

REGULAR ARTICLE

A review of a paediatric emergency department vaccination programme for patients at risk of allergy/anaphylaxis

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Keywords

Allergy, Immunization, Paediatric emergency department, Referral

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Received

25 January 2012; revised 30 May 2012;

accepted 14 May 2012.

DOI:10.1111/j.1651-2227.2012.02737.x

ABSTRACT

Aim: We sought to review the clinical outcomes of patients referred to our emergency department (ED) vaccination service for children with a history of allergy or anaphylaxis or in whom there was a concern of a significant adverse reaction.

Methods: This was a prospective observational cohort study set in an urban tertiary Paediatric ED. All attendances for any childhood vaccination for a 5-year period (from January 1, 2006 to December 31, 2010) were included. Our primary outcome measure was any adverse reaction as a result of the vaccine administered.

Results: A total of 446 vaccines were administered during the study period in 374 patients. Of these vaccinations, 310 (69.5%) were Measles, Mumps, Rubella (MMR). The majority of patients (348, 93%) were referred from the community. Suspected egg allergy was the reason for the majority of referrals for MMR (261/310 (84.2%)). Only six patients (1.3%) experienced an immediate reaction to a vaccination. All reactions were minor.

Conclusion: This is one of the largest studies looking at childhood vaccinations performed in a hospital setting for children who are 'at risk' of allergy, anaphylaxis or hypersensitivity. A significant number of referrals were unwarranted and the majority could have been safely managed in the community.

BACKGROUND

Significant concerns have existed in the primary care and paediatric communities with regard to administering vaccines to children who are or who may be at risk of an allergic reaction or anaphylaxis (1). However, the incidence of vaccine-associated anaphylaxis is very low (2). Unfounded concerns can lead to delays in children receiving their vaccinations in a timely manner. The subsequent system of referral to a hospital can add to this delay. Much of the concern has surrounded the Measles, Mumps, Rubella (MMR) vaccine in children with a history of egg allergy (1).

The Immunization Guidelines for Ireland (2008 Edition, updated 2009), produced by the National Immunization Advisory Committee of the Royal College of Physicians of Ireland, specifically state that allergy or anaphylaxis to egg is not a contraindication to MMR (3,5). They suggest that '*If there is a genuine concern regarding serious allergy, a paediatrician may be consulted and the vaccine given in hospital although this is not medically necessary*'. Furthermore, guidelines prepared by the Standards of Care Committee (SOCC) of the British Society for Allergy and Clinical Immunology (BSACI) state that '*All children with egg allergy should receive their normal childhood immunizations, including MMR vaccination as a routine procedure*

performed by their family doctor/nurse' (6). It goes on to state that children '*who have had documented anaphylaxis to the vaccine itself (MMR) should be assessed by an allergist*', but it does not recommend vaccination of these children in hospital.

The MMR vaccine contains attenuated measles, mumps and rubella viruses. It is grown in cultures of fibroblasts derived from chick embryo; hence, it can contain traces of the egg-white protein ovalbumin. However, studies have shown that ovalbumin is present in MMR in negligible amounts, such that an allergic reaction as a result of this

Key notes

- Significant concerns have existed regarding administering vaccines to children who may be at risk of an allergic reaction/anaphylaxis.
- This can lead to delays in children receiving their vaccinations in a timely manner.
- In this, one of the largest studies looking at vaccinations in hospital for children who are 'at risk' of allergy, anaphylaxis or hypersensitivity, the results show that the majority of these patients could have been safely managed in the community.

particular constituent would be unlikely (7). Published data suggest that anaphylactic reactions to MMR are not associated with hypersensitivity to egg antigens but to other vaccine components (e.g. gelatin and neomycin) (8).

In 2003, as a response to an increase in ad hoc referrals from the community, the Emergency Department (ED) at our institution introduced a vaccination service for children with a history of allergy or anaphylaxis or in whom there was a concern of a significant adverse reaction. These children were typically referred from the community (their general practitioner (GP) or other community healthcare services) or from specialists within the hospital, for example, Dermatology.

We sought to review the clinical outcomes of patients referred to our vaccination service, and in the light of an expanding literature in this area, determine the continuing need for this service in any future service configuration.

METHODS

Design

This was a prospective observational cohort study. Our primary outcome measure was any adverse reaction as a result of vaccine(s) administered.

Setting

The study took place at the Department of Emergency Medicine, Our Lady's Children's Hospital, Crumlin (OLCHC), Dublin, Ireland. This is an urban tertiary paediatric hospital with approximately 34 000 ED attendances per annum. A Community Liaison Nurse (CLN) operates the vaccination service in the ED. The CLN and a Consultant in Emergency Medicine will review referrals, and an appointment is sent to the patient. At that appointment, the vaccine is administered by the CLN and the patient is observed directly for 15 min. Thereafter, the patient and family remain in the ED for 1 h and are then discharged following clinical review. Patients who develop a reaction to the vaccine during the 1-h observation period are reviewed by a senior Emergency Physician. Further treatment and follow-up are prescribed as necessary. A follow-up phone call is made by the CLN at 72 h after vaccination to enquire about any possible delayed reactions.

Procedure

Data were collected prospectively and entered into an electronic database. All attendances for any childhood vaccination from January 1, 2006 to December 31, 2010 (5 years) were included. The database was reviewed for the following: reason for referral, referral source and type and severity of any allergy or reaction to the vaccine, either immediate or delayed.

RESULTS

Vaccines administered

A total of 446 vaccines were administered during the study period (Table 1) in 374 patients. Of these vaccinations, 310 (69.5%) were MMR.

Table 1 Vaccines administered

Vaccine	Number administered (n = 446)
Measles, Mumps, Rubella	310
2-in-1	1
3-in-1	4
4-in-1	33
5-in-1	31
6-in-1	15
Meningococcal C	34
Haemophilus Influenza Type B (HiB)	6
Polyvalent Pneumococcal Vaccine (<i>Pneumovax</i> ™)	10
Tetavalent Human Papilloma Virus	2

(2in1 = Diphtheria and Tetanus (DT); 3in1 = DT & Pertussis (DTP); 4in1 = DTP & Polio; 5in1 = DTP and Polio and Hib; 6in1 = DTP & Polio & Hib & Hep B).

Table 2 Reason for referral

Reason for referral	MMR vaccine (n = 310)	Other vaccines (non-MMR) (n = 64)
Egg allergy	261	1
Dairy allergy	3	0
Nut allergy	6	0
Allergy/reaction to previous vaccine	16	47
Multiple allergies (not including egg)	11	3
Antibiotic allergy	5	0
Eczema	1	0
Family history of vaccine reaction/allergy	0	8
Not documented	7	5
MMR, Measles, Mumps, Rubella.		

Referrals

The majority of patients were referred from either a GP (n = 309, 82.6%) or a local Area Medical Officer (AMO, that is, doctors who run a vaccination service in a local health centre or school; n = 44, 11.8%). However, a small number (n = 21, 5.6%) were referred from other teams within our hospital, in particular the Dermatology service who referred some patients with a history of severe allergic reaction to eggs and in whom they had significant concerns regarding a reaction to a vaccine.

Suspected egg allergy was the reason for the majority of referrals for MMR (261/310 patients (84.2%), Table 2). A reaction to a previous vaccination was the reason for the majority of referrals for all other vaccines (47/64 patients (73.4%) Table 2). Patients were also referred for a variety of other reasons, such as having a history of eczema, a family history of a reaction to a vaccine, an allergy or reaction to an antibiotic or dairy or nut allergy.

Adverse reactions

Only six patients in our study experienced an immediate reaction to a vaccination (1.3% of total number of vaccinations given). These are detailed in Table 3.

Table 3 Immediate reactions (in the ED)

Case number	Age	Gender	Vaccine administered	Reason for referral	Description of reaction	Treatment	Follow-up (Phone call after 72 h)
1	13 months	M	MMR	Egg	Red macular rash to sacral area; onset 10 mins postvaccine	Observation; nil specific	Well since ED discharge
2	10 years	F	MMR	Multiple allergies including egg	Flushed face	Observation; nil specific	Well since ED discharge
3	5 years	M	MMR	Multiple allergies including egg	Vesicular rash	Observation; nil specific	'Off-form' for 48hrs but otherwise well since
4	18 months	F	MMR	Egg, Dairy & Fish allergy	Vesicular rash to face	Observation; nil specific	Well since ED discharge
5	5 years	M	MMR	Egg allergy	Urticarial rash	Oral antihistamine stat dose	Well since ED discharge
6	5 years	F	MMR & 4-in-1	Egg allergy	Felt weak, possible vasovagal episode	Observation; nil specific	Well since ED discharge

ED, Emergency department, MMR, Measles, Mumps, Rubella.

One patient developed an urticarial rash and required a dose of antihistamine. He was discharged within a few hours once the rash had dissipated. No follow-up tests were ordered as this was his booster MMR and no future doses would be required. Two patients developed vesicular-type rashes, another a flushed face and one patient developed a macular rash. The latter occurred within 10 min of the vaccine, whereas the other three developed between 15 min and 1 h. All patients' rashes eased after a period of observation in the ED and no further treatment was given. There was one episode of an immediate vasovagal episode in a 5-year-old secondary to the injection process. This resolved within minutes.

Thirty-one patients reported symptoms at the follow-up telephone call at 72 h. These included being 'off-form', vomiting and local swelling at the injection site. None of these patients required a healthcare visit for these symptoms.

DISCUSSION

Measles, Mumps, Rubella accounted for the majority of vaccines (69.5%) that were administered by our service. Allergy to egg is the principal reason for referral despite established international guidelines and a significant body of evidence pointing to the safety of MMR vaccine for this population (5–7,9–21). Children were, however, referred for a variety of different reasons such as other allergies, nonspecific reactions to previous vaccines and family history of a reaction to a vaccine. The majority of our referrals were sourced from GPs.

Only six patients experienced a reaction to a vaccination. All were classified as minor and nonanaphylactoid, and all were reviewed by a senior Emergency Physician. A small number of patients experienced some nonspecific symptoms over the next 72 h, for example, vomiting or pyrexia. All of these symptoms are documented in the patient information leaflets accompanying the products as normal side effects that a patient may experience after the vaccination.

A detailed history of any vaccine reaction should be obtained to determine whether it constitutes an immediate-type hypersensitivity reaction. Many patients experience symptoms post administration of a vaccine, such as nausea or syncope, that are not because of an allergic reaction, as happened in our study. Patients with a history of a hypersensitivity reaction should be recommended for allergy testing if an additional dose of that vaccine is indicated. In the case of a confirmed vaccine allergy, decisions regarding additional doses of that vaccine should be made on a case-by-case basis. Options include giving an alternative vaccine preparation that does not contain the identified allergen, administration of the vaccine in escalated doses, or withholding the vaccine for patients who are at low risk of the disease, have serological immunity and for whom there is the potential of a life-threatening reaction to the vaccine (21). Wood et al. (22) devised an algorithm for the evaluation and management of patients who have a documented hypersensitivity reaction to a vaccine.

Two patients were referred to our service during the last 2 months of this study for the Human Papilloma Virus (HPV) vaccine. Both were referred by their GP as they had had a mild reaction to the first dose of the vaccine that they had received. Neither had a reaction to the vaccine given in ED. Although this is a small number of patients relative to the overall study population, more patients may be referred for this vaccine in the future as a national programme has been rolled out. Allergic reaction to this vaccine is uncommon, however (23).

Egg allergy has also been associated with reactions to the influenza vaccine because of the presence of trace egg proteins. However, Gagnon et al., (24) in a series of 830 patients with confirmed egg allergy, reported minor reactions in only nine patients. Another study reported the safe vaccination of 62 egg-allergic children with negative skin-prick tests to the H1N1 vaccine (25).

This is one of the largest studies looking at childhood vaccinations being carried out in a hospital setting for children who are 'at risk' of allergy, anaphylaxis or hypersensitivity.

Table 4 Published studies of Measles, Mumps, Rubella administration to children with egg allergy

Study	Number of patients	Reported reactions
Hawkes et al., IMJ 2010 (9)	91 (only 47 had egg allergy)	0
Ainsworth et al., ADC 2010 (10)	110	1 (Transient local erythema)
Fina-Aviles et al., An Pediatr (Barc) 2007 (13)	121	17.8% ('Mild local symptoms')
Cerecedo Carballo et al., Allergol Immunopathol (Madr) 2007 (14)	26	0
Torres Borrego et al., An Pediatr (Barc) 2006 (12)	40	0
Goodyear-Smith et al., Human Vaccines 2005 (11)	73	0
Aickin et al., BMJ 1994 (16)	410	4 ('Minor reactions')
Fasano et al., J Pediatr 1992 (6)	140	1 ('4 small hives locally')
Govindaraj, ADC 2009 (letter) (8)	45	0
James et al., NEJM 1995 (18)	54	0
Herman et al., J Pediatr 1983 (15)	24	0
Freigang et al., Ann Allergy 1994 (17)	500	5 ('Minor reactions')
Beck et al., Paediatrics 1991 (19)	16	3 ('Local reactions')

This prospective study is unique in that a large number of other vaccinations were carried out in our population for similar indications. There is no data in the literature that supports the requirement for hospital-based vaccinations for these patients.

The study does have some limitations. Firstly, the number of patients who received some of the vaccines, for example, pneumococcal and HPV, was small. Also patients did not routinely have allergy testing carried out, so it is unknown which patients had had a definitive IgE-mediated allergy.

Table 4 shows a list of published studies looking at the incidence of reactions to MMR in children with a history of egg allergy. Our results corroborate existing evidence that it is safe to carry out MMR and other childhood vaccinations in the primary and/or community care setting. The low rate of relatively minor reactions in our patient population is also mirrored in these studies.

Significant time and resources are used in this tertiary paediatric hospital to provide this service. Our results show that the majority of these patients could have been safely managed in the community. We feel that a referral process should be maintained for a select group of patients, that is, children who are at definite risk of anaphylaxis. We acknowledge the fundamental importance of vaccination, and we must be mindful of the possibility that some vaccines may be delayed or omitted as a result of any change in service.

CONCLUSION

There were only a small number of minor adverse reactions in this study looking at childhood vaccinations being carried out in a hospital setting for children who are 'at risk' of allergy, anaphylaxis or hypersensitivity. The results of this study justify rationalising the existing service and providing further education regarding vaccine safety in these children.

ACKNOWLEDGEMENTS

The authors would like to thank Ms Eadaoin Breen who contributed to data collection in 2008.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

FUNDINGS

There was no specific funding.

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