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Designing a multi-component intervention (P3-MumBubVax) to promote vaccination in antenatal care in Australia

Running title: Antenatal vaccine promotion intervention

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group). We particularly acknowledge the long-term interest and investment in this project by Paul Effler of the Communicable Disease Control Directorate, on behalf of the Government of Western Australia, Department of Health.

Conflict of interest

Katie Attwell has previously been employed by the Immunisation Alliance of Western Australia to conduct social research using an unrestricted grant from Sanofi Pasteur. She has received travel, accommodation and conference registration support from GSK, and travel, accommodation and speaker fees from Merck. The other authors report no conflicts.

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Author contributions

MD, KA, JK and SBO drafted the methodology for the study. The interviews and focus groups were conducted by JK, KA and YH. JK and KA analysed the data, with input from YH and MD. All authors provided input and/or feedback on intervention elements, with JL and AR providing particular input on SKAI-related elements and text messages, respectively. SBO provided substantial input and guidance in the application of the P3 model and adaptation of VaxChat. All authors contributed to drafts of the manuscript and approved the final submitted version.

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Keywords

midwifery; vaccination; health promotion; health services; communication; maternal health services; implementation science

Abstract

Issue addressed

Coverage of maternal influenza and pertussis vaccines remains suboptimal in Australia, and pockets of low childhood vaccine coverage persist nationwide. Maternal vaccine uptake is estimated to be between 35% and 60% for influenza vaccination and between 65% and 80% for pertussis vaccination. Australian midwives are highly trusted and ideally-placed to discuss vaccines with expectant parents, but there are no evidence-based interventions to optimise these discussions and promote maternal and childhood vaccine acceptance in the Australian public antenatal setting.

Methods

We gathered qualitative data from Australian midwives, reviewed theoretical models, and adapted existing vaccine communication tools to develop the multi-component P3-MumBubVax intervention. Through 12 interviews at two Australian hospitals, we explored midwives' vaccination attitudes and

values, perceived role in vaccine advocacy and delivery, and barriers and enablers to intervention implementation. Applying the theory-based P3 intervention model, we designed intervention components targeting the Practice, Provider and Parent levels. Midwives provided feedback on prototype intervention features through two focus groups.

Results

The P3-MumBubVax intervention includes practice-level prompts and identification of a vaccine champion. Provider-level components are a vaccine communication training module, learning exercise, and website with printable fact sheets. Parent-level intervention components include text message reminders to receive influenza and pertussis vaccines in pregnancy, as well as online information on vaccine safety, effectiveness and disease severity.

Conclusions

The P3-MumBubVax intervention is the first Australian antenatal intervention designed to support both maternal and childhood vaccine uptake. A pilot study is underway to inform a planned cluster randomised controlled trial.

So what?

Barriers to vaccine acceptance and uptake are complex. The P3 model is a promising evidence-informed multi-component intervention strategy targeting all three levels influencing healthcare decision-making.

Background

Vaccination for influenza and pertussis during pregnancy protects both pregnant women and infants, but maternal vaccination coverage in Australia remains sub-optimal. Maternal influenza vaccination coverage is estimated to be between 35-60%, and pertussis coverage between 65-80% (1, 2). Pockets of low childhood vaccine coverage also persist. This leaves many pregnant women and their infants vulnerable to the morbidity and mortality associated with these vaccine-preventable diseases.

Reviews find that the most effective strategies involve multi-component interventions (3, 4). Interventions targeting practices, providers and patients have shown promise for promoting maternal, adolescent or childhood vaccines in other countries. They involve provider and patient reminders, informational resources addressing vaccine effectiveness and safety, and structural levers such as on-site vaccinations and standing orders (no prescription required) (5-10). “P3” is an

innovative, theory-based intervention model developed at Emory University, USA to design intervention components at the three interconnected levels of healthcare delivery (5, 6). P3 applies strategies from behavioural economics and builds on the Health Belief Model, Social Cognitive Theory, and the Systems Model of Clinical Preventive Care (5).

Provider recommendation is the primary driver of vaccine uptake in antenatal care settings (6, 11), and expectant parents want to discuss maternal and childhood vaccines in pregnancy (12). In Australia, midwives are a key healthcare provider to discuss vaccines and facilitate uptake. They are highly trusted and play a major role in antenatal care (12), particularly in the public hospital setting where three-quarters of Australian women give birth (13). Australian midwives generally support antenatal vaccination and view it as part of their role, but they receive limited education on immunisation or how to discuss vaccines with expectant parents (14-16).

A P3 maternal vaccination intervention has been piloted (6) and is currently being evaluated in the US setting with obstetricians, but no such model has been tested in the Australian public antenatal setting. Therefore, building on theory and existing interventions, and in consultation with Australian midwives, we iteratively designed a multi-component P3 intervention to optimise midwives' vaccine discussions with expectant parents and improve uptake of maternal and childhood vaccines.

Methods

This "P3-MumBubVax" intervention package was developed through two rounds of formative qualitative research (17). The Round 1 exploratory stage, described in full elsewhere (16), included 12 in-depth interviews with midwives at a tertiary maternity hospital in Western Australia, where immunisation-accredited midwives deliver maternal vaccines onsite, and another in Victoria, where maternal vaccines are not routinely delivered onsite. The interviews explored midwives' vaccination needs, values, practice and preferences. We then designed a prototype intervention package based on the key findings from Round 1, previous research with parents (11, 12, 18-21), and existing interventions like the US-based P3 intervention and the Australian SKAI (Sharing Knowledge about Immunisation) childhood vaccination package for primary care providers and parents (5, 18).

In the Round 2 pretesting stage, we solicited feedback on intervention ideas and prototype designs through midwife focus groups at the same hospitals. Participants discussed their preferred intervention length, terminology, format, design and content; current training; vaccine recommendations; likelihood of utilising intervention components; and goals for antenatal vaccine discussions (Appendix 1).

Midwives were recruited for interviews and focus groups with support from clinic managers at each site. Participants agreed consent, completed a demographic survey, and received $25 for their time. Ethics approval was obtained in Western Australia (RGS00000000736) and Victoria (HREC 37338A). Interviews and focus groups were recorded, transcribed, and analysed in two separate rounds of thematic template analysis (22).

Results

Participants

Twelve midwives participated in interviews: seven in Victoria (VIC) and five in Western Australia (WA) (interview participant demographics published elsewhere) (16). Two focus groups were held, involving five midwives in VIC and thirteen in WA (Table 1). Three midwives from the WA focus group had previously participated in Round 1 interviews.

Summary of findings

In the Round 1 interviews, midwives were willing to make a recommendation to vaccinate, and wanted training and informational resources about vaccines for themselves and to share with parents in a variety of formats (16).

Focus group participants in Round 2 shared similar views and experiences, confirming that our proposed intervention was suitable and aligned with their professional ethos. Common themes included the importance of informed choice; maintaining strong relationships with expectant parents; a need for succinct, easy-to-access vaccine and disease facts and information sources to support their discussions; and a desire for more skills in responding to vaccine misperceptions and/or concerns. The focus groups shaped the format, content and language we used in the final intervention.

P3-MumBubVax intervention components

The finalised intervention components, informed by our qualitative findings, are outlined in Figure 1 and are described below. Given the variation in models of antenatal care across states and hospitals in Australia, aspects of the intervention would need to be modified for the local context (e.g. provision of vaccines onsite, paper vs Electronic Medical Records (EMRs)).

Practice-level components

Sticker prompts: We created physical stickers for paper maternity records or other medical charts to record not only when women received vaccines (either onsite or elsewhere), but also when the

midwives discussed vaccines with expectant parents. Where hospitals use EMRs, stickers could be replaced by digital prompts.

Vaccine champion: We identified a midwife or clinic manager at each site to act as a 'vaccine champion', to facilitate intervention implementation and promote vaccination.

Provider-level components

Online communication and education training: To support vaccine recommendations and provide midwives with training on communication strategies and key facts about maternal and childhood vaccines and vaccine-preventable diseases, we produced an online training video called VaxChat Australia. This was adapted from a training video developed for US obstetricians by the Emory University P3 team (5). The communication approach was also informed by the SKAI intervention package, which applies principles of Motivational Interviewing to address childhood vaccines (23).

VaxChat Australia is broken into three sections: (i) framing (structure of message delivery), (ii) content (what you recommend), and (iii) your clinic (making vaccination routine). The video also provides guidance about introducing other childhood vaccines and highlights that the website is linked to the comprehensive SKAI resource.

Personalised vaccine discussion cheat sheet: After watching VaxChat Australia, midwives complete an online 'cheat sheet' to select key vaccine facts they want to have on hand for easy recall and point-of-care use. In this exercise, midwives select one key fact from a list of 3-5 facts for each of the following topics: general vaccine safety; influenza, pertussis, and hepatitis B severity; flu, pertussis, and hepatitis B vaccine safety; and flu, pertussis, and hepatitis B vaccine benefits. The final list of 10 facts is emailed to them in a format that fits into a lanyard ID badge.

MumBubVax website: The provider portal of the MumBubVax website is home to the VaxChat Australia training video and learning exercise, data on vaccine safety and effectiveness and disease severity, and brief downloadable fact sheets.

Parent-level components

Parent prompts - text message reminders: We developed text message reminders for clinics to send to pregnant women about maternal influenza and pertussis vaccines. Women at the VIC hospital were directed to GPs to receive the vaccines, but the message could instead state that the vaccines would be provided at an upcoming antenatal appointment.

Message timing, frequency and content drew from evidence (10, 20) and our Round 1 midwife interviews. Messages were personalised and the sender was identified as the woman's antenatal

clinic to enhance credibility (20). Messages opened with a statement about disease severity, emphasised vaccine effectiveness, and ended with a call to action.

Our midwife participants discussed influenza at the booking visit (16-20 weeks) and pertussis around 28 weeks, in keeping with the national recommendations at the time of our data collection. However, timing for pertussis vaccine delivery has been changed to 20 weeks (24). For future implementation of this intervention, the reminders will therefore be sent to women twice following their booking visit, to prompt both influenza and pertussis vaccination, with a follow-up reminder after the 28-week visit.

MumBubVax website: The parent-facing MumBubVax website features detailed vaccine and disease information. Midwives expressed that online resources for parents were valuable, but most available resources were overly simplistic. Website information is broken into expandable tiered sections so parents seeking extensive vaccine safety and effectiveness information can access it, but it is not overwhelming. It is framed to highlight the risks of influenza and pertussis to the infant, based on research showing that women are more concerned about risks to their babies than risks to their own health (11). The resources emphasise the severity of influenza, which many women see as less serious than pertussis (19). The site also includes downloadable fact sheets and infographics on pertussis, influenza and birth hepatitis B, and links to extensive childhood vaccine information through the SKAI website.

Discussion

The P3-MumBubVax intervention is designed to address the needs and preferences of Australian midwives and expectant parents. It is innovative and scalable, while also building on evidence and theory from Australia (18), Canada (8) and the US (5-7, 10). It seamlessly links with the SKAI website, which provides high-quality information about childhood vaccines, reflecting expectant parents' preferences for this information in pregnancy (12). A review of interventions to increase maternal vaccine uptake, published after the design of our intervention, supports many of the concepts and features of P3-MumBubVax (3).

The intervention components reflect and account for local contextual differences in Australian public antenatal settings, with options to adapt them to other antenatal care settings, such as GP-led or private obstetric care. Elements such as the content of the website and the timing of the text messages are easy to update to reflect the latest statistics and recommendations.

We anticipated that midwives might raise concerns about the intervention increasing the length of consultations. However, this issue did not arise, and a similar multicomponent intervention trialled

in the US with paediatricians found that it increased conversation efficiency without increasing consultation time (7). Additionally, though previous research suggested that some midwives may be reluctant to recommend vaccination (25), midwives in our study emphasised that they could and did make vaccine recommendations.

Study limitations

This study had some limitations. The focus group sample size was small for a standalone qualitative study, but it was the second round of an iterative process that built on substantial additional published literature and our Round 1 interviews. While we were able to incorporate most of the midwives' feedback, suggestions to translate parent materials into other languages or provide face-to-face facilitated group training were not feasible due to budget constraints. It was also outside the study scope to adapt the intervention for different models of antenatal care, although this is planned. Though we did not involve parents directly in this study, our intervention is informed by well-established data on the vaccination information needs and preferences of pregnant women and parents (12, 18, 20, 21).

Conclusion

Suboptimal coverage of vaccines in pregnancy presents a major risk for maternal and infant health. Furthermore, as new maternal vaccines are introduced (e.g. Group B Streptococcus and Respiratory Syncytial Virus), maternal vaccination discussions will become more challenging and complex. P3-MumBubVax is the first multi-component intervention in Australia to target the practice, provider and parent levels to promote acceptance and uptake of maternal and childhood vaccines. The P3-MumBubVax intervention package is being piloted to evaluate feasibility and acceptability. This will inform a national cluster-randomised controlled trial to evaluate its efficacy and potential to adapt to other antenatal care settings.

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Table 1: Focus group participant details

	VIC	WA
Number of focus group participants	n=5	n=13

Age range *(n)*	18-29 *(3)* 30-39 *(2)* 40-49 *(0)* 50-59 *(0)* 60+ *(0)*		18-29 *(2)* 30-39 *(4)* 40-49 *(3)* 50-59 *(2)* 60+ *(2)*	
Years working as a midwife mean (SD)	3.6 (1.9)		14 (11.1)	
In current role as a midwife, sees same mothers regularly *(n)*	Yes *(0)* No *(5)*		Yes *(11)* No *(2)*	
Midwifery qualifications *(n)*	Nursing Degree + Midwifery Qualification Direct Entry Midwifery Degree Hospital based nursing and midwifery training	*(3)* *(2)* *(0)*	Nursing Degree + Midwifery Qualification Direct Entry Midwifery Degree Hospital based nursing and midwifery training	*(11)* *(1)* *(1)*
Received immunisation training as part of midwifery qualification *(n)*	Maternal and childhood immunisation Maternal immunisation only None at all	*(4)* *(1)* *(0)*	Maternal and childhood immunisation Maternal immunisation only None at all	*(4)* *(1)* *(7)**
Undertook Continuing Professional Development in immunisation *(n)*	Maternal and childhood immunisation Maternal immunisation only None at all	*(2)* *(1)* *(2)*	Maternal and childhood immunisation Maternal immunisation only None at all	*(8)* *(2)* *(3)*

*One participant was a midwifery student on placement so did not complete this question

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Figure

Figure 1: P3-MumBubVax intervention package