



Attitudes about and access to influenza vaccination experienced by parents of children hospitalised for influenza in Australia



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ABSTRACT

Introduction: In Australia, influenza hospitalises more children than any other vaccine preventable disease does. Children aged six months or older are recommended to receive annual influenza vaccines, and pregnant women are recommended vaccination to protect infants aged up to six months. However, vaccine uptake is low. This study explored influenza vaccination knowledge and behaviours of parents of children who were hospitalised for influenza, in order to inform strategies that target barriers to uptake.

Methods: We conducted 27 semi-structured interviews with parents/caregivers during or shortly after their child's hospitalisation for laboratory-confirmed influenza in 2017. Questions were guided by the Social Ecological Model exploring all levels of influence on vaccination uptake from the intrapersonal through to policy, via the parents' perspective. Transcripts were inductively analysed. Themes were categorised into the components of the Capability-Opportunity-Motivation-Behaviour (COM-B) model.

Results: 20/27 children were aged six months or older; 16/20 had not received an influenza vaccine in 2017. Mothers of 4/7 infants aged less than six months were not vaccinated in pregnancy. The themes regarding barriers to influenza vaccination were: (1) Limited Capability – misinterpretations and knowledge gaps, (2) Lack of Opportunity – inconvenient vaccination pathway, missing recommendations, absence of promotion to all, and the social norm, and (3) Missing Motivation – hierarchy of perceived seriousness, safety concerns, a preference for 'natural' ways. Though most parents, now aware of the severity of influenza, intended to vaccinate their child in future seasons, some harboured reservations about necessity and safety. When parents were asked how to help them vaccinate their children, SMS reminders and information campaigns delivered through social media, schools and childcare were suggested.

Conclusion: Improving parents' and providers' knowledge and confidence in influenza vaccination safety, efficacy, and benefits should be prioritised. This, together with making influenza vaccination more convenient for parents, would likely raise vaccine coverage.

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1. Introduction

Each year, between three and five million severe influenza cases and 650,000 influenza-related deaths occur globally [1]. In Australia, influenza causes more hospitalisations and deaths in children than any other vaccine preventable disease (VPD) [2,3].

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For infants aged up to five months rates are fourfold higher (192 hospitalisations per 100,000 population), and for children aged six to 23 months rates are twofold higher (109 per 100,000), compared to people aged ≥ 75 years (46 per 100,000) [4]. Most children hospitalised for influenza in Australia do not have comorbid conditions [5–7], however those with comorbid conditions are more likely to be admitted to the intensive care unit [5,6]. Complications such as febrile seizures, pneumonia, myositis and encephalitis can occur [7,8].

There are two vaccination strategies recommended in Australia to protect children from influenza: vaccination during pregnancy, which has been demonstrated to protect infants of vaccinated mothers from influenza up to age six months [9], and vaccination for all people six months of age and older [10]. However, under the Australian National Immunisation Program (NIP), which provides free vaccines against multiple diseases, these strategies are only funded for some: children with comorbidities that predispose to severe infection, Aboriginal and/or Torres Strait Islander people, and pregnant women [11]. The study we report below involved interviews conducted in 2017 when only Western Australia (WA) funded seasonal influenza vaccination for all children aged between six months and five years [12]. Children not within these categories could receive the vaccine with the provision of a script from a medical professional such as general practitioner (GP), a pharmacy vaccine purchase and return to the provider for injection, or at some community or council health centres (of which have sporadic opening days and hours).

Influenza vaccine coverage in Australia is suboptimal. As assessed by data obtained from the Australian Immunisation Register (AIR), less than 4% of non-Indigenous, and less than 12% of Aboriginal and/or Torres Strait Islander children, aged six months to under five years, received at least one influenza vaccine in 2016 [13]. However, this estimate may be affected by under-reporting to the AIR, which although uncommon for routine child vaccines, may be higher for influenza [14,15]. For children aged six months or over hospitalised for an acute respiratory infection (ARI) (but test-negative for influenza) in 2014, of whom approximately 38.6% had a comorbidity, only 12.4% of all children were vaccinated [6]. An estimated 40–61% pregnant women were vaccinated during 2014–2016 in Australia [16–20].

Studies at a general population level have identified multiple barriers to paediatric and antenatal influenza vaccination in Australia. Barriers common to both groups include: lack of health care provider (HCP) recommendation [16,17,19,21–24]; HCP advising against vaccination [16,17,19,22,23,25–27]; safety concerns [16,17,19,21,23–28]; competing priorities [5,22,24–26]; lack of understanding of the necessity of vaccination [16,19,21–24,26,28,29]; and being unaware of the recommendation to vaccinate [21,22,24,25,29]. Further barriers specific to paediatric influenza vaccination include difficulties in organising and securing an appointment [28,30], and the requirement to have yearly vaccinations [30]. Barriers specific to antenatal influenza vaccination include not being pregnant during influenza season [24,27,31], vaccination not being incorporated into standard antenatal care [24], and it not being a usual behaviour prior to pregnancy [16,19,22,27,31]. However, despite this depth of knowledge about barriers, most of these studies sought to understand those related to influenza vaccination in pregnancy [16,17,19,22,24,27,29,31], and thus there remain gaps in our understanding of behaviour regarding paediatric influenza vaccination, particularly in non-pandemic years and children without comorbid conditions. Importantly, no studies have explored children hospitalised for influenza to understand the facilitators and barriers to influenza vaccine uptake that these families experience. By virtue of their hospitalisation, most of these children are

representative of the vaccine-preventable disease burden and are the target of strategies to improve control of seasonal influenza in Australia. Additionally, data are lacking on the vaccination intentions of parents subsequent to an influenza hospitalisation of their child. Our primary aim was to understand attitudes about and access to influenza vaccination experienced by parents of children hospitalised for influenza, to inform strategies to improve influenza vaccine uptake.

2. Methods

2.1. Case ascertainment and recruitment

This study was part of a program of research and surveillance being conducted on paediatric influenza hospitalisation by the Paediatric Active Enhanced Disease Surveillance (PAEDS) and Influenza Complications Alert Network (FluCAN) collaboration [5]. In 2017, PAEDS-FluCAN identified 1268 influenza-positive children admitted to sentinel Australian hospitals [5].

Children admitted to tertiary paediatric hospitals in New South Wales (NSW) and South Australia (SA) for laboratory-confirmed influenza during April to October 2017 were identified by surveillance nurses. Methods of case identification have been described in detail elsewhere [32]. Parents/caregivers of these children (hereafter referred to as “parents”) were approached, either by telephone or in person while in hospital, by surveillance nurses to participate in this study. The study was explained as aiming to prevent other children from being hospitalised for influenza. Parents were either sent or given a consent pack while in hospital, with further information about the study. SC or CS then followed up via a telephone call with parents to organise the interview, and then conduct it at the best time for the parent. Purposeful sampling ensured parents of children aged less than six months, children aged six months or over with co-morbidities, or children aged six months or over without comorbidities, were interviewed. This enabled insight into the antenatal and paediatric influenza vaccination strategies to protect children from influenza. Recruitment ceased when SC and CS determined that theme saturation had occurred in these groups, whereby the same overall themes were coming up repeatedly, and no new themes were arising in the latter interviews.

2.2. Application to theory

We used two models to understand parents' access to and attitudes about influenza vaccination (Fig. 1). As Kumar et al (2012) [33] did, we also used the Social Ecological Model (SEM) [34]. This model depicts a stratum of influences on health behaviour (intrapersonal interpersonal, organisational, community and policy). This was applied as a descriptive model to structure the interview questions to understand the parents' perspective of these influences. We were also guided by Michie et al's Behaviour Change Wheel [35]. It is an explanatory model of behaviour proposing that capability, opportunity and motivation influence behaviour (COM-B). Michie et al developed the following definitions:

1. Capability: “the individual's psychological and physical capacity to engage in the activity concerned. It includes having the necessary knowledge and skills.” [35].
2. Motivation: “brain processes that energize and direct behaviour, not just goals and conscious decision-making. It includes habitual processes, emotional responding, as well as analytical decision-making.” [35].
3. Opportunity: “all the factors that lie outside the individual that make the behaviour possible or prompt it.” [35].

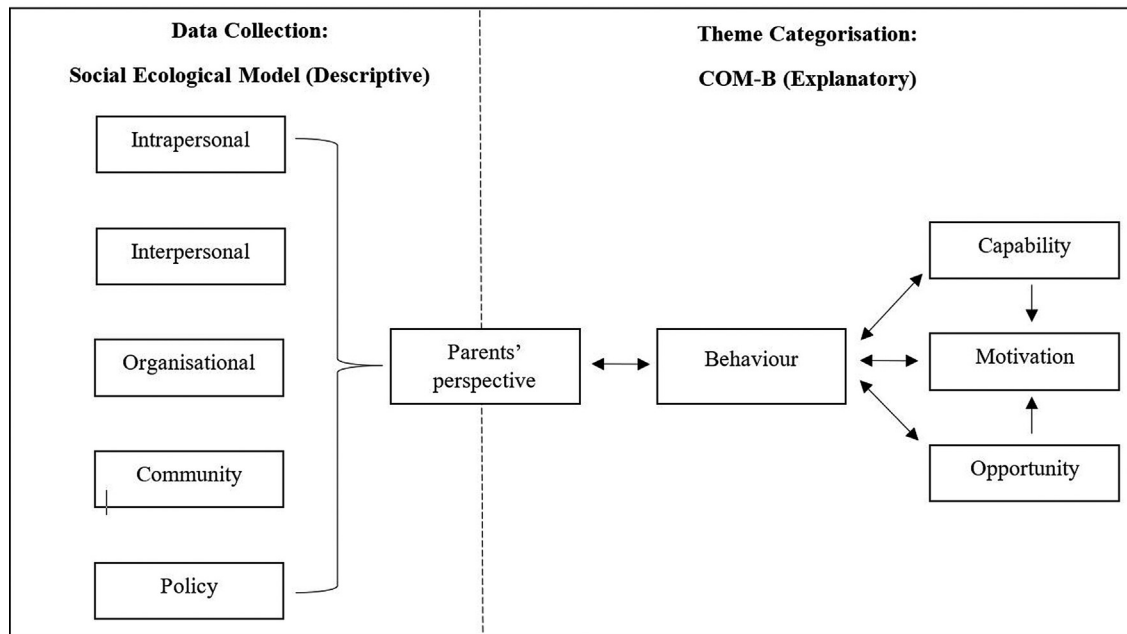


Fig. 1. The theoretical models that guided data collection and categorisation of themes.

2.3. Data collection

Data on demographics, comorbidities, vaccination history, hospitalisation details, and clinical features were collected by surveillance nurses, and semi-structured phone interviews with parents were conducted. We (CS and SC) asked about intrapersonal factors (e.g., knowledge and attitudes regarding influenza disease and antenatal and/or paediatric vaccination, as well as willingness to vaccinate in future seasons), interpersonal factors (e.g., conversations with those in their social network), organisational (e.g., interaction with the health system), community (e.g., vaccine uptake in their community, and their thoughts on how to prevent influenza spreading through community), and policy (e.g., the impact of being eligible for a free influenza vaccine or not). The question guide was assessed by a consumer representative for sensitivity and relevance. All interviews were audio recorded transcribed verbatim by an external transcription company. All transcripts were checked for accuracy by CS and SC before analysis.

2.4. Data analysis

Interview transcripts were thematically analysed, guided by the Braun and Clarke method for thematic analysis in qualitative research [36], and aided by the NVivo 11 software. Initial codes were generated by SC, which were redrafted and/or confirmed in a workshop with CS, HM, JL and two other researchers with experience with qualitative research, and able to give diverse perspectives. Iteratively-developed themes were mapped by SC to COM-B as a general organising framework that would then enable mapping to interventions.

Descriptive statistics of medical and demographic data were calculated on Microsoft Excel. Postcodes were matched to the 2016 Socio-Economic Indexes for Areas (SEIFA) Deciles [37] which rank postcodes between one and ten based on socioeconomic advantage (most advantaged = ten) and disadvantage (most disadvantaged = one) in relation to access to social and physical resources. Postcodes were also matched to an Accessibility/Remoteness Index of Australia (ARIA+) score. This score is based on how far people must travel from their postcode to obtain ser-

vices such as health, education and retail, and is not linked to socioeconomic status [38,39]. Postcodes are scored as “major city,” “inner regional,” “outer regional,” “remote,” and “very remote.”

This study was approved by the Sydney Children’s Hospital Network Human Research Ethics Committee (HREC/16/SCHN/419). Written consent was obtained. Parents and patients have been assigned pseudonyms. In recruitment and interviewing, care was taken to ensure a non-judgemental atmosphere. Aboriginal and/or Torres Strait Islander parents were also offered to have another Aboriginal and/or Torres Strait Islander person (either their friend and/or a HCP) present during the interview for cultural safety.

3. Results

Parents of 45 children hospitalised for influenza between April–September 2017 were invited to participate: 27 (60.0%) were interviewed. Reasons given for declining were being too busy (5/18, 27.8%), single parent (2/18, 11.1%), foster parent (2/18, 11.1%), and cultural differences (1/18, 5.6%). Six (33.3%) gave no reason, and two (11.1%) were lost to follow up after initially expressing interest.

Most children of the parents we interviewed were hospitalised in July (8/27, 30%) or June (6/27, 22%). Most parents (11/27, 41%) were interviewed within the first two weeks after their child was discharged from hospital. All interviews were conducted over the telephone and one interview required the services of a translator. The majority (24/27, 89%) of parents interviewed were female (Table 1). The median length of interview was between 19 and 20 min.

Of the seven children aged under six months when hospitalised, four (57%) had comorbidities, and three (43%) had mothers vaccinated in pregnancy, all at the beginning of their third trimester (Table 1). The infants of vaccinated mothers were born at full term and were aged one day old (a nosocomial infection), 11 weeks old, and 16 weeks old when hospitalised. The median length of stay for infants was five days, and 4/7 (57%) of the children aged less than six months were admitted to intensive care unit (ICU).

Of the 20 aged six months or over, ten (37%) children were aged between six months and less than five years, and ten (37%) were

Table 1
Demographic data on 27 children hospitalised for influenza.

Characteristics	Number (%)
Patients:	
Total children	27 (100)
State of hospitalisation	
New South Wales	16 (59)
South Australia	11 (41)
Age at admission	
0 – <6 months	7 (26)
6 months – <5 years	10 (37)
5 years – <16 years	10 (37)
Weeks between child being discharged from hospital and interview	
Still hospitalised	5 (19)
<2	11 (41)
2 – <4	7 (26)
4 – <8	4 (14)
Male sex	16 (60)
Aboriginal and/or Torres Strait Islander	1 (4)
Born in Australia	26 (96)
Routine vaccines up to date	24 (89)
Children aged <6 months (N = 7)	
Medical comorbidities	4 (57)
Mother received influenza vaccine during pregnancy	3 (43)
Admitted to Intensive Care Unit	4 (57)
Children aged ≥6 months (N = 20)	
Medical comorbidities	11 (55)
Influenza vaccination in 2017	4 (20)
Influenza vaccine received in at least one year in years 2013–2016	5 (25)
Admitted to Intensive Care Unit	0 (0)
Parent/family:	
Female (parent)	24 (89)
English spoken at home	23 (85)
Mother born in Australia	17 (63)
Father born in Australia	16 (59)
Remoteness	
Major city	20 (74)
Inner regional	6 (22)
Very remote	1 (4)
SEIFA Decile 2016 by Postal Area Code	
1–3	8 (30)
4–6	9 (33)
7–9	4 (15)
10	6 (22)

aged between five and 18 years. Eleven (55%) had comorbidities (Table 1). Only four (20%) were vaccinated, and these four children had comorbidities (none of the nine children without comorbidities were vaccinated). Five children (25%) had received an influenza vaccine in previous years, and three of these children were also vaccinated in 2017. The median length of stay was two days. None of the children were admitted to ICU.

Nearly all children (26/27, 96%) were born in Australia, however, many children had parents born outside of Australia. Most children (74%) lived with their families in a major city.

3.1. Barriers to influenza vaccination

Based on parental interviews, the following themes, structured by the elements of COM-B, were defined as the eight major barriers to influenza vaccination. (Fig. 2).

3.1.1. Lack of opportunity

Inconvenient vaccination pathway. Some parents discussed the inconvenience of getting their child vaccinated. This included booking the appointment, getting the child to the health clinic when faced with competing priorities, taking time off work, preparing for the “nightmare” of their child’s fear of needles, paying

for the consultation and the vaccine/s if not eligible for an NIP-funded vaccine.

Despite the inconvenience, most parents were aware of how to access vaccination. However, Allen (see Table 2 for detailed demographic information of those quoted), who lives with his family in a remote rural area of Australia described in detail how he felt the residents of the town were “the poor cousins out [t]here” due to the disadvantage encountered in health and education services. He also said, “I wouldn’t even know if we can get the flu vaccination here.”

There were mixed responses about difficulties in paying for influenza vaccination. Ellie said paying for the vaccine and the consultation is costly, particularly if paying for more than one child, but other parents felt it was not the main barrier.

Three of the four mothers with a child aged less than six months and not vaccinated in pregnancy cited multiple competing priorities experienced during pregnancy as a major barrier to vaccination. Ursula, who’s child was born prematurely at 34 weeks, and four weeks into the influenza vaccination season, said:

“I was going to do it, she just came three days into my maternity leave, and it was on my list of jobs to do, and I just hadn’t got to it. I had...my whooping cough one, because I knew that needed...to get that done by a certain time. So, I had whooping cough done, but I just hadn’t got to the flu vaccine.”

Absence of promotion to all. Parents could recall seeing and hearing influenza vaccination advertisements “everywhere you go.” However, parents of children without comorbidities, none of whom were vaccinated, felt the content was only relevant for those classified as high risk. This was also heard from some parents who mentioned they work in health care and referred to the guidelines to understand their child’s need for influenza vaccination. For example, Abigail, a HCP and mother of Brian, described how after reading the “guidelines,” thought “it’s not really necessary” for Brian to be vaccinated. However, there was a disparity in her views as a mother compared to her views as a HCP. Abigail explained that her routine practice is to recommend the vaccine for all children, but particularly encourages parents of high-risk children to ensure their child is vaccinated.

Finally, some parents said they relied on their child’s personal health record book for information about vaccination requirements. These books are issued at birth and are produced by each state health department. At the time, there was no recommendation for influenza vaccination contained within the NSW or SA books.

Missing recommendations. Some parents reported never receiving a vaccination recommendation from a HCP. This included parents of children with comorbidities, and thus, those who have frequent interactions with HCPs. For the parents of children who did not have comorbidities, most reported few or no opportunities to receive a recommendation to vaccinate. A small number of parents who had actively sought the advice of a HCP regarding influenza vaccination reported feeling dismissed. Despite her request, Cleo was advised by her HCP to not vaccinate her daughter as she did not have comorbidities.

The social norm. Most parents, especially those of children aged less than five years, could recall conversations about vaccination with their friends and were of the perception that their friends’ children had the same vaccination status as their child: most often, fully vaccinated for vaccines provided for all children on the NIP, but not vaccinated against influenza.

Nearly all parents reported knowing someone who said they or their child either “got sick” from the influenza vaccine, or “got the flu” despite being vaccinated. These anecdotes strongly influenced

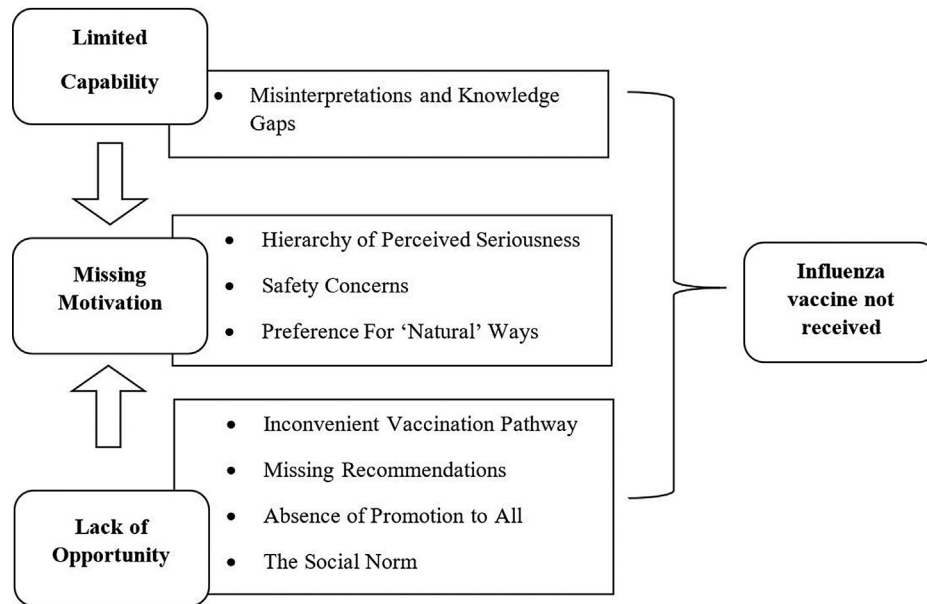


Fig. 2. The barriers to influenza vaccination experienced by parents of children hospitalised for influenza in 2017.

Table 2
Demographics of quoted participants.

Participant's Pseudonym	Patient			Child has comorbidity	Child received influenza vaccine in 2017, before hospitalisation	Mother vaccinated in pregnancy	Child received influenza vaccine in 2013–2016	Child's routine vaccines up to date
	Child's Pseudonym	Age when hospitalised	Length of stay (days)					
Iliana	Jacinta	8w*	5	No	N/A	No	N/A	Yes
Rachel	Lauren	11w	2	No	N/A	Yes	N/A	Yes
Ursula	Victoria	10w	1	Yes	N/A	No	N/A	Yes
Abigail	Brian	10y 0 m	2	No	No	N/A	No	Yes
Allen	Brenda	13y 9 m	5	No	No	N/A	No	Yes
Cleo	Diane	9y 6 m	1	No	No	N/A	No	Yes
Ellie	Francine	7y 1 m	1	No	No	N/A	Yes (2013)	Yes
India	Jay	10y 4 m	3	Yes	Yes	N/A	Yes (2016)	Yes
Susan	Tamara	10y 11 m	6	Yes	No	N/A	No	Yes
Victoria	Isabel	2y 7 m	1	No	No	N/A	No	No
Wendy	Xavier	14y 2 m	1	Yes	No	N/A	No	Yes
Yolanda	Zoran	1y 10 m	2	No	No	N/A	No	Yes

* w = week, m = month, y = year.

some parents' influenza vaccination decision, but not all. Victoria, whose daughter Isabel had never received a vaccine, said that people's negative experiences regarding influenza vaccination is "just another reason in [her] eyes," to not vaccinate, but she is more heavily influenced by her partner who is "very, very against vaccinations" and what they read online.

3.1.2. Missing motivation

Hierarchy of perceived seriousness. Those who had made a conscious decision to not vaccinate had placed influenza's risk and severity on a hierarchy, sitting below diseases like meningococcal and pertussis that were seen as more dangerous. Alongside this perception was greater confidence in being able to manage a possible influenza infection, where parents viewed the disease, before the child was hospitalised, as common and mild, and one which could be "fought." Parents referred to the vaccines provided for all children on the NIP as the "childhood," "recommended," "compulsory" or "required" vaccines. Parents did not view influenza vaccination in this way, and thus were not making it a priority.

Paradoxically, some parents also mentioned the lengths to which they were actively searching for meningococcal vaccines

during a time in which supply was low and demand was high, while simultaneously not being concerned about influenza vaccination during a large influenza season [40]. Parents also reported often restricting with whom their child could play with and avoided public areas such as parks and shopping malls in an attempt to avoid exposure to VPDs. However, this prevention strategy was not extended to influenza.

Safety concerns. Many parents held concerns about the safety of the vaccine, including on: vaccine ingredients; claims that vaccination weakens the immune system; feeling their children are too young to handle influenza vaccination; possibilities of an adverse event following vaccination; and feeling that the seasonal vaccine is not tested enough before being disseminated. Some parents also reported that they had previously had an adverse event following influenza vaccination, and this was the basis for them or their family no longer receiving an annual influenza vaccine.

The fear of the unknown of a vaccine or a medical procedure perceived to be as new, was also echoed by some of the mothers regarding influenza immunisation in pregnancy.

“...You don't even have coffee – most people don't even have a glass of wine when they're pregnant. Not going there.” – Iliana

Preference for 'natural' ways. Some parents who had concerns about vaccine safety also had showed a preference of relying on their child's 'natural' immune system to protect them. They were of the belief that a 'natural' and healthy immune system can be built on good nutrition and alternative medicine.

“I think the human body – I know we can die from the flu, we can die from a lot of things, but I don't believe that the flu vaccine is the answer. I think we need to use our natural resources within our bodies to fight stuff like that off.” – Wendy

3.1.3. Limited capability

Misinterpretations and knowledge gaps. A lack of knowledge of recommendations was a common barrier. Some parents believed that only children with comorbidities require vaccination. One family had unresolved concerns regarding contraindications due to an egg allergy. Some parents questioned the need for vaccination when they believed the influenza virus “mutates” at such a rapid rate that the protection offered through annual influenza vaccination quickly becomes ineffective. Other parents thought young children and infants cannot or should not be vaccinated, such as Yolanda who believed the vaccine was for children from six years old. Yolanda then went on to say about influenza vaccination of her young children:

“I don't know, maybe there are some changes because the [GP, since hospitalisation] said I'm able to vaccinate them now. . .I'm still not sure about them, for being their age, it's a little bit early for them. . .I'm still not convinced.”

3.2. Facilitators of influenza vaccination

In 2017, the overall vaccine effectiveness (VE) against hospitalisation for children was moderate, estimated at 30.3% [5]. Subsequently, some of those who were hospitalised for influenza were vaccinated. This enabled us to also understand the experiences of the parents of four vaccinated children (all who had comorbidities), as well as three mothers vaccinated during their pregnancy.

Convenient vaccination pathway and recommendations received

Parents whose children were vaccinated reported spending many hours at health care facilities due to their child's comorbidity where HCPs, such as GPs and treating specialists, used the opportunity to discuss and provide vaccination either at a GP clinic or hospital immunisation clinic. The women vaccinated in their pregnancy also received a clear recommendation from their antenatal HCP to do so.

Advertisement saturation

These parents recalled seeing many relevant advertisements about influenza vaccination, particularly in medical facilities. For the vaccinated mothers of infants, their frequent interaction with the health system for antenatal checks also meant they were exposed to related information while there.

“There was all of these posters around in the clinic saying pregnant women who get the flu are four times more likely or something to end up in hospital than people who aren't pregnant, I thought, “Oop, better do it.”” – Rachel

Reminders

Some parents received reminders from their healthcare facility to vaccinate. India received reminders from their specialist medical

clinic, and her child's special needs school. This school also organised yearly school-based influenza vaccination of the students, however, this is not a usual service offered in Australian schools.

3.3. Intentions and suggestions

“...if I can give my children vaccines to make sure that they don't get rushed to hospital at the drop of a hat because a bug's just corrupted their body, then that's something that I have to control, and I would certainly be 100 percent supportive of it” – Allen

Most parents said they “definitely,” or “hopefully” would vaccinate their family in the future, now they were aware of the severity of influenza. However, some parents were undecided. They said they need opportunities to discuss concerns with HCPs, and to read more online. Susan said:

“I need to sort of read up more about it to say yes or no. I'm not just going to say ‘well. . .give them a vaccination so they don't get the flu’ but they'll end up with the flu anyway.”

Parents were also eager for SMS reminders to vaccinate, and to receive detailed information about why it is recommended to vaccinate and how it protects children, rather than just being told to vaccinate because it is safe and effective. The best way to get this information to parents was said to be social media, particularly Facebook or Instagram, as it is “strong,” “powerful,” and readily available for “meaningful communication,” by the government.

Cleo, who felt promotion was only for those with comorbidities, suggested advertisements also need to be more informative and clearer that all children aged six months or over should and can be vaccinated. Cleo said:

“[Change] the advertising, the posters, in GP surgeries saying that it should be everyone and then the subtext saying that it's subsidised for particular categories. But putting that in the subtext instead of the main message.”

Many parents also were interested in receiving information about influenza prevention and management from their child's school or childcare, or for both information or vaccination campaigns rolled out at the schools.

“I think we can have some sort of education. . .at the beginning of the year or at the beginning of the cooler seasons. . .A little bit of education in playgroups or childcare centres and even local schools, to actually remind them that it's quite important to have your child vaccinated. . .Even just providing pamphlets or leaflets to those places, that can be given out to the parents or sent out in communication books to the children's homes. Say, the school that they go to, what they do is they put printouts of flyers, or printouts, or notes and they send it out to parents saying that, you know, ‘The vaccination is due, it's going to be on this day, if you are keen fill in the forms.’” – India

4. Discussion

This study gained insights from a highly relevant population: parents of children hospitalised for influenza, many of whom were unvaccinated and thus we were able to understand their barriers to influenza vaccination.

A major barrier to influenza vaccination of children was a lack of awareness, seen by parents to result from an absence of promotion to all age and risk groups. Most of the promotion early in the influenza season, when our interviews were mostly conducted, was to urge “people eligible for the free vaccine to get vaccinated,” [41] and when vaccination was only free for those at high risk. Böhm et al (2017) conducted an experimental study which demonstrated that although promotion of vaccination for those at-risk of influenza does increase the uptake in this group, it decreases the

uptake in those who are not at high risk when compared to the same group receiving no recommendation or a universal recommendation [42]. Though a delicate act, it is important that all parents receive relevant information, particularly as since conducting this study, all Australian jurisdictions now fund and promote influenza vaccination for all children aged six months to less than five years [12].

Universal funding and promotion of such should address some of the barriers identified in this study, such as the absence of promotion to all age and risk groups, and removal of some of the costly inconvenience of vaccination. Indeed, Beard et al (2019) estimated that there was a fivefold increase in uptake in 2018 in children aged six months to less than five years (5.0% to 25.6%), and twofold increase in Aboriginal and/or Torres Strait Islander children (11.8% to 29.5%), compared to 2017 [15]. However, as three-quarters of eligible children remained unvaccinated [15], this highlights that funding does not address all barriers, as echoed by some parents in our study reporting that paying for vaccination was not their main barrier.

Another major barrier revolved around health care worker recommendation as reported by our participants. Many could not recall receiving a recommendation to vaccinate or reported receiving incorrect information from their HCP. This is a common occurrence [16,17,19,21–27,43]. In a previous study some parents reported that their GP was advising that children under five years could not be vaccinated [43], a finding repeated in a study with paediatricians where this belief was held by 14% of respondents [44].

These findings may stem from a suspension of the seasonal influenza vaccination program for children aged less than five years from April–August in 2010 following an increase in febrile convulsions following influenza vaccination, later found to relate to a specific brand [12]. Furthermore, some HCPs are not recommending vaccination due to gaps in their knowledge about the severity of influenza or a lack confidence in the safety and efficacy of influenza vaccination [23,45]. We recommend further research to understand the knowledge and attitudes held by HCPs and to assess their needs, particularly regarding seasonal paediatric influenza vaccination, so that strategies can be developed to ensure that parents receive correct advice and an appropriate recommendation from this trusted source.

We identified that capability, opportunity and motivation all influence influenza vaccine uptake, and thus interventions that target all three of these influences are required. The parents in our study suggested that information campaigns on social media and in schools/childcare (targeting motivation and capability), as well as SMS reminders (targeting opportunity) and in-depth discussions with their HCP (targeting opportunity) would help them vaccinate their children. However, Brewer et al (2017) conducted a review on strategies to increase general vaccination coverage. The authors identified that education campaigns alone that aim to increase people's confidence in vaccination have little or no impact on increasing vaccine coverage, and that reminders have a modest impact, particularly if from a trusted source, is presumptive, and lets the receiver know how to go about accessing vaccination. The interventions that were rated as having a substantial impact on increasing coverage were all related to increasing opportunities for vaccination, such as receiving a recommendation from a HCP [46]. Similarly, a systematic review by Ellingson et al (2019) on strategies to increase antenatal influenza vaccination identified that HCP recommendations are the strongest predictor of vaccination. Ellingson et al found varying evidence on the impact of educational information campaigns, but identified that SMS reminder interventions do not appear to have a significant impact on increasing antenatal influenza vaccination [47]. Further research on multicomponent strategies to increase paediatric and antenatal

influenza vaccination in Australia is recommended, particularly in the form of head-to-head comparisons of interventions.

4.1. Strengths and limitations

A unique facet of this study was the opportunity to gain important insights from parents of children hospitalised for influenza, along with detailed demographic and medical information, to build on the evidence on how to increase influenza vaccine uptake, and ultimately prevent children from being hospitalised for influenza. However, our sample is not representative of the general population, nor all those hospitalised for influenza. Furthermore, the reasons given when declining to be interviewed are also generally some of the barriers to vaccination, such as being a single parent [48], the child attending out-of-home care and thus having a foster parent [28], and being too busy due to competing priorities [25,26]. We are undertaking further quantitative research with parents that is not as time-intensive as in-depth interviews, and seeking to include a more diverse and representative population, in order to assist in improving the knowledge on the barriers to influenza vaccination.

For those who did participate, some parents may have attributed their child's hospitalisation to factors that lie outside of the intrapersonal to deflect any guilt they may have been feeling. For example, it is unknown whether HCPs did recommend vaccinating and the parent did not follow this advice, or whether parents genuinely did not receive a recommendation. However, this is one of the most important facilitators of both paediatric and antenatal influenza vaccination [16,17,19,22,25–27,29–31,49–51], and so it is likely that parents reported on their true experiences.

5. Conclusion

These interviews identified that barriers to influenza vaccination include having limited capability, such as misinterpretations and knowledge gaps; a lack of opportunity, such as missing HCP recommendations; and missing motivation, such as concerns about influenza vaccine safety. These interviews were conducted with parents of children hospitalised for influenza and thus they were undoubtedly aware of the severity of influenza. While some parents were eager to vaccinate in future years, some parents still harboured reservations, which demonstrates the key role of motivational barriers. Multicomponent strategies that target all influences on behaviour are required, such as a combination of information campaigns, building provider knowledge, confidence and recommendation practices for all patients, and removing major access issues.

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Declaration of Competing Interest

None.

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