



# Experiences with provider and parental attitudes and practices regarding the administration of multiple injections during infant vaccination visits: Lessons for vaccine introduction<sup>☆</sup>



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## ABSTRACT

**Introduction:** An increasing proportion of childhood immunization visits include administration of multiple injections. Future introduction of vaccines to protect against multiple diseases will further increase the number of injections at routine immunization childhood visits, particularly in developing countries that are still scaling up introductions. Parental and healthcare provider attitudes toward multiple injections may affect acceptance of recommended vaccines, and understanding these attitudes may help to inform critical decisions about vaccine introduction.

**Methods:** We conducted a systematic review of the literature to examine factors underlying reported parental and healthcare provider concerns and practices related to administration of multiple injections during childhood vaccination visits.

**Results:** Forty-four articles were identified; 42 (95%) were from high income countries, including 27 (61%) from the USA. Providers and parents report concerns about multiple injections, which tend to increase with increasing numbers of injections. Common parental and provider concerns included apprehension about the pain experienced by the child, worry about potential side effects, and uncertainty about vaccine effectiveness. Multiple studies reported that a positive provider recommendation to the parent and a high level of concern about the severity of the target disease were significantly associated with parental acceptance of all injections. Providers often significantly overestimated parental concerns about multiple injections.

**Discussion:** Providers may play a critical role in the decision for a child to receive all recommended injections. Their overestimation of parental concerns may lead them to postpone recommended vaccinations, which may result in extra visits and delayed vaccination. More research is needed on interventions to overcome provider and parental concern about multiple injections, particularly in developing countries.

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## 1. Introduction

In 1974, when the World Health Organization (WHO) created the Expanded Program on Immunization, six antigens and up to eight vaccine doses (some vaccines require multiple doses) were included in the recommended childhood vaccination schedule. By

2012, the WHO recommendations had increased to 11 antigens administered as up to 21 vaccine doses [1]. The availability of funding for vaccine introduction for low- and middle-income countries through the GAVI Alliance and other mechanisms will soon enable more countries to introduce all WHO-recommended vaccines [2]. Introduction of pneumococcal conjugate vaccine (PCV) will reduce child mortality worldwide, and the introduction of inactivated poliovirus vaccine (IPV) in all countries is a critical component of the Global Polio Eradication Initiative endgame strategy [3]. These introductions will also increase the number of injections at vaccination visits in nearly all countries [2]. This trend will continue as vaccines currently being developed for malaria, tuberculosis and other diseases are licensed and introduced [2–4].

<sup>☆</sup> *Disclaimer:* The findings and conclusions in this report are those of the authors and do not necessarily represent the official positions of the World Health Organization or the U.S. Centers for Disease Control and Prevention.

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An important consideration in the introduction of a new injectable vaccine is the increase in the number of recommended injections at a single vaccination visit. The universally endorsed practice of simultaneous administration of all recommended vaccines improves timeliness, ensures protection at the earliest possible age, and maximizes efficient use of finite health sector resources, which is particularly important in low- and middle-income countries [5,6]. However, since many of these countries have not yet introduced all WHO-recommended vaccines, little is systematically documented about healthcare provider and parental attitudes and practices toward vaccination visits with increased numbers of injections in these locations. Countries having well-documented provider and parental experiences with multiple injections may provide important information to help low- and middle-income countries prepare for an increase in the recommended number of injections given at a vaccination visit. To better understand the determinants of provider and parental attitudes about multiple injections, we conducted a systematic review of the literature. Our aim was to identify studies of parental and provider attitudes and practices regarding vaccination visits with multiple injections and factors associated with these attitudes and practices, and to consider strategies to increase acceptance.

## 2. Methods

### 2.1. Search strategy

We searched 29 databases for English, French and Spanish language articles (Table 1). Our search filters combined terms (and their derivatives) specific to vaccination, multiple injections (and synonyms), health care provider and parental (or other caregiver) practices, attitudes or beliefs. We identified gray literature reports and working papers related to multiple injections through discussions with immunization experts at UNICEF, WHO and the US Centers for Disease Control and Prevention (CDC), and examined references in identified articles to identify additional studies. We initially reviewed titles and abstracts of identified articles to determine if papers met the eligibility criteria. Articles that appeared to meet the eligibility criteria were fully read to ensure eligibility to be included in the systematic review process.

### 2.2. Eligibility criteria

We included papers that described findings from primary research in a setting of childhood vaccination services and assessed one or more of the following: (a) provider or parental attitudes or practices (or both) related to simultaneous administration of multiple injections; (b) provider or parental practices regarding administration or acceptance of multiple injections following recent addition of a new injectable vaccine to an existing vaccination visit; or (c) strategies for overcoming provider or parental concerns about administration of multiple injections. Studies could be from any country, published from January 1970 through January 2014. For the purposes of this analysis, we refer to all caregivers as parents.

### 2.3. Article review and analysis

We used a standardized data collection form to systematically abstract information from each article, including study rationale, country, vaccinations offered, sample size, data collection methods, and key findings and recommendations. We synthesized the abstracted information, identifying common areas of concern about multiple injections for providers and parents, and factors related to these concerns and their impact on vaccine coverage and delay; and

**Table 1**

Keywords and data sources used for a systematic review of parental and health care provider attitudes and practices related to adding injections to childhood immunization schedules using literature from 1970 to 2014.

| Keywords used singly or in combination | Literature databases used | Websites visited and organizations contacted                                                       |
|----------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------|
| Acceptance                             | Access UN                 | <a href="http://www.basics.org">www.basics.org</a>                                                 |
| Added                                  | AccessScience             | <a href="http://www.searchbeta.bl.uk">www.searchbeta.bl.uk</a>                                     |
| Attitude <sup>a</sup>                  | AGRICOLA                  | <a href="http://www.care.org">www.care.org</a>                                                     |
| Barrier <sup>a</sup>                   | Bioline International     | <a href="http://www.fhi.org">www.fhi.org</a>                                                       |
| Behavior <sup>a</sup>                  | BioMed Central            | <a href="http://www.filarisis.org">www.filarisis.org</a>                                           |
| Caregiver <sup>a</sup>                 | BIOSIS                    | <a href="http://www.gavialliance.org">www.gavialliance.org</a>                                     |
| Combination                            | CAB Abstracts             | <a href="http://www.greynet.org">www.greynet.org</a>                                               |
| Compliance                             | CHID Online               | <a href="http://www.hki.org">www.hki.org</a>                                                       |
| Concomitant                            | CINAHL                    | <a href="http://www.ifrc.org">www.ifrc.org</a>                                                     |
| Doctor <sup>a</sup>                    | Cochrane Library          | <a href="http://www.msh.org">www.msh.org</a>                                                       |
| HBV                                    | CSA-Illumina              | <a href="http://www.nyam.org/library/greylitorgs.shtml">www.nyam.org/library/greylitorgs.shtml</a> |
| Health worker <sup>a</sup>             | Databases                 | <a href="http://www.paho.org">www.paho.org</a>                                                     |
| HiB                                    | Dissertation Abstracts    | <a href="http://www.path.org">www.path.org</a>                                                     |
| Immunization <sup>a</sup>              | EMBASE                    | <a href="http://www.pathfind.org">www.pathfind.org</a>                                             |
|                                        | Expanded Academic         |                                                                                                    |
|                                        | ASAP                      |                                                                                                    |
| Infant                                 | Global Health             | <a href="http://www.psi.org">www.psi.org</a>                                                       |
| Injection <sup>a</sup>                 | IBSS                      | <a href="http://www.redcross.org">www.redcross.org</a>                                             |
| Vaccination <sup>a</sup>               | IndMed                    | <a href="http://www.savethechildren.org">www.savethechildren.org</a>                               |
| Multiple                               | LexisNexis Academic       | <a href="http://www.savethechildren.org.uk">www.savethechildren.org.uk</a>                         |
| Simultaneous                           | LILACS                    | <a href="http://www.trachoma.org">www.trachoma.org</a>                                             |
| Additional                             | MEDLINE                   | <a href="http://www.un.org">www.un.org</a>                                                         |
| Pain                                   | PAIS                      | <a href="http://www.undp.org">www.undp.org</a>                                                     |
| Parent <sup>a</sup>                    | POPLINE                   | <a href="http://www.who.int/library">www.who.int/library</a>                                       |
| Physician <sup>a</sup>                 | Population Index          | Centers for Disease Control & Prevention                                                           |
|                                        |                           | UNICEF                                                                                             |
| Pneumococcal                           | Proquest Research Library |                                                                                                    |
| IPV                                    | PubMed                    | World Health Organization                                                                          |
| Meningococcal                          | SIGLE                     |                                                                                                    |
| Hepatitis B                            | UNDP Project Reports      |                                                                                                    |
| Practice                               | Web of Science            |                                                                                                    |
| Provider <sup>a</sup>                  | WHOLIS                    |                                                                                                    |
| Schedule                               |                           |                                                                                                    |
| Vaccine <sup>a</sup>                   |                           |                                                                                                    |
| Sequential                             |                           |                                                                                                    |
| Combo                                  |                           |                                                                                                    |
| Concern                                |                           |                                                                                                    |

<sup>a</sup> Keyword search included singular and plural version of word.

summarized both tested and proposed interventions to overcome resistance to multiple injections.

## 3. Results

### 3.1. General characteristics of included publications

Among 218 articles identified by the initial review of abstracts and titles, 44 met the final inclusion criteria and were reviewed (Fig. 1). Forty-two (95%) of these were from peer-reviewed journals and 2 (5%) came from gray literature sources (Table 2). Only two (5%) studies were from low- or middle-income countries (Rwanda and Ukraine); whereas 27 (61%) were conducted in the United States, 6 (14%) in Canada and 6 (14%) in other high-income countries, including one seven-country survey (Table 2).

In four (9%) studies, investigators reviewed vaccination records, in 37 (84%) they conducted interviews (14 [32%] with providers only, 15 [34%] with parents only, and 8 [18%] with both), and in 4 (9%) they evaluated strategies to increase acceptance of multiple injections. Specific injectable vaccines were reported to have been recently introduced in 26 (59%) studies, including PCV ( $n=7$ ); IPV ( $n=4$ ); PCV and IPV ( $n=1$ ); PCV, influenza and varicella vaccines ( $n=1$ ); hepatitis B vaccine (HepB) ( $n=7$ ); meningococcal C vaccine (MenC) ( $n=3$ ); HepB and MenC ( $n=1$ ), *Haemophilus influenzae* type b vaccine (Hib) ( $n=1$ ) and a switch from whole-cell diphtheria–tetanus–pertussis (DTP) vaccine to acellular (DTaP)

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