








# ORGANIZATION OF THE WORK PROCESS THROUGH KNOWLEDGE, ATTITUDES, AND PRACTICES FOR SAFE ADMINISTRATION OF VACCINES IN CHILDREN: A SCOPING REVIEW

ORGANIZAÇÃO DO PROCESSO DE TRABALHO ATRAVÉS DE CONHECIMENTO, ATITUDES E PRÁTICAS PARA ADMINISTRAÇÃO SEGURA DE VACINAS EM CRIANÇAS: UMA REVISÃO DE ESCOPO

ORGANIZACIÓN DEL PROCESO DE TRABAJO A TRAVÉS DE CONOCIMIENTOS, ACTITUDES Y PRÁCTICAS PARA LA ADMINISTRACIÓN SEGURA DE VACUNAS EN NIÑOS: UNA REVISIÓN DE ALCANCE

 Erica Rayane Galvão de Farias<sup>1</sup>  
 Cleonice Andrea Alves Cavalcante<sup>1</sup>  
 Adriana Cristina Aires de Melo<sup>1</sup>  
 Aylanne Maria Lopes Soares<sup>2</sup>  
 Danilo Oliveira da Silva<sup>3</sup>  
 Antônia Danielly Moura de Souza<sup>3</sup>  
 Jéssica Selenia Ferreira Monteiro<sup>4</sup>

<sup>1</sup>Universidade Federal do Rio Grande do Norte - UFRN, Programa de Pós-graduação em Saúde e Sociedade - PPGSES, Escola de Saúde - ES. Natal, RN - Brazil.

<sup>2</sup>Hospital Estadual Giselda Trigueiro, Urgência e Emergência. Natal, RN - Brazil.

<sup>3</sup>Universidade Federal do Rio Grande do Norte - UFRN, Centro de Ciências da Saúde - CCS, Escola de Enfermagem - EE. Natal, RN - Brazil.

<sup>4</sup>Universidade Federal do Rio Grande do Norte - UFRN, Centro de Ciências da Saúde - CCS, Curso de Medicina. Natal, RN - Brazil.

Corresponding Author: Erica Rayane Galvão de Farias  
E-mail: erica\_raianes2@hotmail.com

## Authors' Contributions:

Data Collection: Erica R. G. Farias, Danilo O. Silva; Investigation: Erica R. G. Farias, Adriana C. A. Melo, Danilo O. Silva, Antônia D. M. Souza; Methodology: Erica R. G. Farias; Project Management: Erica R. G. Farias, Cleonice A. A. Cavalcante; Supervision: Erica R. G. Farias, Cleonice A. A. Cavalcante; Visualization: Erica R. G. Farias, Jéssica S. F. Monteiro; Writing - Original Draft Preparation: Erica R. G. Farias, Jéssica S. F. Monteiro; Writing - Review and Editing: Erica R. G. Farias, Jéssica S. F. Monteiro.

Funding: No funding.

Submitted on: 10/26/2021

Approved on: 09/12/2022

Responsible Editors:

 Tânia Couto Machado Chianca  
 Bruna Figueiredo Manzo

## ABSTRACT

Objective: to map the organization of the work process through knowledge, attitudes, and practices for the safe administration of vaccines in children. Method: a literature review was carried out using the Scoping Review method, in accordance with the recommendations of the international PRISMA-ScR guide, and the method of the Joanna Briggs Institute Reviewers Manual. The electronic search of the studies was carried out in the databases PubMed, CINAHL, Web of Science, Scopus, COCHRANE, LILACS and PsycINFO and in the gray literature, between the years 2000 and 2021. Articles, reviews, theses, dissertations, and manuals available were included. In full that were in line with the objective of this study, having been contemplating the English, Portuguese, Italian, Spanish and French languages. Studies that were not free of charge through the CAFE platform, duplicated, unrelated to the researched theme and that did not have a well-defined methodology were excluded from the review. Results: the review included 19 published studies. Brazil was the country with the highest number of studies. The main findings led to the construction of conceptual categories. The first seven refer to the main characteristics of the studies included in this scope review; the other three categories aimed to answer the guiding question and were composed of indicators present in the organization of the work process before, during and after the safe administration of a vaccine to the child. Conclusion: it is concluded that the objectives of this research were achieved by mapping the organization of the work process through knowledge, attitudes, and practices for the safe administration of vaccines in children. As a limitation of this study, there is a lack of research that guides post-vaccination care, and it is suggested that further research be carried out.

Keywords: Vaccination; Nursing; Child; Patient Safety; Immunization.

## RESUMO

Objetivo: mapear a organização do processo de trabalho através de conhecimento, atitudes e práticas para administração segura de vacinas em crianças. Método: realizou-se uma revisão de literatura com o método Scoping Review, de acordo com as recomendações do guia internacional PRISMA-ScR, e o método do Joanna Briggs Institute Reviewers Manual. A busca eletrônica dos estudos foi realizada nas bases de dados PubMed, CINAHL, Web of Science, Scopus, COCHRANE, LILACS e PsycINFO e na literatura cinzenta, entre os anos 2000 e 2021. Foram incluídos artigos, revisões, teses, dissertações e manuais disponibilizados na íntegra que estivessem em consonância com o objetivo deste estudo, tendo sido contemplando os idiomas inglês, português, italiano, espanhol e francês. Foram excluídos da revisão estudos não gratuitos pela plataforma CAFE, duplicados, que não tivessem relação com a temática pesquisada e não tivessem sua metodologia bem definida. Resultados: a revisão englobou 19 estudos publicados. O Brasil foi o país com maior número de estudos. Os principais achados propiciaram a construção das categorias conceituais. As sete primeiras se referem às principais características dos estudos incluídos nesta revisão de escopo; as outras três categorias objetivaram responder à questão norteadora e foram compostas por indicadores presentes na organização do processo de trabalho antes, durante e após a administração segura de uma vacina na criança. Conclusão: conclui-se que os objetivos desta pesquisa foram alcançados mediante mapeamento da organização do processo de trabalho através de conhecimento, atitudes e práticas para administração segura de vacinas em crianças. Como limitação deste estudo, evidencia-se a escassez de pesquisas que norteiam os cuidados pós-vacinação e sugere-se que novas pesquisas sejam realizadas.

Palavras-chave: Vacinação; Enfermagem; Criança; Segurança do Paciente; Imunização.

## RESUMEN

Objetivo: mapear la organización del proceso de trabajo a través de los conocimientos, actitudes y prácticas para la administración segura de vacunas en niños. Método: se realizó una revisión de la literatura mediante el método Scoping Review, según las recomendaciones de la guía internacional PRISMA-ScR y el método Joanna Briggs Institute Reviewers Manual. La búsqueda electrónica de estudios se realizó en las bases de datos PubMed, CINAHL, Web of Science, Scopus, COCHRANE,

## How to cite this article:

Farias ERG, Cavalcante CAA, Melo ACA, Soares AML, Silva DO, Souza ADM, Monteiro JSF. Organization of the work process through knowledge, attitudes, and practices for safe administration of vaccines in children: a scoping review. REME - Rev Min Enferm. 2022[cited \_\_\_\_ \_\_\_\_ \_\_\_\_];26:e-1477. Available from: \_\_\_\_\_ DOI: 10.35699/2316-9389.2022.40919

LILACS y PsycINFO y en la literatura gris entre los años 2000 y 2021. Se incluyeron artículos, revisiones, tesis, disertaciones y manuales disponibles en su totalidad que estuvieran en línea con el objetivo de este estudio, en inglés, portugués, italiano, español y francés. Se excluyeron de la revisión los estudios no gratuitos a través de la plataforma CAFE, los duplicados, los que no estaban relacionados con el tema investigado y los que no tenían bien definida su metodología. Resultados: la revisión incluyó 19 estudios publicados. Brasil fue el país con el mayor número de estudios. Los principales resultados propiciaron la construcción de las categorías concebidas, las siete primeras se refieren a las principales características de los estudios incluidos en esta revisión de alcance, las otras tres categorías tienen como objetivo responder a la pregunta orientadora y se componen de indicadores presentes en la organización del proceso de trabajo antes, durante y después de la administración segura de una vacuna en el niño. Conclusión: se concluye que se lograron los objetivos de esta investigación al mapear la organización del proceso de trabajo a través de los conocimientos, actitudes y prácticas para la administración segura de las vacunas en los niños, se evidencia como limitación de este estudio la escasez de investigaciones que orienten la atención post-vacunación y se sugiere la realización de nuevas investigaciones.

Palabras clave: Vacunación; Enfermería; Niño; Seguridad del Paciente; Inmunización.

## INTRODUCTION

Vaccination is one of the most common procedures in childhood and is among the greatest advances observed in the health area. In Brazil, a healthy child, up to one year old, must receive 10 different types of vaccines, according to the latest update of the 2020 child calendar, from the National Immunization Program (PNI, Programa Nacional de Imunizações) of the Ministry of Health (MoH). The distribution of these vaccines is guaranteed by the Unified Health System (SUS, Sistema Único de Saúde).<sup>1</sup>

It is worth noting that the act of vaccinating increases the life expectancy of the population, controls pandemics and saves millions of lives.<sup>2</sup> Vaccines are immunobiologicals that contain antigens, which, when inoculated into the human body, are capable of inducing active specific immunity that leads to the fight against a certain disease.<sup>3</sup>

With the advent of the SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus-2) pandemic, vaccination has been discussed worldwide, and it is quite common to find, via the internet, a variety of information from reliable sources and others that are a somehow questionable. As a result, debates and technical evaluations on vaccine safety permeate aspects related to the occurrence of adverse events flowing immunization.<sup>3</sup>

Events of this nature are related to several factors, such as immunization errors caused by inadequate handling, prescriptions and/or administration. Therefore, such errors are preventable. It is worth mentioning that questions related to the occurrence of these errors are not frequently addressed, since, in the beginning, punitive actions were applied, which did not favor changes in this aspect, that is: the control of situations was centered on individual actions instead of systemic ones.<sup>1</sup>

In Brazil, in 2016, immunization errors represented 18.8% of the 15,371 reported cases of suspected AEFI.<sup>4</sup> Data extracted from the PNI supported a Brazilian survey between the years 2003-2013, revealing a significant increase in adverse events following immunization that arise from specifically of immunization errors.<sup>5</sup>

The concern regarding immunization errors and what can be done in order to minimize them subsidized this research. We sought to answer the following problem: what knowledge, attitudes and healthcare practices should be included in the organization of the work process for the safe administration of vaccines in children? Such findings are of great relevance for structuring proposals related to the safety of children who will undergo vaccination.

Human error is one of the main factors responsible for the occurrence of accidents in the health area; however, it cannot be attributed solely to the professional. In general, human error results from a sequence of failures, whether in planning or execution, and therefore cannot be attributed to chance.<sup>5</sup>

Considering what was exposed and following the current trends and recommendations of the World Health Organization (WHO) for safe practices in immunization, this scope review aimed to map the organization of the work process through knowledge, attitudes, and practices to safe administration of vaccines in children. The findings of this review supported the construction of a graphic protocol for the organization of the work process through knowledge, attitudes, and practices for the safe administration of vaccines in children. Such a tool can help healthcare professionals and managers in the planning and management of immunization actions, with recommendations for implementing strategies aimed at preventing and reducing risk factors for errors. In this way, it contributes to the quality of the service provided and to user safety.

## METHOD

This is a Scoping Review, with a research protocol registered in the Open Science Framework (DOI: 10.17605/OSF.IO/3TM9X). This investigation mapped the scientific production of relevant studies in the field of childhood vaccination, performing a comprehensive search and summarizing the main findings of the available evidence.<sup>6</sup> For this scope review, a structured search protocol was created that meets

the recommendations of PRISMA-ScR<sup>7</sup>, the methodology of the Joanna Briggs Institute Reviewer's Manual<sup>8</sup> and the rationales of Arksey and O'Malley.<sup>9</sup> From this perspective, the search protocol was arranged in five steps, namely: i) identification of the research question; ii) identification of relevant studies; iii) selection of studies; iv) data analysis; and v) synthesis and presentation of results. It should be noted that all the steps mentioned were carried out in pairs.

To elaborate the research question and search strategy, the PCC strategy was adopted (P: Population – Vaccination in children; C: Concept – Knowledge, attitudes, and practices in health; C: Context – Patient safety).<sup>7</sup> The searches were carried out independently by two reviewers, between July and August 2021, in the PubMed, CINAHL, Web of Science, Scopus, COCHRANE, LILACS and PsycINFO databases. Furthermore, the search in the gray literature was arranged in the CAPES, DART, EThOS, RCAAP, ERIC portals and in the Catalog of Theses and Dissertations in Latin America. For this, the Journal Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES, Coordenação de Aperfeiçoamento de Pessoal de Ensino Superior) was used, with the access of a student participating in the Federated Academic Community (CAFe, Comunidade Acadêmica Federada) and login at the higher education institution Universidade Federal do Rio Grande do Norte (UFRN) as a way to standardize the collection on these bases. The descriptors vaccination, immunization, vaccine, child, child health, comprehensive healthcare, patient safety, safety management and risk management were used. To maintain coherence in the search for studies and avoid bias selection, descriptors were used separately and associated, respecting the specific characteristics of each of the selected databases.

The searches were limited to the period from 2000 to 2021. However, this type of review does not recommend temporal delimitation, but this procedure was adopted considering that the contents referring to childhood vaccination published in previous years could be obsolete and would compromise the quality of the findings. Manual searches were performed in the references of the included studies in order to detect relevant searches, but the authors were not contacted to identify additional studies.

The following inclusion criteria were adopted: literature review articles or originals, with a quantitative or qualitative approach, theses, dissertations, and Brazilian manual from the Ministry of Health

Available from full and in line with the objective of this study. The languages English, Portuguese, Italian, Spanish and French were contemplated. The following were excluded: non-free studies through the CAFe platform, duplicate studies, those that did not have a well-structured methodology or did not respond to the research question.

The titles and abstracts of the studies found were organized in a Microsoft Excel 2016® spreadsheet, removing duplicates. Two independent reviewers screened the articles by reading the titles and abstracts to identify relevant ones. Subsequently, the studies selected based on the eligibility criteria were read in full by both reviewers for the composition of the final review sampling.

Data from these studies were extracted based on the JBI manual and in line with the recommendations of Arksey and O'Malley, being arranged in spreadsheets in Excel 2016® and analyzed using simple descriptive statistics by three researchers. Information on title, authorship, type of study, type of research, year of publication, country of origin, objective, method, and level of evidence gave rise to seven conceptual categories, which were described in Figure 3 of the results, providing a sample general overview.

Furthermore, the conceptual categories that allowed answering the guiding question of this research were classified as: organization of the work process before administration (Figure 4); organization of the work process during administration (Figure 5); and organization of the work process after administering a vaccine to a child (Figure 6). Such categories present the indicators, that is, the knowledge, attitudes and practices that must be included in the organization of the work process for the safe administration of vaccines in children, mentioning the studies in which the indicators were cited and their respective levels of evidence. It is also noteworthy that we opted for the synthetic presentation of such indicators, with the aim of exploring them in the discussion stage.

Finally, the study was carried out with public domain data; thus, ethical appreciation was not necessary.

## RESULTS

The adopted search strategies allowed retrieving 193,220 studies, of which 500 were excluded by replication. The reading with analysis of the titles and abstracts to select the articles relevant to the question of this review resulted in the remaining of 146 articles, which had as a phenomenon of interest to answer the question of the study. From the reading of the full text, 19 studies were

selected, as they dealt with knowledge, attitudes and healthcare practices that must be included in the organization of the work process for the safe administration of vaccines in children. The search, screening, eligibility, and sample selection process is shown in Figure 1.

The sample consisted of 12 articles, 4 technical manuals, 1 thesis and 2 dissertations. Regarding the country of origin of publications, Brazil stood out with 11 texts (59%), followed by France, with two (11%), and one (5%) in each of the following countries: Turkey, Ireland, Canada, England, South Korea, and USA. Figure 2 shows the number of studies found according to the year of publication.

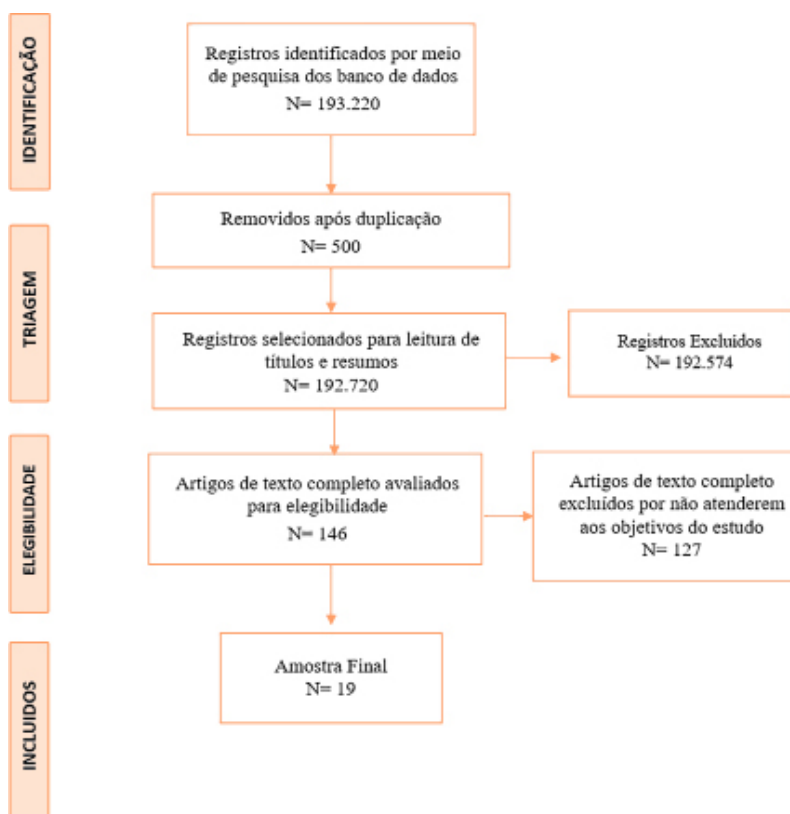


Figure 1 - Flowchart of the study selection process for Scoping Review, adapted from PRISMA-ScR®. Natal, RN, 2021

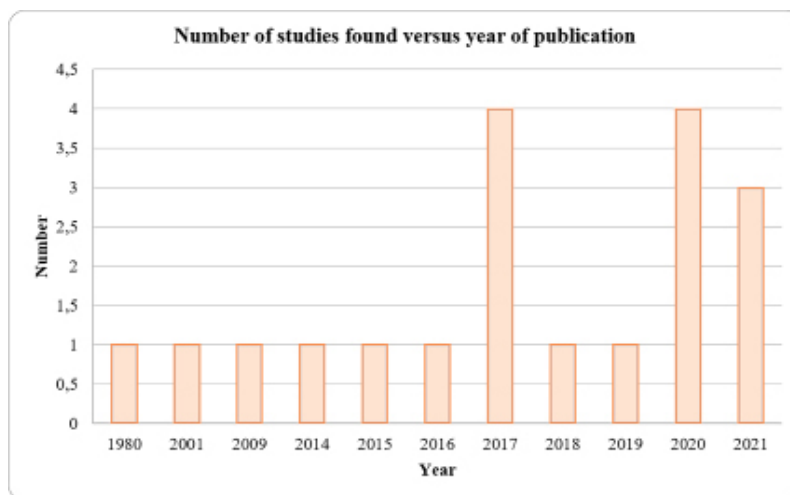


Figure 2 - Number of studies found by year of publication. Natal, RN, 2021

Regarding the levels of evidence of the studies, the level II stood out, with 8 publications (42.1%), followed by 5 (26.31%) with level V, 4 (21.05%) with level VII and 1 (5.26%) of levels I and VI, respectively. Then, the creation of conceptual categories began. The first seven

refer to the main characteristics of the studies included in this scope review. General information was summarized in order to facilitate an overview of the selected sample. Below, Figure 3 presents the systematization of the categories.

Figure 3 - Conceptual categories related to the main characteristics of the studies: title, country, type of study, year of publication, database, authors, and type of research. Natal, RN, 2021

Title	Country	Study Type	Year	Database	Authors	Research Type
Adverse event following immunization and immunization error: from the epidemiological perspective to the perception of healthcare professionals	Brazil	Original Research	2017	AMERICA LATINA	Bisetto LHL <sup>5</sup>	Retrospective
Impact of a quality improvement model on the reduction of errors related to vaccine administration in a Basic Health Unit	Brazil	Original Research	2020	AMERICA LATINA	Nunes MBM <sup>10</sup>	Observational
Evaluation of the quality of Nursing care in public vaccination rooms in Goiânia	Brazil	Original Research	2017	CAPES-TESE	Bastos ML <sup>11</sup>	Cross-sectional
Knowledge and practices on childhood vaccination: results of a survey with French physicians	France	Original Research	2019	CINAHL	Bakhache P et al <sup>12</sup>	Observational
Effects of rapid vaccine injection without aspiration and application of manual pressure before vaccination on pain and crying in infants	Turkey	Original Research	2017	CINAHL	Göl İ, Altuğ ÖS <sup>13</sup>	Experimental
Incidence of adverse events following immunization in children	Brazil	Original Research	2017	CINAHL	Silva AEBC et al <sup>14</sup>	Retrospective
Needle size for vaccination procedures in children and adolescents	Ireland	Review Article	2018	COCHRANE	Beirne PV et al <sup>15</sup>	Systematic
Knowledge of vaccinators: operational aspects in vaccine administration	Brazil	Original Research	2001	LILACS	Pinto MLC et al <sup>16</sup>	Descriptive
How to communicate about vaccine safety: guidelines to guide health workers in communicating with fathers, mothers, caregivers, and patients	Brazil	Technical Manual	2020	LILACS	Organização Pan-Americana da Saúde (OPAS) <sup>17</sup>	Technical Manual
Physical interventions and injection techniques to reduce injection pain during routine childhood immunizations: Systematic Review of Randomized Controlled Trials and Quasi-randomized controlled trials	Canada	Review Article	2009	PUBMED	Taddio A et al <sup>18</sup>	Systematic
Immunization: knowledge and practices of Nursing professionals in the vaccine room	Brazil	Original Research	2020	LILACS	Silva MRB et al <sup>19</sup>	Observational
National plan for implementing vaccination against COVID-19	Brazil	Technical Manual	2021	LILACS	Ministério da Saúde et al <sup>20</sup>	Technical Manual
Evaluation of the intramuscular injection technique through the "check-list"	Brazil	Original Research Article	1980	LILACS	Almeida MCP et al <sup>21</sup>	Observacional
Update course for the vaccination room worker	Brazil	Technical Manual	2014	LILACS	Ministério da Saúde et al <sup>22</sup>	Technical Manual
Safety incidents related to pediatric immunization in primary care: a mixed methods analysis of a national database	England	Original Research Article	2015	PUBMED	Rees P et al <sup>23</sup>	Cross-sectional
Vaccine-related errors in reconstitution in South Korea: A national survey of physicians and nurses	South Korea	Original Research Article	2021	PUBMED	Lee YH et al <sup>24</sup>	Cross-sectional
Strategies to reduce errors associated with 2 vaccine components	USA	Original Research Article	2020	PUBMED	Samad F et al <sup>25</sup>	Retrospective
Vaccination errors in general practice: creating a preventive checklist based on a multimodal analysis of reported errors	France	Original Research Article	2016	SCOPUS	Charles R et al <sup>26</sup>	Research action
Safety in the use of vaccines	Brazil	Technical Manual	2021	ISMP	Nascimento MMG et al <sup>27</sup>	Technical Bulletin



Furthermore, three more conceptual categories were created to answer the guiding question of this scope review. These categories were arranged in Figures 4, 5 and 6. The first is composed of indicators present in the organization of the work process before administering a vaccine to a child. Then, the second category grouped the indicators present during the administration of a vaccine to a child.

Finally, the third category gathered the necessary indicators after administering a vaccine to a child. These three categories contain the indicators of the procedural organization of work, the studies in which such indicators were inferred and the level of evidence of the findings.

Below, Figures 4, 5 and 6 present the indicators and their distribution by category.

Figure 4 - Conceptual category: organization of the work process before administering a vaccine to a child. Natal, RN, 2021

BEFORE ADMINISTRATION		
INDICATORS	STUDY(IES)	LEVEL OF EVIDENCE
Team of two healthcare professionals in the vaccination room	T1, A7	V, II
Dialogue that establishes security and reliability	M1, A6, M4	VII, V, VII
Restriction on the number of companions in the room	T1, A1, M1, A12	V, II, VII, V
Analyze the vaccination card	T1, A7, A9, A12, M4	V, II, VI, V, VII
Ask the user's age to receive such immunobiological	T1, D2, A3, A5, A9, M4	V, II, V, V, VI, VII
Check the user's past health history	D1, D2, A5, A7, A9, M4	II, II, V, II, VI, VII
Question about problems that contraindicate or postpone vaccination	T1, D2, A5, A6, A9, A12, M4	V, II, V, V, VI, V, VII
Indicate the CRIE, if necessary	D2, A5	II, V
Accommodate and position the user comfortably for vaccination	T1, A1, M3	V, II, VII
Guidance on the type of immunobiological to be administered, subsequent doses and possible AEFI and conducts in the face of such an event	T1, D1, D2, A3, A5, A6, A7, A8, A9, M4	V, II, II, V, V, V, II, II, VI, VII
Register on the vaccine card and SIPNI	D2, A1, A7	II, II, II
Sanitize hands	T1, D1	V, II
Read the bottle label before preparing the dose	T1, D2, A4, A7, A8, A12, M4	V, II, I, II, II, V, VII
Check minimum interval between doses	A3, A5, A7, A9, A12, M4	V, V, II, VI, V, VII
Check the expiry date of single dose, multidose and reconstituted vaccine vials before preparing the vaccine	T1, D2, A3, A9, A12	V, II, V, VI, V
Show parents or users the vial label with focus on vaccine name and expiration date	T1, A12, M4	V, V, VII
Prepare dose using aseptic technique	T1, A1, A3, A7, A12, M4	V, II, V, II, V, VII
Prepare in a clean and dry place	D1, A12	II, V
Clean the vial with clean, dry cotton	D1, A12	II, V
Be careful not to contaminate the vaccine vial during the preparation	D1, A1, A12	II, II, V
Check the integrity of the packages	D1, A5, A12	II, V, V
Pay attention to the correct dilution	D2, A1, A9, A12, M4	II, II, VI, V, VII
Pay attention to the contents of the vial and do not use frozen vaccines, with the presence of foreign bodies or with a dubious appearance	A5	V
Do not administer the vaccine to children who have a fever	A5	V
Suggest that the mother breastfeed (or give a bottle) a few minutes before, during and after vaccination, in order to facilitate the process	M1	VII
If oral vaccines are administered together with injectables in the same session, it is suggested to start with the oral vaccine against the rotavirus, followed by the oral vaccine against the polio virus and, finally, start breastfeeding so that the other vaccines (injectables) are administered with a view to facilitating the process	M1	VII
Caution with similar vaccines and/or with similar labels	A9, A12, M4	VI, V, VII

Source: elaborated by the author (2021)

A: articles, T: theses, D: dissertations, M: technical manual.

Figure 5 - Conceptual category: Organization of the work process during the administration of a vaccine to a child. Natal, RN, 2021

During Administration		
INDICATORS	STUDY(IES)	LEVEL OF EVIDENCE
Delimit the application area	T1, A9	V, VI
Check if the dose in (mL) of the vaccine is correct for the age of the user	T1, A9, M4	V, VII, VII
Use the Z technique for intramuscular administration	D1, A8	II, II
Clean the administration site with dry cotton	D1, A12	II, V
Follow a pattern in simultaneous vaccination. It is recommended to start from least to most painful	D2, M1, A6	II, VII, V
Inject the liquid without aspirating	A2, M1	II, VII
Immediate manual pressure at the application site	A2, A5 A6, A8, A9	II, V, V, II, VI
Ensure correct route of administration	A3, A9, A12	V, VI, V
Choose the needle - length and caliber - according to the user's body structure and the route of application	A4, A6, A9, A12	V, V, VI, V
Correct volume according to the age, clinical condition of the user and the type of vaccine	A5, A9, A12, M4	V, VI, V, VII
Children must be held by their parents or accompanied by them on their lap. It is recommended to hold the child firmly, but not too tightly	M1, A6	VII, V
If extravasation occurs during or after the application of a vaccine, either at the injection site itself or at the connection between the syringe and the needle, with loss of small volumes (e.g., 2 to 3 drops), additional doses are not recommended. Applications on the vastus lateralis of the thigh should be done with the knee slightly flexed	M3	VII
The choice of IM injection site should be based on the volume of material to be injected and the mass of the muscle to be used - vastus lateralis of the thigh preferred up to 24 months of age	M3, A12	VII, V
Lyophilize the vaccine without shaking	A10	II
Aspirate the entire contents of the diluent vial to properly dilute. Attention to the corresponding diluent of each vaccine	A10, A11, M4	II, II, VII
Attention for aspiration in multidose vial, care in overdose	A10, A11	II, II
Attention for aspiration in single-dose vial, pay attention to completely remove the contents of the vial	A10, A11	II, II

Source: elaborated by the author (2021)

A: articles, T: theses, D: dissertations, M: technical manual.

Figure 6 - Conceptual category: organization of the work process after administering a vaccine to a child. Natal, RN, 2021

APÓS A ADMINISTRAÇÃO		
INDICATORS	STUDY(IES)	LEVEL OF EVIDENCE
Sanitize hands	T1, D1, A8, A12, M4	V, II, II, V, VII
Observe the occurrence of adverse events	D1, A12, M4	II, V, VII
Report immunization errors to the person responsible for the vaccine room and notify errors and AEFI	A11, A12, M4	II, V, VII
Discard the syringe immediately after application	A12	V

Source: elaborated by the author (2021)

A: articles, T: theses, D: dissertations, M: technical manual.

## DISCUSSION

Mapping the literature that deals with knowledge, attitudes and healthcare practices that must be included in the organization of the work process for the safe administration of vaccines in children allowed knowing and structuring the necessary indicators for the organization of the work process before, during and after administration of vaccines. Thus, when analyzing the origin of the publications, the Brazilian territory stood out with the highest number of studies, which may be related to the appreciation of the elaboration and use of protocols for patient health care.

Thus, the standardization of behaviors related to professional practice is essential for the provision of adequate and safe care, as they focus on structuring procedures and reducing errors.<sup>28</sup>

However, a care protocol requires that its content have scientific information, with characterization of the level of evidence. In addition, the elaborative process of a regulating tool does not disregard the context of the service, that is: it is necessary to incorporate, in this process, the local reality in which the recontextualization of the content occurs, presenting meaning for the professional and having a beneficial impact on the health of the population.<sup>29</sup>

Within the time interval referring to the selected studies, the last two years (2020 and 2021) presented the highest number of publications. Thus, the direct relationship with the SARS-CoV-2 pandemic is notorious, considering that this period echoed the incessant search for answers, urging the need for information regarding the etiology, pathogenesis, clinic, therapeutic measures, epidemiological patterns distribution, in addition to the effects of the preventive measures adopted to control COVID-19.<sup>30</sup>

As a result, the publication process was accelerated: numerous journals in the health area gave priority to works focused on COVID-19 and streamlined all stages of research dissemination, from submission to online publication, with the aim of ensuring that the information could be used and for quick responses to the gaps that arose in the pandemic scenario. Furthermore, it is expected that the speed in the dissemination of scientific reports in the field of vaccination will be a perennial process, so that its notoriety goes beyond the peak of an emergency.<sup>30</sup>

Bearing in mind the categories that present the indicators of knowledge, attitudes and practices that must be included in the organization of the work process for the safe administration of vaccines in children and considering the high amount of information Available from Figures 3, 4 and 5, we list the most relevant points to guide this discussion. Thus, we will approach the indicators that appear mostly in the selected studies. For this reason, in studies like this one, indicators that appear less frequently are essential, echoing the need to approach them critically.

Initially, it is essential to have two healthcare professionals in the vaccination room, since the vaccination process is complex, either because of the various stages that constitute it, or because of the safety precautions required. Thus, the number of employees designed for this sector directly interferes with the completeness and quality of the assistance provided. Under this analysis, a study carried out with professionals working in the vaccine room points to the lack of human resources as a contributing factor to the occurrence of immunization errors. Thus, reducing the number of employees overloads those who remain actively in the service, increasing the risk of errors.<sup>5</sup>

In addition, the increase in the supply of immunobiologicals required an increase in the number of healthcare professionals. However, there is no proportion for such demands, making it difficult to have a minimum presence of two vaccinators in the physical area and opposing the principle of comprehensiveness set out in the SUS.<sup>5</sup>

Therefore, it is extremely important to know the main immunization errors (IE) so that reduction strategies are implemented. In this regard, a survey carried out in Brazil showed the incidence of IE without an adverse event, by immunobiological and type of error, noting that the highest rates occurred due to inadequate administration technique, lack of attention to the expiration date and to the prescription and indication of vaccines.<sup>5</sup>

Thus, errors caused by the lack of attention - which may or may not lead to adverse events - demonstrate the need for a peaceful environment. An observational study carried out in a basic health unit in the countryside of the state of São Paulo showed that 80% of immunization errors were due to interference in work practice in the vaccine room environment.<sup>31</sup> This same research points out that the quality of the ambience enables a conversation capable of creating a bond of trust with the parents or guardians of the child, minimizing the reluctance of vaccinating their children. A review that originated as part of the project Communicating to Vaccinate (COMMVAC) revealed that the professional-family dialogue is an educational moment and positively impacts the vaccination status, knowledge, and changes in parents' attitudes.<sup>31</sup>

In addition, the patient's clinical evaluation involving aspects such as recommendations, contraindications, past health history and analysis of the vaccine card are extremely indispensable in this process, since, if there is something that makes it impossible to take it, the assignment will be immediate, and the possible damage will not occur. Because it is an investigative activity, the clinical screening aims at the safety of the process. Thus, it is extremely important that the clinical screening be carried out rigorously, drawing attention to all information that may contraindicate vaccination.<sup>10</sup>

In this context, an observational study, carried out in the state of São Paulo and aimed at comparing outcome measures, highlighted that 68% of immunization errors were linked to failure to check the patient's clinical history.<sup>11</sup> Another observational study shows that only 17.6% of the participants questioned about AEFI in previous doses or hypersensitivity to some component of the vaccine.<sup>32</sup> Both studies reveal the importance of clinical screening in the vaccination process.

The 2020-2021 biennium had the highest number of publications, which is due to the numerous protocols related to vaccination against COVID-19.



This was very relevant in this context, as it brought immunization (programmatic) errors to the center of the discussions, which are preventable adverse events following immunization that can (and should) be minimized through adequate technical training of vaccinators and use of the correct technique. of vaccination.<sup>20</sup>

Particularly noteworthy is the immediate vaccination after the extravasation of large volumes of vaccine. Of course, it is evaluated on a case-by-case basis, and it is worth noting that, if this error occurs - considering that the recommended dose volumes usually contain an excess of antigen as a margin of error - it is unlikely that extravasation of small volumes of two to three drops will occur in worse immune response. Therefore, as a general rule, additional doses are not recommended.<sup>33</sup>

It is noteworthy that, before vaccination against COVID-19, this type of recommendation was not clearly described in other Ministry of Health manuals in case of occurrence of this type of error, which can occur with any injectable vaccine. This information is very relevant for all healthcare professionals working in the vaccine room; however, such conduct has not yet been included in the routine manuals of vaccine rooms. Therefore, it cannot be practiced with routine vaccines.

The involvement of the guardian in vaccinating the child is relevant, and it is important to invite him/her to check the label of the vaccine that will be administered, as well as explain the correct and safe positioning of the child. Thus, studies show that family members who received information regarding how to hold and what to do in case of adverse events demonstrated greater confidence in professionals.<sup>34,35</sup> Thus, this educational process offered in the vaccine room results in greater credibility, which is fundamental for the maintenance and expansion of immunization programs.<sup>35</sup>

Certainly, it is extremely necessary to carry out the manipulation, preparation, and administration of the substance with aseptic technique. Likewise, hand washing is highlighted as a widespread procedure and, even so, its neglect still causes AEFI. An example is the hot abscess, which has an infectious etiology and requires treatment with antimicrobials. In general, its cause is contamination in the vaccination process.<sup>1</sup>

Therefore, with regard to patient safety, the use of the five "rights" in administering vaccines: right patient, right vaccine, right time, right dose and right administration preparation is essential.<sup>36</sup>

Furthermore, other studies have promoted the grouping of relevant actions to minimize pain in children, such as the Z technique, in the application of more than one vaccine, the administration should start from the less painful one to the more painful one, and there is no need to aspirate before administering a vaccine.<sup>36,37</sup>

In addition to performing manual pressure on the application site after administration, defining the needle, length, and caliber suitable for the child's body structure and bearing in mind that the vastus lateralis of the thigh is the reference site for administration, it is imperative that the child have the knee flexed, requiring the participation of the family member and the pre-established bond. In this sense, the numerous findings highlighted here can be used to reduce pain and promote the safety of the child who will be vaccinated.<sup>36,37</sup>

Thus, the category descriptors after administration represented the smallest number of findings, demonstrating scarcity. However, this step is extremely important, considering that immediate adverse events and the notification of errors and AEFI will be observed. That said, it is important to highlight that all adverse events (resulting from immunization errors or not) must be reported. In addition, the action of notifying is not penal in nature: its purpose is to guide, promote the improvement of the work process and intervene in possible failures, while it permeates the data collection through monitoring by National Health Surveillance Agency (Anvisa, Agência Nacional de Vigilância Sanitária).<sup>12</sup>

Finally, the importance of this study for the safety of children submitted to the vaccination process is recognized. Such findings can support the construction of tools for clinical practice, whether standard operating protocols or checklists. This study presented as a limitation the fact that the effectiveness of the protocols that composed the sample was not very likely, since this is a review that only aimed to identify such protocols.

## CONCLUSION

It is concluded that the objectives of this research were achieved through searches carried out in different databases to map the organization of the work process through knowledge, attitudes, and practices for the safe administration of vaccines in children. The care that must be followed before, during and after the vaccination process was highlighted.

Thus, the safety of a child who will undergo the vaccination process involves many factors, from the organization and preparation of the team of vaccinators to the administration and observation of immediate adverse events. Such findings will serve as a basis for the construction of standardizing tools for the childhood vaccination process and the reduction of immunization errors related to this process.

This research constituted the first stage of the construction and validation of a graphic protocol for the organization of the work process through knowledge, attitudes, and practices for the safe administration of vaccines in children that will be used in the vaccination room of the Universidade Federal do Rio Grande do Norte (UFRN). A limitation of the study is the lack of research that guides post-vaccination care, and it is suggested that further research be carried out.

## REFERENCES

- Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Imunizações e Doenças Transmissíveis. Manual de vigilância epidemiológica de eventos adversos pós-vacinação. Brasília (DF): Ministério da Saúde; 2020.
- World Health Organization. Vacinas e imunização. Geneva (CH): OMS; 2021. Available from: [https://www.who.int/health-topics/vaccines-and-immunization#tab=tab\\_1](https://www.who.int/health-topics/vaccines-and-immunization#tab=tab_1)
- Nascimento MMG, Guimarães PH, Anacleto TA. Segurança no uso de vacinas. Belo Horizonte (MG): Instituto para práticas seguras no uso de medicamentos; 2021.
- Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Boletim Epidemiológico Programa Nacional de Imunizações: aspectos históricos dos calendários de vacinação e avanços dos indicadores de coberturas vacinais, no período de 1980 a 2013. Brasília (DF): Ministério da Saúde; 2018.
- Bisetto LHL. Evento adverso pós vacinação e erro de imunização: da perspectiva epidemiológica à percepção dos profissionais de saúde [Tese]. São Paulo (SP): Universidade de São Paulo, Escola de Enfermagem da USP; 2017.
- Peters MDJ, Godfrey C, Mclnerney P, Munn Z, Tricco AC, Khalil H. Chapter 11: Scoping Reviews. In: Aromataris E, Munn Z, editors. JBI Manual for Evidence Synthesis; 2020[cited 2021 Dec 15]. Available from: <https://doi.org/10.46658/JBIMES-20-12>
- Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018[cited 2021 Oct 2];169(7):467-73. Available from: <https://www.equator-network.org/reporting-guidelines/prisma-scr/>
- JBI EBP Database Guide. Filadélfia (PA): The Joanna Briggs Institute; 2014[cited 2021 Sept 20]. Available from: <http://joanna-briggs.org/jbi-approach.html#tabbed-nav=Levels-of-Evidence>
- Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005[cited 2022 Jan 15];8(1):19-32. Available from: <https://www.tandfonline.com/doi/abs/10.1080/1364557032000119616>
- Nunes MBM. Impacto de um modelo de melhoria da qualidade na redução de erro relacionado à administração de vacina em Unidade Básica de Saúde [Dissertação]. Ribeirão Preto (SP): Universidade de São Paulo, Escola de Enfermagem de Ribeirão Preto; 2020. 98f.
- Bastos ML. Avaliação da qualidade da assistência de Enfermagem em salas públicas de vacinação de Goiânia [Dissertação]. Goiânia (GO): Universidade Federal de Goiás, Faculdade de Enfermagem; 2017.
- Bakhache P, Virey B, Bienenfeld C. Conhecimento e práticas sobre vacinação infantil: resultados de uma pesquisa de médicos franceses. *Eur J Pediatr*. 2019[cited 2021 Dec 10];178:533-40. Available from: <https://doi.org/10.1007/s00431-018-03314-3>
- Göl İ, Altuğ ÖS. Effects of Rapid Vaccine Injection Without Aspiration and Applying Manual Pressure Before Vaccination on Pain and Crying Time in Infants. *Worldviews Evid Based Nurs*. 2017[cited 2021 Nov 13];14(2):154-62. Available from: 10.1111/wvn.12206
- Silva AEB, Braga P, Mochizuki L, Lima J, Sousa M, Bezerra A. Incidência de eventos adversos pós-vacinação em crianças. *Rev Enferm UFPE on line*. 2017[cited 2022 Apr 7];11(10):4126-35. Available from: <https://periodicos.ufpe.br/revistas/revistaenfermagem/article/view/231174>
- Beirne PV, Hennessy S, Cadogan SL, Shiely F, Fitzgerald T, MacLeod F. Tamanho da agulha para procedimentos de vacinação em crianças e adolescentes. *Cochrane*. 2018[cited 2022 Mar 15];8. Art. N°: CD010720. Available from: 10.1002 / 14651858.CD010720.pub3
- Pinto MLC, Áfio JC, Soares E. Conhecimento dos vacinadores: aspectos operacionais na administração da vacina. *Rev Rene*. 2001[cited 2022 Mar 15]2(2):31-8. Available from: <http://periodicos.ufc.br/rene/article/view/5827/4142>
- OPAS-Organização Pan-Americana da Saúde. Como se comunicar sobre a segurança das vacinas: diretrizes para orientar os trabalhadores da saúde quanto à comunicação com pais, mães, cuidadores e pacientes. Washington, D.C: OPAS; 2020.
- Taddio A, Ilersich AL, Ipp M, Kikuta A, Shah V, Equipe HELPin-KIDS. Intervenções físicas e técnicas de injeção para reduzir a dor de injeção durante as imunizações rotineiras na infância: revisão sistemática de ensaios controlados randomizados e ensaios controlados quase randomizados. *Clin Ther*. 2009[cited 2022 Feb 18];31 (Suppl 2):S48-76. Available from: 10.1016/j.clinthera.2009.07.024. 19781436
- Silva MRB, Oliveira RB, Armada S, Halene CD, Medeiros CS, Cunha AL, et al. Imunização: conhecimento e práticas dos profissionais de Enfermagem na sala de vacina. *Nursing (São Paulo)*. 2020[cited 2021 Dec 21];23(260):3533-6. Available from: <http://www.revis-tanursing.com.br/revistas/260/pg57.pdf>
- Ministério da Saúde (BR). Secretaria Extraordinária de Enfrentamento à COVID-19. Plano Nacional de Operacionalização da Vacinação Contra a COVID-19. Brasília (DF): Ministério da Saúde; 2021.
- Almeida MCP, Gomes DLS, Silva E. Avaliação da técnica de injeção intramuscular através do "check-list". *Rev Bras Enferm*. 1980[cited 2021 Dec 21]33(4):428-42. Available from: <https://doi.org/10.1590/0034-716719800004000006>
- Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. Curso de atualização para o trabalhador da sala de vacinação: manual do monitor. 3ª ed. Brasília (DF): Ministério da Saúde; 2014. 242 p.

23. Rees P, Edwards A, Powell C, Evans HP, Carter B, Hibbert P, et al. Pediatric immunization-related safety incidents in primary care: a mixed methods analysis of a national database. *Vaccine*. 2015[cited 2021 Dec 21];33(32):3873-80. Available from: 10.1016/j.vaccine.2015.06.068
24. Lee YH, Harris RC, Oh HW, Oh Y, Vargas-Zambrano JC, Choe YJ. Vaccine-Related Errors in Reconstitution in South Korea: A National Physicians' and Nurses' Survey. *Vaccines (Basel)*. 2021[cited 2021 Feb 10];9(2):117. Available from: 10.3390/vaccinas9020117
25. Samad F, Burton SJ, Kwan D, Porter N, Smetzer J, Cohen MR, et al. Estratégias para reduzir erros associados a vacinas de 2 componentes. *Pharmaceut Med*. 2021[cited 2021 Jan 15];35(1):1-9. Available from: 10.1007/s40290-020-00362-9
26. Charles R, Vallée J, Tissot C, Lucht F, Botelho-Nevers E. Vaccination errors in general practice: creation of a preventive checklist based on a multimodal analysis of declared errors. *Fam Pract*. 2016[cited 2021 Feb 10];33(4):432-8. Available from: 10.1093/fampra/cmw026
27. Nascimento MMG, Guimarães PH, Anacleto TA. Segurança no uso de vacinas. *Boletim do Instituto para Práticas Seguras no Uso de Medicamentos. ISMP Institute for Safe Medication Practices*. 2019[cited 2021 Feb 10];10(1):1-11. Available from: <https://www.ismp.org/news/ismpr-releases-biannual-report-vaccination-errors>
28. Gomes ATL, Alves KYA, Bezerril MS, Rodrigues CCFM, Ferreira Júnior MA, Santos VEP. Validação de protocolos gráficos para avaliação da segurança do paciente politraumatizado. *Acta Paul Enferm*. 2018[cited 2022 Jan 12];31(5):504-17. Available from: 10.1590/1982-0194201800071
29. Mota, RO, Brito EAWS, Souza TLV, Farias LMVC, Matias EO, Lima FET. Preparo de medicamentos administrados via intramuscular na pediatria: atuação da equipe de Enfermagem. *Cogitare Enferm*. 2016[cited 2021 Dec 21];21(5):1-9. Available from: <https://revistas.ufpr.br/cogitare/article/view/45619>
30. Martinez-Silveira MS, Pinto Junior EP, Araújo RF, Mendes AAF, Diele-Viegas LM, Pescarini JM. Impacto da pandemia de COVID-19 no ciclo da informação e comunicação científica. Salvador (BA): Eudfba; 2020.
31. Padilha, DZ, Witt, RR. Competências da enfermeira para a triagem clínica de doadores de sangue. *Rev Bras Enferm*. 2010[cited 2022 Jan 10];64(2):234-40. Available from: <https://www.scielo.br/j/reben/a/HcBbVxgyQNYvx76KNQdr3ty/?lang=pt&format=pdf>
32. Perkins RB, Fisher-Borne M, Brewer NT. Engaging parents around vaccine confidence: proceedings from the National HPV Vaccination Roundtable meetings. *Hum Vaccin Immunother*. 2019[cited 2022 Jan 10];15(7-8):1639-40. Available from: <https://pubmed.ncbi.nlm.nih.gov/30188782/>
33. Puri N, Coomes EA, Haghighyan H, Gunaratne K. Social media and vaccine hesitancy: new updates for the era of COVID-19 and globalized infectious diseases. *Hum Vaccin Immunother*. 2020[cited 2022 Jan 10];16(11):2586-93. Available from: 10.1080/21645515.2020.1780846
34. Sociedade Brasileira de Imunização. Família. Segurança das vacinas. São Paulo (SP): SBIm; 2020[cited 2021 Sept 22]. Available from: <https://familia.sbim.org.br/seguranca/boas-praticas>
35. Amaya MR, Paixão DPSS, Sarquis LMM, Cruz EDA. Construção e validação de conteúdo de checklist para segurança do paciente em emergência. *Rev Gaúch Enferm*. 2016[cited 2022 Feb 15];37(esp):e68778. Available from: <https://www.scielo.br/j/rgenf/a/x7GjXFKy8SJNpQgFCvf95Gg/?format=pdf&lang=pt>
36. Almeida ER, Moutinho CB, Carvalho SAS, Araujo MRN. Relato sobre a construção de um protocolo de Enfermagem em puericultura na atenção primária. *Rev Enferm UFPE on line*. 2016[cited 2022 Feb 15];10(2):683-91. Available from: <https://periodicos.ufpe.br/revistas/revistaenfermagem/article/viewFile/11006/12373>
37. Agência Nacional de Vigilância Sanitária. Implantação do Núcleo de Segurança do Paciente em Serviços de Saúde. Brasília (DF): Agência Nacional de Vigilância Sanitária; 2016 [cited 2021 Sept 22]. Available from: [https://www.saude.go.gov.br/images/imagens\\_migradas/upload/arquivos/2017-09/2016-anvisa---caderno-6---implantacao-nucleo-de-seguranca.pdf](https://www.saude.go.gov.br/images/imagens_migradas/upload/arquivos/2017-09/2016-anvisa---caderno-6---implantacao-nucleo-de-seguranca.pdf)