International Journal of Gynecology and Obstetrics 132 (2016) 94–99

Contents lists available at ScienceDirect

International Journal of Gynecology and Obstetrics

journal homepage: www.elsevier.com/locate/ijgo

CLINICAL ARTICLE

A retrospective cohort study of the association between midwifery experience and perinatal mortality

Beverley Lawton [a,*], Sara Filoche [a], Stacie E. Geller [b], Sue Garrett [a], James Stanley [c]

[a] Women's Health Research Centre, Department of Primary Care, University of Otago, Wellington, New Zealand
[b] Department of Obstetrics and Gynecology, University of Illinois, Chicago, IL, USA
[c] Dean's Department, University of Otago, Wellington, New Zealand

ARTICLE INFO

Article history:
Received 14 January 2015
Received in revised form 25 June 2015
Accepted 3 September 2015

Keywords:
Experience
Midwives
Perinatal mortality

ABSTRACT

Objective: To determine whether experience of midwife-only and nurse-midwife lead maternity carers (LMCs) is related to perinatal mortality. *Methods:* In a retrospective analysis, routinely collected data were obtained for all pregnancies resulting in live births (or stillbirth at ≥20 weeks or weighing >400 g) in New Zealand in 2005–2009. An anonymized dataset of date of midwife registration was used. The main outcome measure was perinatal mortality (fetal deaths and neonatal deaths ≤27 days). *Results:* Among 233 215 eligible births, 84 043 were linked to a midwife-only LMC and 150 172 to a nurse-midwife LMC. Among pregnancies with midwife-only LMCs, perinatal mortality was higher when the midwife had less than 1 year of experience than when the midwife had 5–9 years' experience (rate ratio 1.33; 95% confidence interval 1.02–1.73), an absolute difference of two additional deaths per 1000 births. There was a decreasing rate of perinatal mortality with increasing experience ($P = 0.031$). Perinatal mortality rates did not differ by experience in the nurse-midwife group. *Conclusion:* Pregnancies cared for by early-career (<1 year) midwife-only LMCs were associated with a 33% increase in perinatal mortality. No association between experience and perinatal mortality was found for nurse-midwives. Midwife-only trained LMCs could require additional training and/or supervision in their first year of practice.

1. Introduction

The lack of experience of junior doctors has been associated with increased patient mortality [1]. The annual staff changeover of the most junior tier of doctors in the UK occurs in August and has been associated with a 6% increase in mortality for patients admitted in the changeover week compared with the week before [2]. In US hospitals, an increase in mortality—called the "July effect"—has also been shown to be associated with the introduction of junior staff [3,4]. Nevertheless, little is known about the relationship of professional experience to patient mortality for other health professionals such as midwives.

In New Zealand (NZ), the perinatal mortality rate was 10.7 per 1000 births in 2012 and has remained stable since 2007; this rate is comparable to those in the UK and Australia [5]. In NZ, maternity care is government funded and most care is undertaken by lead maternity carers (LMCs; midwives, general practitioners, or specialist obstetricians). As of 2010, 78.2% of pregnant women in NZ were booked with a midwife as their LMC, whereas only 7.4% and 15% of pregnant women were booked with medical doctors or public hospital midwives and obstetricians as their LMCs, respectively [6]. The LMC is responsible for providing care to the pregnant woman throughout pregnancy, labor, birth, and the postnatal period. Through this lead role, they also assess whether referral to an obstetrician or other specialist care is appropriate. Midwifery LMCs act as independent practitioners using a business model, billing the government for services.

NZ midwifery training has been a 3-year degree course since 1992. Immediately on completion of this qualification, midwives can practice independently as LMCs. Prior nurse training is not required for midwifery in NZ, although some midwives (nurse-midwives) have prior nurse training. At present in NZ, there is no requirement for supervision during the first year after graduation, although a mentorship program does exist. A strong recommendation from the 2008 maternity quality review in Wellington, NZ, stated: "To ensure safety for women and their babies, and appropriate support for new graduate midwives, there needs to be mandatory supervision (physical oversight) and mentoring for midwives in their first year of practice" [7]. Supervision of early career midwives has also been recommended by reviews of deaths undertaken by NZ coroners and the NZ Health and Disability commissioner [8,9]. After the death of a mother and her neonate in NZ, several recommendations were made by the coroner, including "Midwives should not be permitted immediately upon graduation and registration with the Midwifery Council to provide lead community

* Corresponding author at: Women's Health Research Centre, Department of Primary Health Care and General Practice, University of Otago, PO Box 7343, Wellington 6242, New Zealand. Tel.: +64 4 806 1893, +64 21 463762; fax: +64 4 385 5539.
E-mail address: bev.lawton@otago.ac.nz (B. Lawton).

http://dx.doi.org/10.1016/j.ijgo.2015.07.003
0020-7292/

care to women" [10]. However, this recommendation is yet to be formally adopted by the Ministry of Health.

The present study sought to determine whether experience, defined as years since midwifery registration date, of both midwife-only and nurse-midwife LMCs is related to perinatal mortality. It was hypothesized that pregnancies cared for by early career midwives would be associated with increased perinatal mortality compared with those cared for by midwives with 5–9 years of post-midwifery qualification experience.

2. Materials and methods

The present retrospective cohort study used routinely collected data on pregnancy and delivery events and mortality in NZ, and linked them to publicly available midwifery registration data. The study population included all pregnancies resulting in live births (or stillbirth at a gestational age of ≥20 weeks or weighing >400 g) in NZ between January 1, 2005, and December 31, 2009, for which the mother had booked with a midwife as a LMC before labor. Multiple pregnancies were assessed as separate birth events. Pregnancies were excluded if there was no assigned midwife LMC before labor and if the midwife's qualification and/or experience could not be determined from the professional registration data. Patient consent was not required because patient data were based on non-identifiable encrypted National Health Index (NHI) numbers. Ethical approval was granted by the multi-region ethics committee (MEC/12/EXP/046).

Pregnancy, birth, and mortality events were obtained from the National Maternity Collection and the Mortality Collection from the NZ Ministry of Health's Information Group (MOHIG) [11,12]; both these collections have high coverage of births and deaths and include national inpatient data. Pregnancy and birth datasets were linked by a pregnancy key number which uniquely identifies pregnancies. These data were linked to mortality records using the infant's encrypted NHI number, a unique identifier assigned to each person using health and disability support services. Socioeconomic status was defined using NZ Deprivation Index 2006 quintiles, a validated, census-derived area-based index of relative socioeconomic deprivation, in which quintile 1 represents the least deprived areas and quintile 5 the most deprived [13].

Date of midwife registration was determined from the publicly-accessible NZ Midwifery Council website [14], which contains names, midwifery registration date, and up to five qualifications (including year and description). This information was matched to the master dataset of midwife registration identifiers by the MOHIG, and subsequently provided to the research team as an anonymized dataset with identifiers as month/year of registration. The midwife identifiers allowed mapping of midwife qualification and experience to the pregnancy/birth/mortality dataset.

The infant was the unit of analysis (delivery and birth event). The primary outcome measure was perinatal death. The outcome included all perinatal deaths (fetal deaths and neonatal deaths up to 27 days).

The primary risk factor was the midwife's experience at the time of booking, defined as number of years from the date of post-professional midwifery registration to the date of booking for that pregnancy (when the pregnant woman enlisted in the care of the midwife). Experience was treated as categorical in analyses (<1, 1 to <2, 2 to <3, 3 to <4, 4 to <5, 5–9, 10–19, and ≥20 years of post-registration experience [eight categories]). Midwives with their first qualification as a midwife (e.g. Bachelor of Midwifery) were categorized as midwife-only LMCs, whereas midwives with a first nursing qualification (e.g. Bachelor of Nursing) were categorized as nurse-midwife LMCs.

Risk subsets were determined for pregnancies on the basis of available demographic and obstetric history variables. A pregnancy was classified as low risk (maternal age 21–39 years at delivery, singleton pregnancy, and parity of ≤3) or high risk (maternal age <21 years or >39 years, twin/multiple pregnancy, and parity of four or more) [15,16]; the high-risk subset was chosen if any of these factors were found, whereas the low-risk classification required that all variables were present and no risk criteria were met.

All statistical analyses were conducted using SAS 9.2 (SAS Institute, Cary, NC, USA). Descriptive statistics (frequencies, percentages) are presented by experience group for sociodemographic and clinical characteristics, including absolute counts of mortality (stillbirth, early neonatal, and late neonatal).

Poisson regression was used to estimate relative differences in perinatal mortality by midwife experience. Rates are presented by experience group (rates per 1000 births, plus 95% confidence intervals [CIs]) along with rate ratios (RRs) and 95% CIs (reference group: 5–9 years of post-registration experience). For analyses using experience as a categorical risk factor, Type 3 effect hypothesis tests were conducted to assess whether risk of perinatal mortality differed by experience group (to protect against Type 1 error when considering multiple comparisons). Hypothesis tests for trend across experience groups were also performed (from Poisson regression treating experience group as an ordinal variable). Reported P values are likelihood ratio tests (LR tests) from these models and were considered significant at less than 0.05.

3. Results

This retrospective cohort study included 233 215 births, of which 83 043 were linked to a midwife-only LMC and 150 172 to a nurse-midwife LMC (Fig. 1).

Maternal sociodemographic factors and delivery data for the 83 043 midwife-only LMC deliveries are presented in Table 1. Across experience groups, 41 298 (49.7%) pregnancies were recorded for mothers of NZ European ethnicity and 51 988 (62.6%) deliveries were classified as normal (spontaneous vertex vaginal birth without obstetric assistance). Experience in the midwife cohort was distributed across the low to middle ranges, with 48 575 (58.5%) midwife-LMC pregnancies being cared for by a midwife with less than 5 years of post-registration experience. Case mix analysis indicated a comparable distribution of high- and low-risk pregnancies across experience groups (Table 1), with 21.4%–24.3% being high-risk pregnancies (slightly lower [17.7%] in the highest experience group).

Perinatal mortality type is described in Table 2. The highest proportion of perinatal deaths that occurred in the early neonatal period was among midwives with less than 1 year of post-registration experience; the lowest proportion was among those with 10–19 years of experience. The rate of perinatal mortality among all pregnancies by experience group for midwife LMCs ranged from 8.1 deaths per 1000 births (<1 year group) to 4.9 deaths per 1000 births (10–19 years group) (Table 3). The overall LR test of mortality by experience group (categorical) was not significant (χ^2 (7 df) 8.0, $P = 0.329$). Comparisons between experience groups suggested a 33% higher mortality rate (RR 1.33; 95% CI 1.02–1.73) in the under 1 year group compared with the reference group (5–9 years). In absolute terms, this equates to two more perinatal mortalities per 1000 births among midwives with under 1 year of experience. Tests for trend indicated a significantly decreasing trend in rate of mortality over experience groups (χ^2 (1 df) 4.7, $P = 0.031$; experience treated as an ordinal variable).

Analysis restricted to the low-risk pregnancies (n = 59 678) indicated similar mortality rate patterns to the overall pregnancies analysis (e.g. for midwives with <1 year of experience compared to the 5–9 years category: RR 1.35, 95% CI 0.96–1.89). The LR test for differences in perinatal mortality by experience category was not significant (χ^2 (7 df) 6.2, $P = 0.523$), nor was the test for trend by experience category (χ^2(1 df) 2.62, $P = 0.105$) (Supplementary Material S1).

Maternal sociodemographic and delivery characteristics for the 150 172 nurse-midwife LMC pregnancies are presented in Table 4. Of these pregnancies, 80 301 (53.5%) were to mothers of NZ European ethnicity and 95 795 (63.8%) were had a normal delivery method (with similar proportions by experience group). Case mix analysis indicated that 18.8%–24.5% of the pregnancies with nurse-trained LMCs