Vaccine xxx (2018) xxx–xxx

Contents lists available at ScienceDirect

Vaccine

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

Strategies to implement maternal vaccination: A comparison between standing orders for midwife delivery, a hospital based maternal immunisation service and primary care

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ARTICLE INFO

Article history:
Received 13 September 2017
Received in revised form 11 November 2017
Accepted 20 December 2017
Available online xxxx

Keywords:
Standing orders
Vaccines in pregnancy
Maternal vaccination
Vaccination

ABSTRACT

Maternal vaccination is a safe and effective strategy to reduce maternal and neonatal morbidity and mortality from pertussis and influenza. However, despite recommendations for maternal vaccination since 2010, uptake remains suboptimal. Barriers to uptake have been studied widely and include lack of integration of vaccination into routine pregnancy care and access to vaccination services. Standing orders for administration of vaccines without the need for a physician review or prescription have been demonstrated to improve uptake as part of multi-model interventions to increase antenatal influenza and post-partum pertussis vaccination.

Monash Health is a university-affiliated, public healthcare network in Melbourne, Australia providing maternity services across three hospitals. In this study we compared three different immunisation models – an immunisation nurse-led immunisation service, standing orders for midwife-administered pertussis vaccination within pregnancy care clinics, and delivery by general practitioners in primary care. Uptake of maternal pertussis vaccine was measured as recorded in the state-wide perinatal data collection tool.

Uptake improved significantly at all three hospitals over the study period with the most significant change (39% to 91%, $p < .001$) noted at the hospital where standing orders were introduced.

Our study highlights the diversity of immunisation service models available in maternity care settings. We demonstrated significant improvement in uptake of maternal pertussis vaccination with introduction of midwife-administered vaccination but each maternity service should consider the model best suited to their needs.

1. Introduction

In recent years maternal immunisation has become an integral component of pregnancy care. Following the lead of the United Kingdom (UK) and the United States (US), many countries now recommend maternal influenza and pertussis vaccination during pregnancy. Both vaccines have been demonstrated to be highly efficacious in preventing maternal and neonatal morbidity and mortality [1–3].

However despite demonstrated efficacy and safety, uptake of these vaccines during pregnancy remains suboptimal. Barriers to uptake include failure to incorporate vaccination into routine pregnancy care, lack of healthcare provider (HCP) recommendation, concerns about safety, and access to vaccination services [4–6].

Numerous studies have highlighted the importance of HCP recommendation as an enabler of vaccination [7–10]. As providers of population level vaccination programs, primary care physicians are well versed in discussing immunisation and often have an established capacity to store and administer vaccines in their clinics. However, in Australia and the US, midwives or obstetricians are often the only HCP many pregnant women consult during pregnancy so the logistics of incorporating maternal vaccination into pregnancy care need to be considered. Barriers to maternity

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https://doi.org/10.1016/j.vaccine.2017.12.080
0264-410X/

services providing vaccination include lack of the necessary infrastructure to support vaccination, lack of training and knowledge of maternity care providers regarding current recommendations, and concerns about liability and reimbursement [4,5].

Studies have also demonstrated that women's intention to be vaccinated does not necessarily equate with receipt of vaccination. Competing time pressures, priorities, and difficulty accessing immunisation providers are barriers to vaccination despite an intention to do so [11]. In a study of influenza vaccination in pregnancy, women were 2.7 (CI 1.1–6.9, p = .035) times more likely to be vaccinated if the vaccine was offered at their pregnancy care facility compared to those who had to get the vaccine elsewhere [7].

At some locations, further barriers to vaccine administration include a requirement for a prescription from a doctor and obtaining the vaccine from a pharmacy. Such barriers can be readily overcome by instituting standing orders for midwife administration of vaccines without the need for physician review or prescription. The US Advisory Committee on Immunisation Practices has recommended the use of standing orders to improve immunisation rates for more than a decade [12]. One community hospital in the US increased their post-partum pertussis vaccine uptake from 18% to 69% (p < .001) with introduction of standing orders [13]. Similarly, two other US hospitals implemented standing order models and reported increased vaccination rates to approximately 80% compared to only 20% overall in the US [14–16].

In this study we implemented standing orders for midwife administration of acellular pertussis-containing vaccine (dTpa) during the third trimester and report on the impact of this change. In addition, with three different immunisation models utilised within the same healthcare network, this study provides a unique opportunity to directly compare different immunisation models in the Australian context.

2. Materials and methods

Monash Health is the largest public healthcare network in Melbourne, Australia providing maternity care to over 10,000 women per year across three hospitals. Hospital A is a tertiary obstetric referral centre with an onsite immunisation service. Hospital B provides primary and secondary level maternity care to a large migrant and refugee population with approximately 3000 deliveries per annum. Hospital C provides primary and secondary level maternity care for approximately 3000 women each year.

All States and Territories in Australia fund dTpa for pregnant women. Women can access vaccination through primary care, local government immunisation services and in some states through pharmacies. In addition, at our institution pregnant women are offered free vaccination through a nurse-led immunisation service located at hospital A. Despite being available to all pregnant women of the health network, our earlier work suggests that the immunisation service is almost exclusively accessed by women receiving pregnancy care at hospital A [8]. This is most likely due to the geographic distance of both Hospital B and Hospital C from hospital A. Therefore, prior to this study women attending hospital A received their vaccination through the immunisation service, and women attending hospital B and hospital C were predominantly referred to their general practitioner (primary care) for vaccination.

To facilitate equitable access to onsite maternal vaccination across all three maternity services, and improve uptake, the existing standing order for post-partum administration of dTpa by midwives was expanded to include antepartum administration. The amendment was approved in June 2015. A standing order enables midwives to administer vaccination after obtaining informed consent from the woman, without the need for a prescription or order from a medical doctor. Standing orders were implemented at hospital B in October 2016, but had not yet been implemented at hospital C at the time of the study. As such we were able to compare three different models of immunisation service delivery- a dedicated immunisation nurse-led immunisation service (hospital A), standing orders for midwife administration within pregnancy care clinics (hospital B), and provision by primary care (hospital C). Education regarding standing orders was provided to maternity care staff at hospitals B and C in the week prior to and week following implementation of standing orders at hospital B.

Prior to hospital discharge pregnant women's self-reported receipt of antenatal pertussis and influenza vaccines is recorded by midwives as part of the Victorian Perinatal Data Collection in the Birthing Outcome System (BOS) database at all three maternity services. Prior to 17th January 2017 the antenatal vaccination field could only be completed post-partum. Since 17th January 2017 midwives have also been able to complete these fields during any antenatal visit.

The accuracy of BOS in capturing maternal vaccination was validated by comparing vaccination records from the immunisation service at hospital A with the subsequent entry on BOS. This was performed for women vaccinated between March and May 2016. This validation study was repeated for women vaccinated in February–April 2017 following the changes facilitating antepartum data entry to determine the effect of this change on the accuracy of the database.

A time series analysis of dTpa uptake as captured in BOS was performed to assess the impact of the introduction of standing orders at hospital B. Power calculations determined that a sample size of 500 women was needed in both pre- and post-implementation groups based on 90% power to detect a 10% difference in uptake. We estimated 20 vaccinations would be administered per week at hospital B and therefore required uptake data for 6 months post-implementation. Uptake was assessed in fortnights from 1st September 2015 to 30th June 2017 at all three hospital sites. This provided uptake rates for births 13 months prior to the introduction of standing orders and for eight months following with data during the month of implementation not included in the analysis. The post-implementation period was further divided to account for the delay between administration of dTpa at 28–32 weeks gestation and those women birthing. Thus the three periods of comparison were (1) Pre-implementation of standing orders: 1st September 2015–26th September 2016; (2) First three months post-implementation: 8th November 2016–30th January 2017; (3) Subsequent post-implementation period: 31st January 2017–3rd July 2017 (when women vaccinated using standing orders were likely to have birthed and therefore be entered into BOS).

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS; IBM Corporation. IBM SPSS Statistics for Windows, Version 22.0. Armonk, New York: IBM Corp, Released 2013). The Mann Whitney *U* test was used to determine the significance of differences in uptake between periods 1 and 2 and 2 and 3 at each hospital. To evaluate the difference in accuracy of BOS a Pearson chi-squared test was performed. A p-value of less than .05 was deemed to be significant for all analyses. The study was approved by our institution's research support service as a Quality and Service Improvement project (5th May 2017, Ref RES-17-0000-248Q).

3. Results

3.1. Uptake

At hospital B uptake was recorded for 2848 deliveries over 56 weeks prior to implementation of standing orders and for 1766

Please cite this article in press as: Krishnaswamy S et al. Strategies to implement maternal vaccination: A comparison between standing orders for midwife delivery, a hospital based maternal immunisation service and primary care. Vaccine (2018), https://doi.org/10.1016/j.vaccine.2017.12.080