

ANNA STEFANOWICZ, MARIA KRAJEWSKA,
ANETA KOŁODZIEJSKA, JOLANTA WIERZBA

Rola pielęgniarki i położnej w wykonywaniu szczepień ochronnych u dzieci i młodzieży

The role of a nurse and a midwife in vaccinations of children and adolescents

Streszczenie

W dzisiejszych czasach pielęgniarka i położna jest niezależnym pracownikiem ochrony zdrowia. Swoje cele realizuje w sposób samodzielny i odpowiedzialny. Wypełniając obowiązki zawodowe wobec pacjenta pełni funkcje opiekuńcze, wychowawcze, promocji zdrowia, profilaktyczne, terapeutyczne i rehabilitacyjne. Uczestniczy również w zdrowiu publicznym.

Według Światowej Organizacji Zdrowia (WHO) zdrowie publiczne to dziedzina wiedzy i umiejętności, której celem jest zapobieganie chorobom, przedłużanie życia oraz upowszechnianie zdrowia psychicznego i fizycznego.

Jednym z najważniejszych osiągnięć z dziedziny zdrowia publicznego są szczepienia ochronne. Szczepienie ochronne polega na wprowadzeniu szczepionki do organizmu człowieka lub zwierzęcia w celu czynnego wytworzenia stanu odporności humoralnej i komórkowej. Szczepionką nazywamy preparat do uodporniania czynnego, który zawiera określony antygen lub antygeny.

Pierwszą na świecie szczepionkę wynalazł i zastosował angielski lekarz Edward Jenner. Była to szczepionka przeciwko ospie prawdziwej.

Realizacja szczepień w Polsce ma charakter masowy lub indywidualny. Szczepienia te realizowane są w oparciu o Program Szczepień Ochronnych ogłoszony przez Główny Inspektorat Sanitarny w danym roku. Zgodnie z polskim prawem część szczepień ochronnych jest obowiązkowa, a część zalecana.

Istnieje wiele różnych regulacji prawnych w zakresie wykonywania szczepień ochronnych i wymogów kwalifikacyjnych wobec pielęgniarki i położnej.

W pracy przedstawiono podział, cele, wskazania, przeciwwskazania, ogólne zasady, techniki i warunki wykonywania szczepień. Opisano również rolę pielęgniarki i położnej w wykonywaniu szczepień ochronnych u dzieci i młodzieży.

Abstract

Nowadays nurses and midwives are autonomous workers of the health care system. They pursue their goals with independence and responsibility. While carrying out their professional duties towards patients, they provide them with care, education and health promotion, as well as perform prophylactic, therapeutic and rehabilitative functions. They also actively participate in public health issues.

In accordance with the World Health Organization (WHO) suggestions, public health is a domain of knowledge and skills, where the prevention against diseases, the prolongation of human life and the promotion of physical and mental health are the objectives.

Prophylactic vaccinations are one of the greatest achievements of public health. A prophylactic vaccination is the introduction of a vaccine into the human or animal organism to produce humoral and/or cellular immunity. Vaccine is a preparation containing an antigen or antigens, used to produce active immunity.

The first vaccine in the world was invented by an English physician Edward Jenner. It was a vaccine against smallpox.

Vaccinations in Poland can either be mass-scale or individual operations. These vaccinations are performed on the basis of the Immunization Programme, announced by the Chief Sanitary Inspectorate (Główny Inspektorat Sanitarny) for a given year. In accordance with the Polish legislation, some of the prophylactic vaccinations are obligatory, while others only recommended.

Prophylactic vaccinations can be administered by nurses and those midwives who underwent a special training.

This paper presents the division, objectives, indications, contraindications, general principles, techniques and conditions of vaccinations; it also describes the roles of nurses and midwives in administering prophylactic vaccinations to children and adolescents.

Słowa kluczowe: pielęgniarka, położna, szczepienia ochronne, dzieci, młodzież.

Keywords: nurse, midwife, prophylactic vaccinations, children, adolescents.

Nowadays nurses and midwives are autonomous workers of the health care system. They realise their objectives with independence and responsibility. While carrying out their professional duties towards patients, they care of them, educate them, offer health promotion as well as perform prophylactic, therapeutic and rehabilitative functions [1].

In accordance with the suggestions of the World Health Organization (WHO), public health is a domain of knowledge and skills, where the prevention against diseases, the prolongation of human life and the promotion of physical and mental health are the objectives [2].

Prophylactic vaccinations rank amidst the greatest achievements in the public health. A prophylactic vaccination is the introduction of a vaccine into the human or animal organism to produce humoral and/or cellular immunity. Vaccine is a preparation which contains a definite antigen or antigens, used to produce active immunity.

Vaccinations in Poland can either be mass-scale or individual operations. These vaccinations are performed on the basis of the Immunization Programme announced by the Chief Sanitary Inspectorate (Główny Inspektorat Sanitarny) for a given year. In accordance with the Polish legislation, some of the prophylactic vaccinations are obligatory, while others only recommended. The obligation to receive vaccinations pertains to all Polish citizens and all persons abiding on the territory of Poland. Recommended vaccinations are optional, while the obligatory ones should be executed under constraint [3]. It should be remembered that vaccinations are sometimes not carried out in accordance with the vaccination schedule. This could be due to health reasons, a longer stay abroad or a negative approach of a child's legal guardians to this form of prevention. There are various forms of legal regulations pertinent to the prophylactic vaccinations, as well as the set of requirements specifying nurse's and midwife's qualifications.

Prophylactic vaccinations can be administered by nurses and those midwives who underwent a special training. The objective of nurse training is to prepare them for the vaccination of all patients, while midwives after the training can only inoculate new-borns, in accordance with a special vaccination calendar.

However, both nurses and midwives without this training but with a 2.5-year practice will be permitted to administer vaccines within the framework of prophylactic vaccinations till 31 December 2015 [4,5].

The first vaccine in the world was invented by an English physician Edward Jenner. It was a vaccine against smallpox (1796). Edward Jenner applied his first, experimental vaccines to the arm of an eight-year-old boy. He made two incisions in the boy's arm and rubbed a small amount of puss infected with the cowpox virus. The boy suffered from fever but recovered after a few days and revealed immunity to smallpox [6,7].

Vaccines are classified according to the following:

1. Form of vaccine antigen

a) attenuated vaccines – contain live strains of germs with considerably reduced virulence, i.e. vaccine against tuberculosis (BCG), oral vaccination against poliomyelitis (OPV), vaccines against measles, mumps, rubella (MMR or Priorix), vaccine against chickenpox and against yellow fever;

b) inactivated vaccines – contain killed and detoxicated suspensions of microorganisms, e.g. vaccine against typhoid fever;

c) toxoids (anatoxins) – contain metabolic products of bacteria cells, e.g. tetanus or diphtheria toxoids;

d) sub-unit – contain weakened/ inactivated forms of microorganisms or their parts prepared from an isolated fraction which contains bacterial protective antigen, e.g. vaccines against *Haemophilus influenzae* type b, vaccines against meningococci and pneumococci;

e) polysaccharide vaccines – contain capsule polysaccharides as the antigens of the vaccine, e.g. vaccines against diseases caused by *Haemophilus influenzae* type b, *Neisseria*;

2. Form of a vaccine

a) fluid vaccine – are ready to use, e.g. vaccine against influenza, tetanus or diphtheria toxoids;

b) lyophilised (dried) vaccines – are in the form of a powder in an ampoule or just powder, e.g. vaccines against measles, mumps, rubella, chickenpox, tuberculosis, rabies.

3. Vaccine specificity

a) monovalent vaccines – contain a single type of a germ or antigens from only one type of germs, e.g. only one strain was used in the vaccine against influenza;

b) polyvalent vaccines – contain all or several types of the same germs or antigens from several types of the same germ, e.g. a polyvalent vaccine against infections caused by *Streptococcus pneumoniae*;

c) combination (combined) vaccines – contain various germs or antigens from various germs, which evoke immunity against several diseases at the same time, e.g. DTP (against diphtheria, tetanus, pertussis), MMR (measles, mumps, rubella);

d) single vaccines – contain antigens of a single micro-organism and ensure immunity against a single disease [8].

Prophylactic vaccinations prevent from a defined infectious disease. They reduce the risk of complications in certain groups of patients – so called “risk groups”. Prophylactic vaccinations break transmission routes of infections and protect a population sensitive to a given infection [2].

The following groups of people should be included in vaccination schedules:

- healthy children and adults – to ensure routine immunity or to reinforce existing immunity (e.g. vaccination against hepatitis B virus, poliomyelitis, measles, tetanus)
- people threatened by serious complications after an infection (e.g. vaccinations against influenza, virus hepatitis types A and B, chickenpox)
- women in reproductive age, to prevent congenital infections, (e.g. against rubella)
- children who have many siblings, those from orphanages and other care institutions
- people employed with the production and distribution of comestibles, workers of micro biological laboratories
- people working in medical profession and paramedics
- travellers to endemic regions [2].

Prophylactic vaccinations of children and adults require a physician's knowledge on indications and contraindications of pertinent vaccinations, as well as general principles concerning vaccination techniques and conditions, the equipment of a vaccination centre, methods of pain elimination,

the ways of vaccine administration, risks related to vaccinations themselves, and the mode of keeping due documentation.

As recommended by the Advisory Committee for Immunisation Practices (ACIP) and the Committee on Infectious Diseases of the American Academy of Paediatrics only the anaphylactic reaction to a former dose of a vaccine or any of its components can be the permanent contraindication against vaccination, while a temporary contraindication can be caused by an acute mild or severe disease and/ or the aggravation of a chronic disease [9,10].

Vaccination should be postponed until any acute disease symptoms disappear. In case of a chronic disease, vaccines should be administered while the patient is in a stable health condition. Contraindication to a live vaccine are as follows: congenital and acquired immune deficiency, former cases of an anaphylactic reaction, history of a bone marrow transplantation and/ or pregnancy [9,10].

Vaccines can be administered even if a patient formerly developed mild or moderate local allergic reaction to a vaccine, in allergy, asthma, hay fever, malnutrition and during antibiotics and/ or low-dose steroids therapy, in skin inflammation and/ or local skin inflammation, as well as in chronic and/ or local dermatitis, and chronic diseases of the heart, lungs, kidneys, or liver.

Breast-feeding and prematurity are not contraindications [9,10]. However, it is the physician who makes the final decision about vaccination.

It is physician's obligation to follow a current binding programme of prophylactic vaccinations. The elimination of diseases and the reduction of cases of a given infectious disease are the objectives of such a programme. Each patient and /or his family must be informed about the schedule of obligatory vaccinations, the profits of vaccinations and the possible unwanted postvaccinal reactions and their risk [11].

Incidents after and/ or organism response to vaccination are called adverse postvaccinal effects. These reactions can be mild or severe. Severe postvaccinal reactions are rare but require hospitalisation. They can lead to the permanent impairment of a patient's physical or mental health or even to death. Among the most common adverse postvaccinal reactions the following appear most often: local reactions after BCG, oedema, swelling of the lymph nodes, abscess in the injection site, encephalopathy, febrile and non-febrile convulsions, poliomyelitis caused by a vaccine virus, encephalitis, meningitis and cerebro-spinal meningitis, Guillain-Barré syndrome, painful joints, hypotension-hyperactive episodes, fever over 39 degrees Centigrade, thrombopaenia, continuous weeping, sepsis, anaphylactic reaction, septic and/ or anaphylactic shock, allergic reaction, generalised infection BCG and mumps orchitis and sialadenitis after the inoculation with mumps vaccine [12]. Each adverse postvaccinal reaction should be reported to the Local or Regional Sanitary-Epidemiological Station (Terenowe lub Powiatowe Stacje Sanotarno-Epidemiologiczne) not later than 12 hours after the suspicion of such a reaction. The reporting can be carried out by phone or fax [13].

Prophylactic vaccinations are the basic and indispensable mode of medical treatment. They accompany children and their guardians from the first days of their lives. Vaccine

administered to a small patient causes pain and stress. In such cases a nurse or midwife and child's parents should find the most suitable strategy to reduce a small patient's pain, give him the sense of safety and turn the child's attention from the actual inoculation process. The choice of a method depends on a child's age, its health condition and mental and physical development. There are various activities aimed at the reduction of pain e.g. the use of such vaccines which cause the least pain, among those available on the market, vaccination in a sitting position (on parent's lap), administering the most painful vaccine as last one during a single visit, breathing exercises (e.g. blowing a balloon or a pin-wheel), turning a child's attention away from the inoculation process and nurse's activities, local anaesthesia (e.g. Emla cream), breast-feeding during inoculation and giving sweets to a child [9,14].

Before a vaccination, a physician should interview a patient to assess his/her general condition on the day of vaccination, perform physical examination and establish whether any allergic reactions to previous doses of a given type of vaccine, as well as other vaccines have ever appeared before [9,11,14].

Choice of a proper place for inoculation is an important element of the vaccination procedure. A nurse and/ or a midwife make this decision together with a physician.

Depending on the manufacturer's instructions, vaccines are administered in the following way:

a) intramuscularly

The choice of the place of inoculation depends on a patient's body mass. Babies before 18 months of age receive inoculation into the antero-lateral part of a thigh. Older children and adults receive intramuscular inoculations into their arms.

There are two techniques of intramuscular inoculation. In the first of them the inoculator gathers a fold of a muscle with a free hand and introduces the needle at the angle of 90 degrees into this gathering with the other hand. The second technique suggests that the inoculator stretches the patient's skin using the thumb and index of a free hand and then introduces the needle at the right angle to the surface of the skin.

After the introduction of the needle, the inoculator must always check by aspiration whether the needle has not been injected into a blood vessel.

Intramuscular inoculations cannot be done into the gluteus maximus because of too thick a layer of subcutaneous tissue [9,14-16].

b) subcutaneously

In a subcutaneous injection, the inoculator should hold the skin and the subcutaneous tissue with the thumb and index of a free hand and "lift" it. Using the other hand, the inoculator introduces the needle at the angle 45 degrees [9,14-16].

c) intracutaneously

To ensure proper inoculation, the inoculator should stretch the skin in the place of the needle injection and introduce the needle parallel to the surface of the skin up to 2 mm under the epidermis [9,14-16].

This method is used for tuberculin tests and BCG inoculations.

Vaccinations against tuberculosis are optional. The BCG (*Bacillus Calmette Guérin*) vaccine used throughout Europe

contains live bovine tubercle bacillus (*Mycobacterium Bovis*). This vaccine is administered to new-borns together with the vaccine against hepatitis B virus right after birth [17].

The inoculation technique is difficult. A nurse and/or a midwife should introduce the vaccine slowly, injecting 0.1 ml of the vaccine intracutaneously into the 1/3 length of the outer upper part of the arm. If the inoculation has been done properly a whitish nodule of 5-10 mm in diameter appears and vanishes after a few minutes. The irritated skin usually heals after 2-4 months, leaving a whitening scar of 3-8 mm in diameter.

This inoculation must not be done on the top of the arm as this is a very bad place for the expected healing of the injection site [17].

The same intracutaneous method is used for tuberculin tests and BCG inoculations. It is one of the methods for diagnosing tuberculosis included in the former vaccinations calendar, permitting the check of a patient's tuberculin allergy before a planned booster vaccination [17].

During the tuberculin tests, a nurse – following a physician's prescription, injects 0.1 ml of tuberculin intra-cutaneously centrally into the left forearm. A white, porous wheal of 7-9 mm in diameter appears in the place of injection, disappearing in a few minutes. After 72 hours from the tuberculin injection, the nurse measures the diameter of the infiltration with a very accurate transparent ruler, while a physician determines the type of the infiltration using Edward and Palmer scale [16].

The BCG vaccination and tuberculin tests require high concentration and precision from a nurse and/ or a midwife [17].

d) orally

Oral vaccines, e.g. against poliomyelitis (OPV) are administered to the inner, chick-side of the oral cavity; therefore, a child should first remain in a half-reclining position on a parent's lap. During the administration of the vaccine and after the procedure, the child's lips should be cleaned with sterile gauze several times.

The nurse should inform the child's parents about the details of hygiene in this case. During several subsequent days after the vaccination, the child should wash hands very carefully and very often because with this way of vaccine administration – live bacteria can be present in the faeces [9,14-16].

e) by multi-puncture method

Previously, this was the method for the anti-smallpox vaccines administration. Nowadays American Food and Drug Administration approved the anti-smallpox vaccine only for the high risk groups of, including: laboratory personnel working directly with smallpox viruses and other related strains of orthopoxviruses. The inoculation is performed using a sterile, forked needle. The skin should be cleaned and disinfected. The needle containing the vaccine solution should be kept at the right angle against the skin. Next, on the skin area of 5 mm in diameter, a series of 15 very fast stabs should be done perpendicularly to the skin surface. After 15-30 seconds tiny bleeding points should appear on the patient's skin. After the inoculation, the vaccinated area

should be wiped with gauze. The wound should be dressed with bandage ensuring ventilation [7].

Medical personnel must observe general principles and particular requirements before and during vaccination. The fundamental principle and requirement is that of asepsis. Thanks to this, the risk of infection transfer is minimised. A nurse and/ or midwife, should wash and disinfect her/his hands repeatedly, wear gloves before each vaccination and disinfect the inoculated area with a continual movement. The inoculations must be done only with disposable/single-use equipment. The thickness and length of needles should be appropriate to the place of application. No vaccine can be administered to a place with the symptoms of inflammation. Some vaccinations can be given simultaneously with other vaccinations, provided the inoculation is done in distant places on a patient's body [9,14,16].

Vaccinations should be made in a vaccination facility of a given health-care institution. The organisation and equipment of such a facility is an important element of the vaccination procedure. Both the rooms accommodating vaccination facilities and equipment used in the procedure must fulfil professional and sanitary requirements and conform to due legislation [3].

Vaccines should be stored in accordance with a manufacturer's instruction, usually on lower shelves of a refrigerator (temperature 2-8 degrees Celsius). They must not be frozen, de-frozen and/or soaked. Only vaccines with the good "best before" date can be used, their administration must only be done in the way recommended by a manufacturer [9,14,16].

A nurse and/or midwife are obliged to keep the record (a notebook) of 24-hour temperature measurements of a thermometer installed in the refrigerator. The temperature measurements should be noted down twice a day (morning and evening).

It is crucial that vaccines against human papillomavirus (HPV), measles, mumps, rubella, C-meningococcus, Rotaviruses and chicken pox be protected from light [9,14,16].

Treatment rooms of the vaccination facilities must have the resuscitation set. The resuscitation set must contain medicines required for instant and effective administration at the early stage of the anaphylactic shock [14,16].

A nurse and midwife working in the vaccination facility must remember that any non-sterile injection, an error during inoculating, the improper place of vaccination, a mistake during transport and improper storage of a vaccine, as well as the negligence of any contraindication to vaccination can potentially lead to a postvaccinal reaction such as an abscess in the inoculation site, local reaction, a negative impact of a drug, the damage of sciatic nerve, local reaction to a frozen vaccine, along with a blood-transmitted infection (e.g. hepatitis B and/or C, HIV), sepsis, and the symptoms of a toxic shock [14,16].

Each vaccination must be documented in a physician case record (history), nurse case record, immunity card and vaccination book. Medical personnel performing an inoculation should write down the date of inoculation, the name of a vaccine and its manufacturer, serial number of a vaccine, the place and way of vaccine administration (inoculation method), the name of the person prescribing the vaccination and the name of the inoculator.

If a way of a vaccine administration (inoculation method) has been recorded, it will be very easy to identify a vaccine which caused a local postvaccinal reaction, should any appear [14,16].

Vaccinations are the most important element of infectious diseases prevention. If they are properly done, the expected immunological reaction of an organism is achieved, while the risk of unwanted postvaccinal reactions is eliminated. The observance of due general principles is fundamental in the work of every physician, nurse and midwife. It should be remembered that, properly carried-out health education, is the most important for observing all prophylactic vaccinations. Health education is mostly performed by nurses and midwives with the help of flyers, brochures, books, charts, video films and conversation. This education should reach all children and their parents/guardians [18].

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Informacje o Autorach

Mgr piel. ANNA STEFANOWICZ – doktorantka, asystent; mgr piel. MARIA KRAJEWSKA – asystent, Zakład Pielęgniarstwa Ogólnego, Katedra Pielęgniarstwa, Oddział Pielęgniarstwa, Wydział Nauk o Zdrowiu, Uniwersytet Medyczny w Gdańsku; mgr piel. ANETA KOŁODZIEJSKA – wykładowca, dr n med. JOLANTA WIERZBA – adiunkt, Zakład Pielęgniarstwa Ogólnego, Katedra Pielęgniarstwa, Oddział Pielęgniarstwa, Wydział Nauk o Zdrowiu, Uniwersytet Medyczny w Gdańsku.

Adres do korespondencji:

Anna Stefanowicz
Zakład Pielęgniarstwa Ogólnego, Katedra Pielęgniarstwa,
Oddział Pielęgniarstwa, Wydział Nauk o Zdrowiu
Uniwersytet Medyczny w Gdańsku
ul. Do Studzienki 38, 80-227 Gdańsk
Tel: 0 604 405 605
E-mail: ania-stefanowicz@amg.gda.pl