Educational interventions for the prevention and management of adverse events following immunisation: a systematic review

Abstract This study investigated educational interventions for the prevention and management of adverse events following immunisation. This a systematic review was conducted by examining observational studies, with no restriction as to language or year, registered in PROSPERO with the identifier CRD42022313144 and by searching the MEDLINE, LILACS, Embase, CINAHL and Scopus databases. Two researchers selected the studies, extracted the data and assessed the risk of study bias; disagreements were resolved by a third researcher. A total of six articles met the inclusion criteria of the systematic review and the studies reported significant post-intervention improvements in staff conduct in relation to immunisation. It was concluded that educational strategies that lead to continued professional development in relation to vaccination in primary care were effective in reducing and/or eradicating immunisation errors and adverse events following immunisation.

Key words Continuing education, Nursing, Drug-related side effects and adverse reactions, Vaccination, Systematic review
Introduction

Adverse events following immunisation (AEFIs) are defined by the World Health Organisation (WHO) as “any untoward medical occurrence which follows immunisation and which does not necessarily have a causal relationship with the usage of the vaccine”.

Factors involved in such events include vaccine composition, the organism of the vaccinated individual and the vaccination application process. Staff conduct in non-compliance with standards and techniques may or may not cause harm to the client, leading to what are termed immunisation errors (IEs).

A 2020 survey in 5 English-speaking countries found prevalence of IEs of 1.15 per 10,000 vaccine doses. In several countries then, IEs are responsible for AEFIs and are therefore the first to be examined in an investigation. Several authors state that vaccine hesitancy may be associated with the occurrence of IEs.

Nursing plays a fundamental role in the immunisation process, at the stages of reception, vaccination screening, the correct preparation, handling and administration of immunobiologicals, clarifying doubts and giving guidance on vaccines administered and possible AEFIs. Faced with a AEFI, nurses will report and investigate the event, thus contributing to improved quality and patient safety at the stages of the vaccination process.

Nurses face difficulties in their work process, such as poor physical structure, organisational problems, as well as poor quality training. Most prominent among these difficulties are those relating to knowledge and attitudes to the day’s work.

Accordingly, knowledge and safety in nursing staffs’ conduct and guidance are indispensable at all stages of vaccination in Primary Health Care (PHC), with a view to optimising health services in accordance with Brazil’s National Immunisation Programme (Programa Nacional de Imunização, PNI). In this regard, specific conduct can be adopted to prevent AEFIs, from reception and screening, assessment for postponement or contraindication of vaccination through to vaccination safety and quality, and AEFI monitoring and management.

It is thus important and current to think about education strategies that promote meaningful learning. Studies indicate Continued Professional Development (CPD) for health personnel as a strategy for improving immunisation-related safety.

In 2004, the Ministry of Health introduced the National Policy of Continued Professional Development in Healthcare (Política Nacional de Educação Permanente em Saúde, PNEPS), which proposed to change and improve the training of health professionals, thus reinforcing the quality of nursing staffs’ vaccination training, by deploying active methodologies to encourage thinking and problem solving based on the realities of health service provision.

CPD in healthcare makes for meaningful learning, because it enables staffs to lead the process and offer proposals for reordering their work process on the basis of their thinking about their service practices. CPD is thus essential to building quality services.

According to Google Scholar and the Virtual Health Library (VHL), in the last ten years, studies of CPD for nurses in preventing and managing AEFIs have been insufficient. The scientific literature features, in Brazil, a 2015 experience report, which discusses AEFIs, and a 2021 qualitative, descriptive study using realistic simulation as a resource for training primary health care personnel in the immunisation process. Although studies endorse immunisation-related CPD, the effectiveness of any action taken has not been assessed.

This study thus investigated education interventions in the prevention and management of adverse events following immunisation.

Methods

The protocol for this Systematic Review (SR) was based on Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA-P) and then registered with the International Prospective Register of Systematic Reviews (PROSPERO) under identifier CRD42022313144.

The manuscript was described by reference to the PRISMA 2020 checklist and flowchart. The article selection, extraction and risk of bias assessment stages were carried out by two researchers and disagreements were resolved by a third researcher.

Using the acronym PICOS (P = population, I = intervention, C = comparison, O = outcome and S = study type) the following guiding question was asked: “Do education interventions for health professionals promote prevention and proper management of adverse events following immunisation?”

The inclusion criteria for article eligibility were that studies involve educational interven-
Selection of systematic review studies

Initially, 2,627 articles were found in the five databases. After excluding duplicate studies, 2,230 remained, which were selected by titles and abstracts. After applying the inclusion and exclusion criteria, nine articles were considered eligible. However, the full text of one study could not be accessed. Thus, eight articles were evaluated by reading the full text and two were excluded for not answering the guiding question. Thus, after article selection differences were resolved by the third researcher, six articles, as shown in Figure 1, were included in the systematic review.

Characteristics of the systematic review studies

Chart 2 shows authors and year of publication, database, periodical, title, country, language of publication, objective and populations of the study. Four of the six articles are indexed in the MEDLINE database, one in Embase and one in CINAHL. All studies included were published between 2006 and 2021.

The studies were conducted in India, Nigeria, the United States and South Korea. Sample populations ranged from 20 to 323 health personnel, including nurses, doctors, pharmacists, nursing and pharmacy assistants, health agents, midwives and cold chain handlers.

As in Table 3, the content taught regarding immunisation was vaccine administration, waste disposal, care for the cold chain, AEFIs, vaccination calendar, problems in the immunisation process, dangers of unsafe injection practices, immunisation recording, basic concepts of immunisation and vaccination coverage.

The education interventions ranged from four hours to three months and most studies used pre-test and post-test questionnaires to assess the effectiveness of these interventions, except for one study, which used only a post-intervention questionnaire. Other means of assessment used were visual inspection, checklist, supportive supervision, number of immunisations and vaccination coverage.
As regards the interventions' effectiveness, research showed significant improvements among staff in immunisation following the interventions, as shown in Chart 3. One study demonstrated that validated content transmitted by an educational module was effective in conveying knowledge at all the stages of the immunisation process.

Another study emphasised that content relating to safe administration of vaccines and waste disposal had significant effect on the health personnel's knowledge, although no significant improvements were found in their practice, because of precarious working conditions. The study also reported that training should be provided to all personnel involved in vaccination activities, including cleaning staff.

One study indicated that in-depth training in the cold chain with PowerPoint presentations and detailed discussion, followed by practical training with field visits, was appropriate, while another study showed that a pilot study should be conducted to adjust the duration of the intervention. As a result, in that study, live training went from 2 hours to 4 hours with a view to improving personnel's practice time. The study also emphasised that a model combining online and live training was effective.

One study considered that individual guidance and distribution of educational leaflets with content on care with vaccine storage was effective training. Lastly, another study showed that supportive supervision was an appropriate manner for personnel to learn at all stages of the immunisation process, as the environment and routine belonged to the participants' own workplace.

Some articles argued that interventions should not be occasional, but continuous, so one of the articles took this issue as accounting for the positive, although unsatisfactory, results in identification of heat- and cold-sensitive vaccines, in preventive maintenance of cold chain equipment on a fixed monthly date, temperature maintenance on holidays and formulation of an appropriate emergency contingency plan, and alerted to the need for subsequent staff guidance.

Educational interventions in the immunisation process are thus essential to preventing and managing AEFIs. The educational strategy for this purpose should maintain close contact with the concrete realities of health personnel's work and a pilot study should be conducted in order to prepare the intervention. It is also necessary to combine educational resources, provide periodic interventions for all employees involved in the immunisation process and assure appropriate conditions for vaccination-related activities.

Risk of bias in systematic review studies

As shown in Chart 4, four of the six studies included in the review returned moderate risk of bias and two, low risk. All articles ad-
<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Database/Periodical Title</th>
<th>Title</th>
<th>Country/Language of publication</th>
<th>Goal</th>
<th>Study population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sebastian, Parthasarathi e Ravi (2021)</td>
<td>MEDLINE/Therapeutic Advances in Vaccines and Immunotherapy</td>
<td>Impact of educational intervention on the best immunisation practices among health care professionals in a south Indian city</td>
<td>India/English</td>
<td>To assess the outcome of an educational intervention for healthcare professionals on the safe and quality use of vaccines.</td>
<td>323 health professionals (121 doctors, 77 nurses and 125 pharmacists).</td>
</tr>
<tr>
<td>Musa, Parakoyi e Akanbi (2006)</td>
<td>Embase/Annals of African Medicine</td>
<td>Evaluation of Health Education Intervention on Safe Immunisation Injection among Health Workers in Ilorin, Nigeria</td>
<td>Nigeria/English</td>
<td>To assess the effect of health education intervention on knowledge and standard of practice of safe immunisation injection among health workers in static immunisation centre.</td>
<td>102 health professionals (50 Community health extension workers, 14 Community health officers, 28 nurses/midwives and 10 Junior community health extension workers); 50 participants received the education intervention and 52 did not.</td>
</tr>
<tr>
<td>Mallik et al. (2011)</td>
<td>MEDLINE/African Health Sciences</td>
<td>Assessing cold chain status in a metro city of India: an intervention study</td>
<td>India/English</td>
<td>To assess changes in cold chain status and cold chain handlers’ cold chain maintenance awareness and skills after the intervention.</td>
<td>20 cold chain handlers.</td>
</tr>
<tr>
<td>McKeirnan et al. (2018)</td>
<td>MEDLINE/Journal of the American Pharmacists Association</td>
<td>Training pharmacy technicians to administer immunisations</td>
<td>United States/English</td>
<td>To evaluate the effectiveness of an immunisation training program for pharmacy technicians on technicians’ self-reported confidence, knowledge and number of vaccines administered</td>
<td>30 pharmacy technicians.</td>
</tr>
<tr>
<td>Lee et al. (2012)</td>
<td>MEDLINE/Journal of Preventive Medicine and Public Health</td>
<td>Vaccine Storage Practices and the Effects of Education in Some Private Medical Institutions</td>
<td>South Korea/English</td>
<td>To inspect actual vaccine storage status and awareness, and compare them before and after education was provided.</td>
<td>39 health professionals (20 doctors, 12 nurses, 2 pharmacists, 3 nursing auxiliaries and 2 pharmacy auxiliaries).</td>
</tr>
<tr>
<td>Holla, Borker e Bhat (2013)</td>
<td>CINAHL/Annals of Tropical Medicine and Public Health</td>
<td>Vaccination sessions; challenges and opportunities for improvement: Experiences from Karnataka</td>
<td>India/English</td>
<td>To assess the operational knowledge regarding routine immunisation among medical officers and the outcome of supportive supervision sessions in select immunisation sites.</td>
<td>195 medical officers.</td>
</tr>
</tbody>
</table>

Source: Authors.
Chart 3. Characteristics of interventions and outcome of studies selected for systematic review.

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Type of educational interventions</th>
<th>Instrument for assessing effectiveness of educational intervention</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sebastian, Parthasarathi and Ravi (2021)</td>
<td>Educational sessions using an educational module with content on immunisation process (storage and transport of immunobiologics, AEFIs, vaccine administration, waste disposal and related problems).</td>
<td>Validated pre-test and post-test questionnaire.</td>
<td>Post-intervention assessment found statistically significant improvements at all stages of the immunisation process involving prevention and management of AEFIs, including storage ( \text{p} &lt; 0.001 ), transport ( \text{p} &lt; 0.001 ), administration, including waste disposal ( \text{p} &lt; 0.001 ), AEFI monitoring and reporting ( \text{p} &lt; 0.001 ) and knowledge of AEFIs ( \text{p} &lt; 0.001 ). AEFI reporting improved by 30% after the education sessions.</td>
</tr>
<tr>
<td>Musa, Parakoyi and Akanbi (2006)</td>
<td>Training with content: safe injection, injection waste disposal and dangers of unsafe injection.</td>
<td>Pre-test and post-test questionnaire.</td>
<td>There were statistically significant improvements ( \text{p} &lt; 0.05 ) post-intervention in post-immunisation event prevention by vaccine administration, as the case group showed better knowledge of safe injection than the control. Improvements were also found in safe injection practices at the control group’s health centres, but these were not statistically significant, except as regards single use of syringes to draw the vaccine for each patient.</td>
</tr>
<tr>
<td>Mallik et al. (2011)</td>
<td>In-depth training on cold chain with PowerPoint presentation and detailed discussion, followed by practical training, with field visits, on cold chain temperature monitoring, including interpretation of vaccine vial monitor, agitation testing, preventive maintenance and emergency contingency plan.</td>
<td>Post-intervention questionnaire and visual assessment of cold chain pre- and post-intervention.</td>
<td>Outcomes following the education intervention were significant ( \text{p} &lt; 0.05 ) in preventing AEFIs (internal condition of cold chain equipment, vaccine placement, temperature maintenance and designation of a cold chain handler at each point in the cold chain). Cold chain handlers’ awareness and skills were unsatisfactory as regards heat- and col-sensitive vaccines, preventive maintenance, correct contingency plan and holiday temperature monitoring.</td>
</tr>
<tr>
<td>McKeirnan et al. (2018)</td>
<td>Training programme in immunisation administration, comprising a home study and live training with content including basic immunisation concepts, vaccine schedule, defaulter tracing, documentation and immunisation process. The home study comprised a presentation narrated by way of a Panopto video platform and the live training also consisted in presenting content and conducting vaccine administration practices until competence was acquired.</td>
<td>Pre-test and post-test questionnaire and number of immunisations administered by technicians and AEFIs after training.</td>
<td>25 pharmacy technicians completed the home and live training and the 29 who took the home study assessment passed with greater than 70% competency on the first attempt. Technicians self-reported increased confidence with immunisation skills between the pre-training and post-training surveys. From December 2016 to May 2017, the technicians administered 953 immunisations with 0 adverse events reported.</td>
</tr>
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it continues
addressed questions 1, 2, 3 and 7, but questions 4 and 5 were not addressed in most studies. Only three studies\(^{19,21,22}\) met the criteria for question 6 and only one study\(^{21}\) failed to satisfy items 8 and 9 of the risk of bias assessment instrument.

**Discussion**

In this study, India was notable for studies to assess the effectiveness of educational interventions in the vaccination process to improve prevention and proper management of AEFIs. The Serum Institute in India is the largest producer of vaccines, which is believed to account for its prominence in scientific production\(^{24}\). A literature review addressing vaccination waste as a topic also showed India to be most prevalent in studies\(^{25}\).

This SR also found the largest number of participants to be doctors, but nurses appear to participate in half the studies, even if in small numbers. In the countries where the studies took place, other groups were also involved in vaccination activities; this differs from Brazil, where nurses are responsible the vaccination room, where a nurse supervises the work and arranges CPD for the team\(^{26}\).

Review studies have shown vaccination activities lacking supervision\(^{18,22,23}\). In Brazil, nurses perform a number of duties in PHC and this work overload is known to limit nurses’ activities in vaccination. This finding corroborates an integrative review of Brazilian studies that questioned the absence or limited participation of nurses in the vaccination room and how nurses’ duties end up being performed by nursing technicians. This resulted in errors in the immunisation process for lack of the guidance, supervision and continued professional development fostered by nurses\(^{27}\).

This SR found educational interventions with differing resources and durations. These considerations should be sufficient for CPD to be supported. In other words, they should provide

<table>
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</tr>
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<tbody>
<tr>
<td>Lee et al. (2012)</td>
<td>Individual guidance and distribution of educational leaflets with content on vaccine storage precautions.</td>
<td>Pre- and post-intervention questionnaire and checklist.</td>
<td>Mean checklist score after education was 9.74 out of 15 (p &lt; 0.001). Prior to the intervention, participants committed a series of immunisation errors relating to cold chain precautions, while following the intervention, there were improvements in storage temperature recording (p = 0.016), vaccine storage in the centre of the cold box (p = 0.004), storage of vaccines with other medicines and non-medical items (p = 0.031). Mean questionnaire score after education was 10.48 out of 14 (p &lt; 0.001).</td>
</tr>
<tr>
<td>Holla, Borker and Bhat (2013)</td>
<td>Supervisory support and training sessions on immunisation routine with content on the national immunisation schedule, cold chain management, safe injection, waste disposal and AEFIs.</td>
<td>Pre- and post-test questionnaire and supervision.</td>
<td>Doctors’ overall knowledge improved after the immunisation routine training session to prevent program component errors, including safe vaccination, cold chain precautions and knowledge of AEFIs. Mean pre-test score was 30.65% and post-test, 48.68% (p &lt; 0.001) overall. Supervisory support was also useful in improving immunisation routine sessions, where 100% performance was obtained in use of correct diluents.</td>
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health personnel with food for thought as regards their work process, with a view to improving patient care28.

As regards content, the review found educational interventions at all stages of the immunisation process. It is important that the intervention address care for the cold chain, patient reception and screening, preparation, handling and administration of vaccines, as well as AEFI surveillance29. Accordingly, the content analysis of the studies in this review will be discussed below, by stages of the immunisation process.

Studies in this review found that lack of cold chain equipment was an hindrance18,20. Also, one SR study stated that vaccine packaging had been neglected and that all attention focused on vaccination coverage22. These findings agree with a survey to assess the situation of the vaccination room in a town in Paraíba state, which highlighted improper conditions of refrigeration, a lack of thermometers and improper thermal boxes in insufficient quantity. The same study also found weaknesses in staffs’ knowledge as to correct checking of vaccine temperatures30. These deficits led to IEs and, as a result, can cause AEFIs, besides impairing immunobiologicals’ effectiveness31.

One article in this review stressed that intervention after training significantly improved the staff’s awareness as to recording immunobiological storage refrigerator temperatures22. In order to yield quality results in improved staff training, educational strategies must be based on problematising work processes as experienced by nursing teams, thence to generate changes in the environment by engaging the facility’s staff and management32.

In the vaccination process, screening is carried out jointly with reception and seeks to ascertain needs and priorities as regards vaccination status, as well as guiding clients about the vaccines to be administered. Reception, meanwhile, aims to produce active listening and convey confidence to the patient4,26.

Studies in this review highlighted weaknesses in communication between health personnel and parents or guardians of children to be vaccinated, underlining that this relationship is necessary to ensure the confidence that results in vaccination adherence18,23. The reception, screening and guidance stages are intended to engage patients by communicating that the immunisation process is reliable, so as to combat vaccine hesitancy33.

Donnini et al. (2022)34 found that the most frequent error was administering vaccines at other than the recommended age. Health personnel’s weak knowledge and training as regards the vaccination schedule and the similarity of vaccine labels may be factors in this type of IE, which constitutes a failure in the stages of vaccine

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Chart 4. Critical assessment of studies selected for the systematic review.

<table>
<thead>
<tr>
<th>Study</th>
<th>Questions</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sebastian, Parthasarathi and Ravi (2021)</td>
<td>Y Y Y N N NC Y Y Y</td>
<td>Moderate risk</td>
</tr>
<tr>
<td>Musa, Parakoyi and Akanbi (2006)</td>
<td>Y Y Y Y Y Y Y Y Y</td>
<td>Low risk</td>
</tr>
<tr>
<td>Mallik et al. (2011)</td>
<td>Y Y Y N N NC Y Y Y</td>
<td>Moderate risk</td>
</tr>
<tr>
<td>McKeirnan et al. (2018)</td>
<td>Y Y Y N Y Y Y Y Y</td>
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<td>Moderate risk</td>
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<tr>
<td>Holla, Borker and Bhat (2013)</td>
<td>Y Y Y Y N N NC Y Y Y</td>
<td>Moderate risk</td>
</tr>
</tbody>
</table>

Note: Y – Yes/ N – No/ NC – Not clear.

* Is it clear in the study what is the ‘cause’ and what is the ‘effect’ (i.e. there is no confusion about which variable comes first)? ** Were the participants included in any comparisons similar? *** Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest? & Was there a control group? ++ Were there multiple measurements of the outcome both pre and post the intervention/exposure? +++ Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed? * Were the outcomes of participants included in any comparisons measured in the same way? ++ Were outcomes measured in a reliable way? & Was appropriate statistical analysis used?

screening, preparation, handling and administration.

Manufacturers are thus advised to change immunobiologics’ labelling so as to facilitate correct identification of vials at time of vaccination. Other manners of reducing occurrences of IE are by improving staff training, client participation, nurse supervision of vaccinations, as well as management that works to reduce these risks.

Nursing teams often suffer from weaknesses in vaccine preparation, handling and administration. Teixeira et al. (2021) found that the most frequent errors were preparing several vaccine doses at the same time, inappropriate needle positioning, aspiration before vaccine administration and inserting needles into the rubber of multi-dose vials. Barboza et al. (2020) showed that errors in vaccine administration technique were responsible for most AEFIs.

Solid healthcare waste (SHW) disposal at the vaccine preparation, handling and administration stages also requires training, as failures in this activity are considered IEs and can spread diseases to workers, public and environment.

Preparation for appropriate SHW management requires implementing a solid healthcare waste management programme, although ignored by management and health service professionals, this is what defines and details the stages of SHW management in line with current rules. It thus helps in training health workers in this activity.

As regards client guidance following administration of a vaccine, one study in this SR found that health staff did not advise parents to wait up to 30 minutes at the health service to check for adverse reactions and discovered that they omitted to do so for lack of waiting room space. Batista et al. (2021) agreed, pointing out that most users received no guidance on the vaccines administered, possible AEFIs or what to do should these arise.

This kind of guidance contributes to surveillance of adverse events following immunisation and is necessary in order to assure safe vaccination practices. Recommendations provided by health personnel are known to increase vaccination adherence, but for this to happen staffs must be ready to answer questions and concerns.

One article in this review showed that, following an educational intervention on vaccine administration, health personnel felt more confident in administering the immunobiological, recording the vaccination and providing guidance.

As a contribution to continued professional development, a visual protocol was developed to assure safe vaccination of children under 1 year old. This tool covered the stages of reception, screening, vaccine preparation and administration and guidance. It was concluded that the technology helped to minimise IEs and thus AEFIs at these stages.

From content analysis, a review study demonstrated that inadequate knowledge of the process for reporting AEFIs and lack of time led to low reporting of these events.

In Brazil, however, under- or incomplete reporting of AEFIs and/or IEs is a reality, which in most cases can be explained by health personnel's fear, lack of knowledge about reporting, lack of commitment and overwork. Although AEFIs are associated with IEs, physical environments inappropriate for professional practice have also contributed to the occurrence of these events.

Note, in this connection, that these factors have their origin in the training given to these health personnel and the continuance of this educational process, as well as the support they receive from job managers. However, it should be stressed that health personnel recognise their need for, and the importance of, training on this topic.

In this regard, failure to recognise an AEFI and take appropriate action is reflected in vaccination adherence, as it contributes to refusal in vaccination rooms and, consequently, amplifies myths and taboos, all of which, together with anti-vaccine movements, is leading to the re-emergence of vaccine-preventable diseases that once were eradicated or controlled.

In view of the foregoing, there is a need for CPD to alleviate healthcare staffs’ – and especially nursing teams’ – fear of reporting and foster the recognition, proper management and prevention of AEFIs and/or IEs.

The pre-test and post-test method, used to evaluate the interventions in this review, serves to assess intentional interventions before and after, without a control group. Even in the absence of a comparison group, this method is an effective means of assessing the progress of interventions, because it makes it possible to judge whether the intervention was effective or not and whether changes are needed. It thus enables settings to be modified and contributes to improving a given group's training.

This study found that educational interventions for AEFI prevention and management were effective in improving the training of health per-
sonnel working in vaccination. For this to happen, however, they have to maintain close contact with the realities of health staffs’ experience, that is, be grounded in problematisation, and they must be tested previously and assessed periodically to adjust content, resources and duration. Interventions can guarantee improvements only if associated with good working conditions. Martins et al. (2018) noted that they are still incipient and scarce and have been carried out using traditional methodologies contrary to what is recommended by Brazil’s National Policy of Continued Professional Development in Healthcare (PNEPS).

The limitations to this review included the absence of a search of the grey literature and meta-analysis, because of the heterogeneity of the studies. Also, only observational studies were evaluated.

Note that management must improve working conditions for vaccination by ensuring appropriate environment and equipment, as well as staff to meet vaccination demand safely, particularly nurses to supervise the work. Attention is also drawn to the need to train staffs by CPD to conduct activities pursuant to National Immunisation Programme recommendations.

It is hoped that this review will contribute to other scientific studies with a view to improving the immunisation process by reducing and/or eradicating IEs and AEFIIs by means of educational interventions that contribute to CPD in vaccination in primary health care.
Collaborations

DA Vasconcelos, GM Silva, AF Menezes and MSC Barreiro contributed to the conception and design of the study, analysis and interpretation of results, and writing and critical review of the manuscript. JC Nascimento and CTS Silva contributed to data analysis and interpretation, and writing and critical review of the manuscript. AM Santos and CBT Ferreira contributed to the conception and design of the study, and writing and critical review of the manuscript. All authors approved the final version of the manuscript and are responsible for all aspects of it, including ensuring its accuracy and integrity.

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References


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