immunization rates increased again by age 12 months, over two thirds of infants were not fully immunized at the time of their first birthday.

Of the 58 infants who had passed 6 months of age at the time of the chart review, 23 (40%) had a documented hemoglobin value that was within normal parameters for the infant's age at the time of screening (i.e., 110–150 g/L at age 12 months, or 105–145g/L if screened at age 6 months only). Of the sample, 60% had either not been screened in accordance with FNIHB clinical guidelines or had been screened and identified as having low hemoglobin. Of the 37 infants who had been screened, 14 (38%) had a low hemoglobin value. The lowest infant hemoglobin value noted was 82 g/L. Contextual Notes Data Example B provides contextual data related to anemia and poor weight gain in infancy (see Figure 1).

Discussion

The clinical health outcomes described here and their implications are disturbing on three levels. The findings reflect not only sub-optimal clinical health outcomes but also sub-optimal outcomes in maternal and infant health specifically: two target areas of the Millennium Development Goals (United Nations, 2010). The possibility that the most basic of maternal-child health outcomes remain in jeopardy in a developed and wealthy nation such as Canada raises serious concerns; as a privileged nation, "Canada has led the world in understanding health promotion and population health" (Canadian Institute for Heath Information, 2002, p. 1). These outcomes are at odds with a national philosophy of health care that espouses fundamental values of equity and high-quality care for all. Moreover, and on more immediate and pragmatic grounds, poor maternal-infant health outcomes are associated with the conditions and diseases of later life that increasingly challenge the health of Aboriginal people, such as diabetes.

A comprehensive discussion of the implications of each of the health outcomes described in the previous section is beyond the scope of this article. Thus, the discussion here will focus on the sequelae and implications of selected maternal and infant health outcomes and the implications related to nurses' role in providing primary prenatal and infant care to First Nations women in remote communities.

Sequelae and Implications of Selected Prenatal and Infant Health Outcomes

Birth weight and gestational age. While 75% of the infant birth weights in this sample were within the desirable range of 2,500 to 3,999 grams associated with better perinatal health outcomes, almost 25% were too low (6%) or too high (19%). These findings are comparable to national-level data on First Nations births: 5.7% of all First Nations births in 2001–02 were low birth weight and 20.8% were high birth weight (Health Canada, 2011). Both low and high birth weights are predictors of type 2 diabetes in later life (Public Health Agency of Canada [PHAC], 2008). Given the increasingly high rates of type 2 diabetes in the

Aboriginal population in Canada, this finding has significant implications for long-term health.

Similarly, while more than 75% of the women in the sample delivered after 37 and before 41 completed weeks gestation, premature births accounted for over one fifth (21.5%) of births in the sample, almost three times the pre-term birth rate of 8.2 per 100 live births in Canada overall in 2004 (PHAC, 2008). Births past 41 completed weeks gestation accounted for only 3% of births in the sample[5]; however, this figure is almost four times the national rate of 0.8% (PHAC, 2008).

Birth weight and gestational age at birth are important indicators of perinatal health. Low birth weight includes both premature infants and small for gestational age (SGA) infants. Premature birth is a risk factor for low birth weight and is associated with an increased risk of neonatal morbidity and complications due to immature respiratory, renal, and gastrointestinal function and susceptibility to infection (PHAC, 2008). SGA infants delivered at term are also at increased risk for neonatal morbidity and mortality (PHAC, 2008). Premature and SGA infants are at increased risk for failure to thrive (Krugman & Dubowitz, 2003) and anemia (Willows, Morel, & Gray-Donald, 2000).

Potential longer-term sequelae of low birth weight include impaired learning ability that may extend into school age (Weindrich, Jennen-Steinmetz, Laucht, & Schmidt, 2003), as well as the development of hypertension (Eriksson et al., 2000) and type 2 diabetes in adulthood (Cianfarana et al., 1999).

Of this First Nations sample, 19% of infants were high birth weight, compared to 11.6% in the Canadian population overall (PHAC, 2008). Maternal diabetes, both gestational and pre-existing, is a risk factor for high birth weight and macrosomia. Aboriginal women have high rates of pre-existing type 2 diabetes in pregnancy and are at two to three times the risk for gestational diabetes mellitus compared to non-Aboriginal women in Canada (Harris, Bhattacharyya, Dyck, Hayward, & Toth, 2013); 15% of the women in the study were identified as having diabetes in pregnancy.

High birth weight is associated with increased incidence of perinatal intervention, including induction, operative vaginal delivery, and C-section (Jolly, Sebire, Harris, Regan, & Robinson, 2003; Stotland, Hopkins, & Caughey, 2004), with implications for maternal health postpartum. The total C-section rate of 24.6% found in this study was com-

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[5] As stated previously, it is important to note that planned interventions such as induction of labour or C-section were routinely implemented past 42 weeks gestation and, because sample selection was dependent on recorded live births, any premature births that resulted in fetal death would not have been included in the chart review.

parable to the rate of 25.6% estimated for C-sections nationally (based on 2004–05 data; PHAC, 2008). Interventions are associated with further perinatal complications such as anemia and postpartum infections. Macrosomia is a clinical risk factor for postpartum hemorrhage (Jolly et al., 2003). A recent study of macrosomia in a First Nations population in Quebec found that it was associated with a significantly increased risk of postneonatal death, although not with perinatal death (Wassimi et al., 2011).

Anemia in infants. Data from the contextual notes (e.g., see Figure 1, Example B) suggests that several of the infants in the sample who had not received hemoglobin screening by age 12 months had one or more risk factors for low hemoglobin. These included maternal anemia during pregnancy (Willows, Iserhoff, Napash, Leclerc, & Verrall, 2005), low birth weight, prematurity (Abdullah, Zlotkin, Parkin, & Grenier, 2011), and being primarily breastfed without supplemental iron or being fed cow's milk or milk prepared from powder, as opposed to iron-enriched infant formula (Christofides, Schauer, & Zlotkin, 2005; Willows et al., 2005). Low socio-economic status and *Helicobacter pylori* infection have also been identified as risk factors for anemia in infancy (Abdullah et al., 2011; Christofides et al., 2005). The finding that 36% of infants in the sample had not been screened is concerning.

Equally concerning is the finding that 38% of the infants in the sample who had been screened had a hemoglobin value of less than 110 g/L. In a study of the prevalence of anemia among Cree First Nations infants, Willows et al. (2000) found that 31% of infants had a hemoglobin value of less than 110 g/L at 9 months of age. A value of 110 g/L is the 2.5 percentile for healthy infants, while a value of 100 g/L "corresponds with at least moderately severe anemia" (Willows et al., 2000, p. 324). Willows et al. note that the prevalence of hemoglobin value lower than 110 g/L in Canadian non-Aboriginal infants is 8%. Christofides et al. (2005) found that the prevalence of iron deficiency anemia was eight times higher in residents of First Nations and Inuit communities than in the general population. The high rates of iron deficiency anemia in some First Nations communities suggest that routine hemoglobin screening of infants is indicated in communities where risk factors are prevalent.

The potentially significant sequelae of iron deficiency anemia demand not only aggressive treatment and follow-up of identified cases of low hemoglobin, but also effective primary preventive strategies (Abdullah et al., 2011). Sequelae of iron deficiency anemia in infants include poor weight gain, irritability, decreased attention span, and decreased physical activity, as well as cognitive and psychomotor developmental impairments that may persist into school age (Lozoff, Jimenez, Hagen, Mollen, & Wolf, 2000). The evidence base supporting a causal relationship between iron deficiency anemia in infants and cognitive delay has been challenged on the basis of confounding factors such as poverty and low socio-economic status (Grantham-McGregor & Ani, 2001). However, the authors of this large review of studies conclude that "it is clear that iron deficiency identifies children at concurrent and future risk of poor development" (p. 665S). At this time, it remains generally accepted that the long-term consequences of iron deficiency anemia can have profound implications for the physical, mental, and emotional health of infants and children into school age and even into adulthood.

Infant immunization. Immunization coverage is a key component of preventive infant health care and infectious disease management. Immunization is of particular importance in Aboriginal populations, where the rates of infectious disease, including vaccine-preventable infectious disease, are substantially higher than in non-Aboriginal Canadian populations. In 1999, "rates of mumps, pertussis and rubella [in Aboriginal populations] were three times higher than the overall Canadian rate" (FNIHB, 2003, p. 35). National immunization coverage goals range from 95% for pertussis to 97% for diphtheria, tetanus, polio, invasive Haemophilus influenza type b (H. flu), measles, mumps, and rubella. Coverage rates at age 12 months for First Nations infants in Canada overall in 1999 ranged between 70% and 75% (excluding measles, mumps, and rubella) — not high enough to meet the estimated threshold to achieve herd immunity in First Nations populations. In the present study, data collected during the 2002–04 study period revealed significantly lower immunization rates than the 1999 rates in First Nations overall, with implications for herd immunity at the study site.

The consequences of low immunization rates are obvious: Infants are susceptible to the vaccine-preventable diseases of infancy and childhood. These are the diseases that prior to the availability of effective vaccines were among the most significant causes of infant and child mortality and morbidity. For example, invasive H. flu type b is the major causative organism of bacterial meningitis and epiglottitis. Prior to the availability, in 1998, of an effective vaccine for invasive H. flu type b, there were several hundred cases annually in Canada, with a case-fatality rate of 5% and neurological sequelae or deafness in up to 15% to 20% of cases (National Advisory Committee on Immunization, 2006). Fully 85% of invasive H. flu type b infection occurs in children younger than 5 years, with the peak age being 6 to 12 months. Despite routine infant immunization across Canada, in 2001 there were five cases of invasive H. flu type b disease in Aboriginal children in northern communities, with one death (FNIHB, 2003). It was therefore disturbing to find that 95% of infants in the study sample were not fully immunized against invasive H. flu type b between 6 and 12 months of age.

Implications Related to Nurses' Role in Providing Primary Prenatal and Infant Care

Given that nurses' practice is but one of many interrelated factors influencing the maternal-infant health outcomes reported here, the ability of nurses to provide effective and responsive prenatal and infant care in the context of remote Aboriginal communities remains an integral link in the chain of continuity of care. Nurses must be prepared with the knowledge and competencies needed to provide primary maternal-infant care. Nurses also require skills in relational practice if they are to contribute to fostering patient trust and continuity of care, given that patients may see different nurses, sometimes at every visit. Moreover, to apply a cultural safety lens in their practice with First Nations people, nurses must be familiar with the historical and contextual knowledge that fosters critical thinking about the sociopolitical and historical circumstances that have shaped Aboriginal health (Browne et al., 2009; Canadian Nurses Association [CNA], 2010). In turn, access to and provision of high-quality care can influence health outcomes. Ensuring that nurses have the competencies to provide such care is therefore critical to the delivery of equitable primary care to mothers and infants in remote First Nations communities.

Other research has suggested that nurses at times may lack the knowledge and skills required for practice in remote First Nations communities. A large Canada-wide survey on nurses' practice in rural and remote regions revealed that while 13.5% of respondents worked in a remote community setting, fewer than 3% had "outpost certification"[6] and fewer than 6% had Advanced Practice Nurse preparation[7] (Stewart et al., 2005). In their study of continuity of care in three First Nations communities, Minore et al. (2005) determined that relief nurses, in particular, lacked adequate preparation, which was defined as "ideally" including both primary care and community nursing, "preferably with several years' experience" (p. 93).

The model of nursing that developed to meet the health-care needs of residents of remote communities provides a template for contemporary conceptualizations of the role of primary health care nurse practitioner in Canada. But, paradoxically, whereas nurse practitioner is now recognized as an advanced practice nursing role requiring graduate-level

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[6] "Outpost certification" is not defined but conceivably included nurses who had completed the 3-month Primary Care Skills course. Notably, nurses in the present study who had completed this course did not consistently demonstrate primary health care, community health, or cultural competencies.

[7] Advanced Practice Nurse preparation is defined as including both nurse practitioner and clinical nurse specialist education, not necessarily at a graduate-degree level.

education in many Canadian jurisdictions, including at the national level (CNA, 2008), most nurses employed in remote communities continue to be prepared at the diploma or baccalaureate level (Kulig, 2005; Stewart & MacLeod, 2005; Tarlier & Browne, 2011). Nurses providing primary care require a broad base of knowledge comparable to that of contemporary nurse practitioners (Tarlier & Browne, 2011). Yet many if not the majority of nurses employed in remote communities in these studies received little or no additional education to better prepare them to meet the expectations of an implicitly advanced and explicitly expanded scope of practice (Stewart & MacLeod, 2005; Tarlier et al., 2007).

Limitations of this study include its being restricted to a single site and its inability, in keeping with exploratory studies of this nature, to draw a clear association between nursing practice and health outcomes. However, the research has brought to light sub-optimal maternal-infant health outcomes that are particularly dismaying given the implications for long-term health beyond the individual level. The findings point to a pressing need for changes in health services delivered to Aboriginal people in remote communities. The interpretation of findings in the broader context of health and health-policy formulation suggests that sustainable change must be supported by fundamental shifts in perspective at the policy level (Fontaine, 2005).

Some points for future research, such as implementing and evaluating changes to broader health policy and integration of the various sectors from which the social determinants of health arise, would be best served by an interdisciplinary research perspective. However, there is still a need for research that focuses more narrowly on the role of nurses within the health-care system. We need intervention studies examining how specific nursing interventions influence outcomes, as well as studies exploring how standard nursing interventions may be better modified to meet the needs of Aboriginal people. For example, what difference does early home visiting to mothers of newborns make to outcomes such as immunization status and infant nutritional status (i.e., hemoglobin level and weight gain), and how might home visiting be modified so that it is more culturally acceptable and contextually appropriate?

The most pressing need for nursing research lies in exploring innovative models of nurse preparation and staffing to find models that address the challenges of recruiting, educating, and retaining nurses with the knowledge and competencies to facilitate continuity of care and improved health outcomes. New and more effective models of nurse preparation and staffing are desperately needed, not just to decrease the high rate of nursing turnover in remote Aboriginal communities, but also, and perhaps more importantly, to ameliorate the effects of turnover.

Almost 50 years ago the Hall Royal Commission on Health Services (Hall, 1964) recognized that nurses working in northern communities require complex knowledge and skills that encompass public health, preventive care, and primary care and recommended that professionals be adequately prepared to meet the challenges of northern practice. Yet in 2013 there is still no comprehensive strategy in place to ensure that nurses working in these roles have the requisite knowledge and skills. Similarly, 17 years ago the Royal Commission on Aboriginal Peoples (1996) called for greater quality and equity in health services delivered to First Nations people on reserves. The maternal-infant health outcomes found in the present study suggest that improvement is still needed. Nurses, whether employed full-time or on a relief basis, must possess the competencies necessary to support safe and effective practice in remote communities. Nurses with community-based primary care knowledge and competencies, as well as knowledge related to the historical and sociopolitical context of Aboriginal health in Canada, will be better positioned to exert a positive influence on continuity of care and more equitable maternal-infant health outcomes — and, ultimately, on the overall quality of primary health care delivered within remote First Nations communities.

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