I. Overview

A. Introduction

Preamble
Natural rubber latex allergy is a significant medical concern because it affects health care workers, as well as the general population. It crosses racial and ethnic boundaries, and it can affect males or females anytime during their lives.

There is no cure at this time, only prevention. Three types of reactions are associated with latex products. In order of frequency of occurrence they are an irritant reaction, a delayed hypersensitivity reaction (ie, type IV), and an immediate hypersensitivity reaction (ie, type I) (Table 1). Any individual who experiences any type of latex-associated reaction should be evaluated by a qualified health care practitioner.

Assumptions
Natural rubber latex allergy can be a serious and potentially life-threatening condition. Health care workers and others who experience repeated exposure to latex allergens can develop a latex sensitivity or allergy. Several hundred cases of severe allergic reactions and anaphylaxis and 17 deaths have been reported to the US Food and Drug Administration (FDA).\(^1,2\)

Sensitivity can be described as development of an immunologic memory to the specific latex proteins; however, the affected individual may be asymptomatic. Allergy is the demonstrated outward expression of the sensitivity (eg, hives, rhinitis, conjunctivitis, anaphylaxis). Sensitivity to natural rubber latex is more common than the actual allergy; however, any individual sensitized to natural rubber latex is at risk of a life-threatening reaction and should be treated in the same way as an allergic individual.

Powdered latex gloves are the most common item contributing to the latex load in health care facilities. Recent estimates have shown a 20-fold increase in medical glove use (in billions of pairs) since the introduction of universal precautions in 1987.\(^3\) During the manufacturing process, powder usually is applied to the glove as cornstarch slurry when the glove still is on the mold or former. When the powder slurry is applied to the glove, the extractable, water-soluble proteins leach from the surface of the glove onto the cornstarch particle. When dry, the glove powder then acts as a vector that carries latex proteins from the glove into the environment.

Health care facilities and providers have an ethical responsibility to prevent latex sensitization in patients and employees by creating an environment in which it is safe to be treated and to work. Many facilities in the United States consciously have moved toward a latex-safe environment by switching from powdered latex gloves (eg, examination, surgical) and other latex products to powder-free products with reduced latex protein content. High-protein, powdered latex gloves and other products that create aerosolization can contaminate a facility’s environment with latex allergens.

In 1998, Sussman et al reported a 1% annual incidence of sensitization among powdered latex-glove users, whereas users of powder-free, low-protein, latex glove reported a 0% sensitization rate.\(^4\) In 1999, Levy et al studied a group of dental students in both France and England, reporting that students who wore protein-rich (ie, high protein), powdered latex gloves had a 15% and a 5% sensitization rate, respectively, while students who wore powder-free, protein-poor (ie, low protein) gloves had a 0% sensitization rate.\(^5\)

It is unsafe to treat latex-allergic individuals in an environment laden with latex allergens. Individuals who have been clinically diagnosed as either sensitive or allergic to natural rubber latex should be treated or work in an environment that is latex-safe, with additional measures taken for the immediate vicinity (ie, room) in which the individual receives or provides care. If the entire care facility is maintained as a latex-safe environment, few additional precautions will be needed for latex-allergic individuals. If the facility is not maintained as latex-safe, comprehensive latex precautions will be required each time a latex-allergic individual presents for care or services.

This revised “AORN latex guideline” is based on research and expert opinion available at the time of its revision. Ongoing and future research likely will enhance and expand current knowledge about this topic.

Review of this document has been solicited from content experts at the American Association of Nurse Anesthetists (AANA), the American College of Surgeons (ACS), the American Society of Anesthesiologists (ASA), the American Academy of Allergy, Asthma, and Immunology (AAAAI), the American College of Allergy, Asthma, and Immunology (ACAAI), the American Nurses Association (ANA),
the Association of Practitioners of Infection Control, Inc (APIC), the Spina Bifida Association, and the National Institute of Occupational Safety and Health (NIOSH) division of the Centers for Disease Control and Prevention, as well as the AORN Board of Directors and other recognized experts. This guideline may not apply to every individual and may require modification based on specific needs of a given patient, health care provider, or situation.

Definitions

For purposes of this document the following definitions apply.

♦ **Allergen**: A substance that in some individuals can cause an allergic or hypersensitivity reaction but is not normally considered harmful.6

♦ **Allergic**: A substance that can elicit a hypersensitivity reaction in certain individuals.7

♦ **Allergy**: An immune reaction to an environmental agent that results in a symptomatic reaction.6,7

♦ **Antigen**: Any molecule or substance, more often a protein, that has the ability to bind to an antibody.6,7 “The name arises from their ability to generate antibodies.”6,7

♦ **Irritant contact dermatitis**: A nonallergic, cutaneous response to an irritant. Normally this reaction is primarily localized to the site of exposure. This is not a latex allergy.

♦ **Allergic contact dermatitis (type IV: T-cell mediated/delayed hypersensitivity)**: A delayed, T-cell mediated hypersensitivity response attributed to chemicals (ie, antigens)
used in the latex and some synthetic manufacturing processes and absorbed through the skin.\(^6\) This reaction generally is localized to the contact area.

- **Latex:** Also known as natural rubber latex, this milky cytosol is acquired by tapping the commercial rubber tree, *Hevea brasiliensis*.

- **Latex allergy (type immunoglobulin E [IgE]-mediated/immediate hypersensitivity response):** A localized or systemic allergic response to one or more specific proteins (ie, antigens)\(^6\) found in latex to which the individual has been sensitized and has developed antibodies.

- **Latex-free environment:** An environment in which all latex-containing products, not simply gloves, have been removed. This state is considered unattainable due to the ubiquitous nature of latex products.

- **Latex-safe environment:** An environment in which every reasonable effort has been made to remove high-allergen and airborne latex sources from coming into direct contact with affected individuals. The airborne latex protein load should be less than 0.6 ng per cubic meter.\(^8\)

- **Latex precautions:** Interventions to prevent reactions in people (eg, patients, health care workers) allergic to latex proteins.

- **Reactions associated with latex:** Irritant contact dermatitis, allergic type IV cell-mediated contact dermatitis, and type I IgE-mediated latex allergy. Only the type I IgE-mediated response constitutes a true latex allergy.

- **Sensitization:** The development of immunological memory in response to exposure to an antigen.

- **Sensitivity:** A clinical manifestation of symptoms or response that develops after sensitization.

### Prevalence

Numerous studies indicate prevalence rates for IgE-mediated latex allergy from 0.8% to 6.5% of the general population.\(^1,9-13\) Latex allergy is believed to be responsible for 70% of anaphylactic reactions occurring in anesthetized children with myelodysplasia (eg, spina bifida).\(^12\) Further, there is a large population of latex-sensitive individuals. Varying sensitization rates have been reported for both patients with myelodysplasia and health care workers.\(^14-17\) According to Sussman, the prevalence rate of latex sensitization among patients with spina bifida is between 35% and 70%. The sensitization rate for health care workers with significant exposure to latex is reported to be 10% to 17%.\(^18\) Although latex-sensitive individuals do not always present with clinical symptoms, these individuals should be assessed for latex allergy. For those who are latex-sensitive but have yet to manifest frank symptoms, there is no predictor of whether or when they will react; therefore, all individuals presenting with natural rubber latex sensitivity should be treated as if they are allergic.

In 1992, Lagier et al reported a 10.7% latex allergy rate in French perioperative nurses.\(^19\) A study of Canadian perioperative nurses by Mace et al, in 1997, reported a 6.9% latex allergy prevalence.\(^20\) Studies of perioperative personnel demonstrate sensitivity rates between 2.5% and 15.8%. In 1992, Arellano et al reported a 9.9% latex sensitization rate in a study of 101 anesthesiologists, radiologists, and surgeons.\(^21\) In 1996, Grzybowski reported an 8.9% rate for hospital RNs in general, but showed perioperative nurses to be less affected than nurses in other areas. One possible explanation for this disparity was that nurses in the OR who were latex sensitive or allergic may have transferred to other nursing units.\(^22\) In 1997, Konrad et al reported a 15.8% positive skin prick test rate for anesthesiologists.\(^23\) In 1998, Brown et al identified 12.5% of anesthesiologists at a tertiary care hospital as sensitized (ie, IgE antibody positive by skin test or serology) with only 2.5% expressing symptoms.\(^24\)

### B. Pathophysiology

The major component of natural rubber latex is the hydrocarbon, cis-1, 4 polyisoprene. Chemicals such as sulfur, ammonia, mercaptobenzothiazole, thiuram, and antioxidants may be added during the manufacturing process. Latex protein content and residual chemical levels differ among producers due to variations in manufacturing processes.

Several natural rubber latex proteins responsible for allergic reactions have been identified (Table 2), and sensitivity appears to differ among risk groups.\(^25-28\) Proteins in natural rubber latex may cause a range of mild to severe or even life-threatening type I allergic reactions. Dipped products made from liquid natural rubber latex (eg, gloves, balloons, condoms) contain a greater amount of soluble proteins than dry gum rubber or heat molded latex products and, therefore, can release more allergen.\(^29,29\)

Several types of synthetic materials also may be referred to as latex (eg, butyl, petroleum-based materials) but these do not contain the proteins
that cause allergic reactions. There have been case reports, however, of individuals having a type I natural rubber latex-allergic reaction because synthetic materials may have been mixed with or contaminated with natural rubber latex.\(^{29}\) Water extractable, residual chemicals found in both latex and synthetic gloves usually are implicated in the development of allergic contact dermatitis in individuals who are presensitized.\(^{30-33}\)

### C. Reactions Associated With Latex and Synthetic Products

Reactions associated with latex and synthetic products include irritant contact dermatitis, allergic contact dermatitis (type IV), and immediate IgE hypersensitivity reactions (type I).\(^{34,35}\) Only the type I hypersensitivity reaction constitutes a latex allergy. Some individuals may present with a single complaint or a combination of all three reactions listed above. Irritant and allergic contact dermatitis are the most common clinical reactions associated with latex and other additives.\(^{34,35}\)

Irritant contact dermatitis is the result of damage to the skin, but it is not an allergic reaction. Soaps and cleansers, multiple hand washings, inadequate hand drying, or mechanical irritation (ie, sweating, rubbing inside powdered gloves) may cause skin irritation. It also can be caused by chemicals added during glove manufacture. An acute localized response is evidenced by redness, swelling, burning, and itching. Chronic exposure to the irritant can lead to dry, thickened, and cracked skin. Health care workers experiencing irritant contact dermatitis or skin breakdown should be referred to an occupational health practitioner, allergist, dermatologist, or immunologist for further diagnostic testing. This type of dermatitis is reduced by removing the irritant source after it is identified. Thoroughly washing and drying hands, using only powder-free gloves, changing gloves more frequently, or changing glove types can reduce skin irritation.\(^{11,36,37}\)

Other palliative measures include using only water- or silicone-based moisturizing creams, lotions, or topical barrier agents. Avoid using oil- or petroleum-based skin agents with latex products. These agents may cause breakdown of the latex product. Some skin care agents may help reduce glove-related problems and have been clinically formulated not to interfere with the glove’s barrier integrity. Always check with the manufacturer of the skin care agent to verify that the chosen agent is latex compatible before putting the product into use.\(^{38}\)

Allergic contact dermatitis (ie, delayed hypersensitivity) is a type IV immune reaction. It is a T-cell mediated allergic reaction and usually is localized to the area of contact. Chemical additives used in the manufacturing processes (eg, accelerators) and not the latex itself causes previously sensitized T-cell lymphocytes to stimulate proliferation of other lymphocytes and mononuclear cells, resulting in tissue inflammation and dermatitis.
The onset of type IV reactions is slow, usually occurring during 18 to 24 hours and peaking at 48 hours after exposure. Reactions may present as pruritis, erythema, swelling, crusty thickened skin, pimples, blisters, and other skin lesions. Symptoms usually resolve within three to four days after exposure. Each exposure may lead to increased sensitization and a more severe reaction. Diagnosis is made by a health care provider experienced in chemical allergy testing—patch tests commonly are used. Treatment involves education; thoroughly drying hands; using water- or silicone-based moisturizing creams, lotions, or topical barrier agents; avoiding oil- or petroleum-based products unless they are latex compatible; and avoiding the identified causative agent. Continued use of latex products when there are breaks in the wearer’s skin is believed to contribute to latex protein sensitization. This is due to absorption of solubilized latex proteins associated with the product.

Latex allergy (ie, immediate hypersensitivity) is a systemic type I IgE-mediated response to plant proteins in natural rubber latex. In sensitized individuals, an anti-latex IgE antibody stimulates mast cell proliferation and basophil histamine release, leading to local swelling, redness, edema, itching, and systemic reactions, including anaphylaxis. Type I reactions are immediate, with the onset of symptoms usually occurring in minutes. Symptoms include rhinitis, conjunctivitis, urticaria, laryngeal edema, bronchospasm, asthma, angioedema, anaphylaxis, and death. These responses can
occur when materials containing latex come into contact with the skin, mucous membranes, or internal tissues. Aerosolization of very small amounts of natural rubber latex proteins may cause some individuals to react after inhaling traces of powder from latex gloves or balloons. The severity of repeat reactions is unpredictable; therefore, individuals who have suffered any type I reaction are considered to be at high risk for anaphylaxis.

Latex allergy is diagnosed by a history of type I reactions to latex products, such as gloves, balloons, or condoms, and a skin prick test—no FDA-approved reagent is yet approved in the United States—or serum test to identify IgE antibodies to latex. Individuals may experience irritant, type IV, and type I reactions simultaneously. If a patient or health care worker experiences any form of reaction to a medical device that may contain latex (eg, medical gloves), the individual should be carefully evaluated by a health care provider experienced in latex allergy diagnosis and management. Table 3 provides anaphylactic reaction assessment criteria with which health care workers should be familiar.

### D. Population Affected/Risk Factors

Children with myelodysplasia or a history of multiple surgeries beginning in infancy and any individual with a past history of type I reaction or positive test results to natural rubber latex are at high risk for developing anaphylaxis. People at risk for developing latex sensitization include individuals occupationally exposed to latex (eg, health care workers, food service workers); atopic individuals with a history of asthma, eczema, and rhinitis; people who react to medications; and individuals with multiple environmental allergies. People with a history of type I allergic reactions to certain foods (eg, banana, avocado, chestnut, kiwi) also are at risk.

### Table 4: SAMPLE LATEX ALLERGY QUESTIONNAIRE

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have you ever had allergies, asthma, hay fever, eczema, or problems with rashes?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>2. Have you ever had respiratory distress, rapid heart rate, or swelling?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>3. Have you ever had swelling, itching, hives, or other symptoms after contact with a balloon?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>4. Have you ever had swelling, itching, hives, or other symptoms after a dental examination or procedure?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>5. Have you ever had swelling, itching, hives, or other symptoms following a vaginal or rectal examination or after contact with a diaphragm or condom?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>6. Have you ever had swelling, itching, or hives during or within one hour after wearing rubber gloves?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>7. Have you ever had a rash on your hands that lasted longer than one week?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>8. Have you ever had swelling, itching, hives, runny nose, eye irritation, wheezing, or asthma after contact with any latex or rubber product?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>9. Have you ever had swelling, itching, or hives after being examined by someone wearing rubber or latex gloves?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>10. Has a physician ever told you that you had rubber or latex allergy?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>11. Are you allergic to bananas, papaya, avocados, kiwifruits, other stone fruits, tomatoes, raw potatoes, or chestnuts?</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>12. Have you ever had an unexplained anaphylactic episode? If so, please describe.</td>
<td>❑</td>
<td>❑</td>
</tr>
</tbody>
</table>
increased risk for latex sensitization. This is because of a cross reactivity that exists between natural rubber latex proteins and certain food allergens.\textsuperscript{10,22,24,51} Table 4 provides a sample questionnaire suitable for assessing patients and others for their risk of latex allergy or sensitization.

The ACAAI recommends that individuals with known latex allergy and those at high risk for allergy be treated in a latex-safe environment. Individuals designated as at risk for developing latex sensitization should be assessed carefully, and health care facility protocol should be followed in determining the need for testing for immediate hypersensitivity to natural rubber latex (Table 5).\textsuperscript{10,12,52,53}

### Table 5

<table>
<thead>
<tr>
<th>LATEX ALLERGY RISK GROUPS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Persons at high risk for systemic reactions</strong></td>
</tr>
<tr>
<td>♦ Children with a history of frequent surgeries or use of instrumentation, particularly if begun in early infancy, as with congenital malformations like myelodysplasia (eg, spina bifida) or genitourinary problems.</td>
</tr>
<tr>
<td>♦ Verifiable history of latex allergic reactions, particularly if intraoperative or asthmatic.</td>
</tr>
<tr>
<td>♦ Positive test results to serum latex antibody test (eg, radioallergosorbent/enzyme-linked immunosorbent assay) or skin prick test.</td>
</tr>
<tr>
<td>♦ History of any immunoglobulin E-mediated symptoms, (eg, urticaria, rhinoconjunctivitis, asthma, bronchospasm) when in contact with natural rubber latex products.</td>
</tr>
</tbody>
</table>

| **Persons at risk for developing latex allergy** |
| ♦ Occupational exposure to latex products, particularly to powdered products such as gloves, or to aerosolized latex proteins. |
| ♦ History of latex-fruit syndrome or progressive reactions to foods known to cross-react with NRL—including bananas, kiwifruits, avocados, stone fruits, raw potato, tomato, papaya, or chestnuts—or a history of a latex glove-associated contact dermatitis. |

| **Persons who should be evaluated for latex allergy** |
| ♦ History of any unexplained anaphylaxis—particularly if occurring in a medical or dental setting. |
| ♦ History of hives or itching after incidental latex exposure, such as dental or gynecological examinations, or on contact with balloons, condoms, or natural rubber latex gloves. |
| ♦ History of multiple surgical procedures. |

*Risks suggested by Dr. B. Lauren Charous, Milwaukee Medical Clinic*

### E. Exposure

Systemic exposure to latex can occur through the following routes: mucous membrane, ingestion, inhalation, or intravascular or cutaneous contact. The majority of severe latex reactions result from latex proteins coming in contact with internal tissues during invasive procedures or after contact with mucous membranes of the mouth, vagina, urethra, or rectum.\textsuperscript{45,46} Triggering items include latex gloves, latex glove powder, orthodontic elastic, dental dams, nasogastric tubes, balloons, pacifiers, urinary catheters, enema kits, barium enema catheters, condoms, and balloon catheters. Case reports describe intraoperative anaphylaxis after the peritoneum or other internal tissues are contacted by surgical gloves.\textsuperscript{39,45-48}

Inhalation of latex proteins can lead to bronchospasm or laryngeal edema. Aerosolized glove powder is the most common source of latex protein inhalation.\textsuperscript{49,50} Latex proteins bind to the glove starch powder during the manufacturing process and are expelled into the air when gloves are opened, donned, or removed.\textsuperscript{50} Latex proteins, particularly when bound to starch glove powder and then aerosolized, can and have caused serious health problems for both patients and employees.\textsuperscript{3} Use of powdered latex gloves in the same room as a sensitized individual can produce an allergic reaction. Use of powder-free gloves results in only small or negligible amounts of latex in the air.\textsuperscript{8,30,54-56}
Cutaneous exposure to latex products can trigger serious systemic reactions in highly sensitized individuals. Examples of products that have triggered reactions include gloves, condoms, anesthesia masks, tourniquets, electrocardiogram electrodes, adhesive tape, elastic bandages, condom catheters, rubber shoes, elastic in clothing, balloons, and racquet handles.

**F. Prevention**

The goals of prevention are twofold: to prevent reactions in individuals who are latex-sensitized and to prevent initial sensitization of nonsensitized persons. The only effective preventive strategy at this time is latex avoidance. Working in an environment that is free of powdered, high-allergen latex gloves and products will help minimize sensitization of health care workers. The NIOSH, AAAAI, ACAAI, and others recommend and encourage the use of low-allergen, powder-free latex gloves as an important factor in developing a latex-safe environment. For patients or staff members with a known allergy to natural rubber latex proteins, additional precautions are necessary. The presence of even small amounts of residual aerosolized latex in the air or on surfaces can trigger a life-threatening reaction. Latex-allergic individuals should be treated or work in an environment using strict latex avoidance. Although it is impossible to remove all latex from the environment (eg, wheels on carts), all latex that may potentially contact the individual should be removed.

When establishing a latex-safe environment, pertinent clinical data should be obtained on every latex or latex-containing product used in the facility, with an emphasis placed on the protein and powder content of each product, if powdered gloves or other powdered items are used. Latex products selected for use should be low-allergen and powder-free. The protein content should be less than 50 µg/dm² using the American Society for Testing and Materials (ASTM) D5712 total protein test and less than 10 µg per dm² by the ASTM D6499 antigen test.

AORN’s “Recommended practices for product selection in perioperative practice settings” provides guidance to assist practitioners with product evaluation and selection. A master list or directory of products containing latex and appropriate latex-free substitutes for those products should be maintained by the health care facility and be readily accessible to all health care providers. Since September 30, 1998, the FDA has required that all FDA-cleared medical devices containing natural rubber latex carry a warning statement. This statement reads “Caution: This product contains natural rubber latex which may cause allergic reactions.” This label warning will facilitate alternative product selection for latex-allergic individuals. This ruling does not include pharmaceuticals or products that are not regulated by the FDA.

A latex-free cart may be helpful for consolidating latex-free items in a single place for ease of location and use. Specialty patient care areas, such as the OR, emergency, and labor and delivery departments, should develop a list of items to meet their special care needs. Emergency carts (ie, code carts) also should contain latex-free items (eg, syringes, latex-free gloves, resuscitation equipment). Manufacturer documentation should be obtained to ensure the latex-free status of contents for all carts (eg, code, latex, other specialty carts). It is important that each cart be latex-free as emergency situations can occur without respect for any individual patient considerations. A sample of items to be included in a latex-free cart can be found in Table 6.

Pretreating latex-allergic individuals with certain medication regimens (eg diphenhydramine, ranitidine, corticosteroids) may prevent initial allergy symptoms, but it also may give care providers with a false sense of security. This practice remains controversial. Pretreated latex-allergic individuals may present with anaphylaxis as the first sign observed by the health care team.

The use of medication vials with rubber stoppers also is controversial when caring for latex-sensitive or allergic patients. Protein can be leached from the vial stopper. Even when the single-puncture or the pop-the-top-off method is used, individuals already sensitized to natural rubber latex can react. One study reported that the amount of latex found in a medication vial after 40 punctures was below the level of detection using standardized methods. Another study suggested that medication vials should be changed to synthetic vial tops or be clearly labeled as is required for other medical devices. Coring of the stopper also is a concern. Coring may occur from repetitive puncturing of a multi-use vial stopper. This raises a concern about latex-containing particulate matter potentially contaminating the medication. In two studies, the use of sharp needles reportedly caused coring fragments in 73% of solutions in test vials using multi-dose insulin stoppers.
possible, medications should be used from a latex-free vial. When this is not possible, arrangements with the pharmacy should be made in advance so medications can be drawn into a latex-free delivery device under aseptic conditions (eg, inside the pharmacy’s hood). If neither of these solutions is possible, the stopper should be removed and the medication withdrawn using a latex-free syringe. AORN does not recommend this practice unless all other options have been exhausted.

Reprocessing instruments previously processed in steam and potentially exposed to latex contamination via sterilization tape, container gaskets, or gloves worn in processing is considered unnecessary by most experts because proteins are denatured by heat and steam. Health care facilities are cautioned not to heat sterilize a known latex product in an attempt to render it safe for use on a latex-allergic individual.

Sterilization of medical products by means other than heat has not been well studied in relation to latex allergy. Each facility should contact the manufacturer of the sterilizing agent or technology to verify its safe use for individuals with a latex allergy.

G. Managing Latex-Allergic Individuals

Patients

Preparing a health care facility to care for latex-allergic patients is a complex process that can be costly and labor intensive. A multidisciplinary task force to address latex issues should be formed and may include representatives from the following areas:

- administration,
- risk management,
- quality management,
- safety management,
- surgical services,
- sterile processing,
- distribution,
- anesthesia services,
- materiel management,
- pharmacy,
- laboratory,
- infection control,
- family medicine,
- department of surgery,
- department of allergy and immunology, and
- various nursing departments (eg, intensive care unit, emergency, medical-surgical, home care, education, occupational health).

Employees

Latex-allergic individuals should be counseled about the risk of working in environments with

Table 6

SUGGESTED CONTENTS FOR A LATEX-SAFE CART

- Note: All items must be latex-free.

- Safety needles (25 g through 15 g)
- Syringes (multiple sizes)
- 3-way stopcocks
- IV tubing
- Blood tubing
- Tourniquets
- Assorted tape (.5”, 1”, 1.5”)
- Underpads and small chux
- 100% silicone or polyvinyl chloride (PVC) urinary catheters
- Silicone or PVC external catheters—pediatric and adult
- Urinary drainage system
- Feeding tubes (5 Fr to 10 Fr)
- Feeding pump bag and tubing
- Bulb syringe (60 cc)
- Blood pressure cuffs and connecting tubing
- Stethoscope
- Examination gloves
- Sterile gloves
- Oxygen delivery supplies (eg, cannula, masks)
- Anesthesia breathing bag

The role of the task force is to develop a protocol for creating a latex-safe environment for patients who are latex-allergic. Removing devices and supplies with high latex protein content and discontinuing use of powdered latex products should be an integral part of the protocol. The possible increase in purchase costs for nonlatex items must be weighed against the costs of potential anaphylactic episodes or patient death. The protocol also should include a mechanism for patient education about latex allergy and its management.

Patient safety cannot be compromised. If a facility is maintained as latex-safe, additional preparation for latex-allergic patients may not be necessary. If a facility makes the conscious decision not to continuously maintain a latex-safe environment, special preparation and precautions will be required every time a latex-allergic individual presents for care.
high latex use. They should use only nonlatex gloves and avoid all products containing latex. The ACAAI suggests that these individuals wear an allergic identification bracelet or tag, always carry an epinephrine auto-injector device, and avoid environments where powdered latex gloves are used or balloons are allowed.\(^\text{52}\)

For both facility and employee protection, employees new to a facility should be assessed to determine the risk or presence of latex-related problems. This can be done through the employee health service or a similar mechanism during the pre-employment history and physical examination. A simple questionnaire can be used as part of the initial assessment. People at high risk for latex sensitivity should have further evaluation for latex allergy. Individuals considered at high risk

- have existing allergies, particularly to fruits (eg, latex-fruit syndrome)\(^\text{83}\);
- have hand dermatitis or eczema; and
- use gloves regularly.

Low-risk employees with a negative clinical history of latex reactions do not need allergy testing, but they should be evaluated if symptoms suggestive of latex sensitivity develop during their employment. For people with contact dermatitis, the causative agent should be identified and avoided if possible. If the dermatitis appears on the hands, the use of glove liners under latex or nonlatex gloves that do not contain the triggering agent has been found to be helpful.\(^\text{41,52}\)

All employees should be educated about latex sensitivity and allergy and be able to recognize the symptoms of a latex reaction. Employees should be encouraged to report development of any symptoms to the facility's employee health service or other designated mechanism.

II. Nursing Process Application

A. Perioperative Nursing Vocabulary

The perioperative nursing vocabulary is a clinically relevant and empirically validated standardized nursing language. It relates to the delivery of care in the perioperative setting. This standardized language consists of a collection of data elements (ie, the Perioperative Nursing Data Set [PNDS]) and includes perioperative nursing diagnoses, interventions, and outcomes. In 1999, the PNDS was recognized by the ANA committee on nursing practice as a data set useful in the practice of nursing. The perioperative patient-focused model provides the conceptual framework for the PNDS and the model for perioperative nursing practice.\(^\text{84}\) The patient and his or her family members are at the core of the model. The model depicts perioperative nursing in four domains and illustrates the relationship between the patient, family members, and care provided by the perioperative professional nurse. The patient-centered domains are

- D1—safety,
- D2—physiological responses to surgery,
- D3—patient's and family members' behavioral responses to surgery, and
- D4—health system in which perioperative care is provided.

Each data element in the PNDS is represented by a unique identifier. The domains are represented by the letter "D" followed by numbers one to four to indicate the particular domain being addressed. Nursing diagnoses are represented by the letter "X" and a number unique to the diagnosis; interventions are represented by the letter "I" and a unique number; and outcomes are represented by the letter "O" and a unique number. These designations are used in this document as appropriate.

B. Assessment

Perioperative nurses assess, document, and communicate patient status to all members of the health care team. Data collection involves the patient and his or her significant others. Assess for the following risk factors:

- history of multiple surgeries beginning at an early age (eg, spina bifida, urinary malformations);
- food allergies (eg, latex-fruit syndrome)\(^\text{83}\);
- exposure to latex; and
- history of allergic reaction to latex.

Assess for inadvertent latex exposure and impending anaphylaxis. Table 7 provides a summary of symptoms of latex exposure and possible anaphylaxis for both conscious and anesthetized patients.

C. Nursing Diagnosis

The perioperative nurse analyzes the assessment data when determining nursing diagnoses. Following is a partial list of nursing diagnoses that may be associated with latex-allergic individuals ("X" = nursing diagnosis, "D" = domain).
♦ X 32 (D2)—latex allergy response (risk for);
♦ X 30 (D3)—knowledge deficient related to latex hypersensitivity (risk for/actual);
♦ X 50 (D1)—skin integrity, impaired, related to manifestations of allergic reaction (risk for/actual);
♦ X 7 (D2)—breathing pattern, ineffective, related to facial angioedema, bronchospasm, and laryngeal edema (risk for/actual);
♦ X 8 (D2)—cardiac output, decreased, related to severe latex-allergic reaction (risk for/actual);
♦ X 61 (D2)—tissue perfusion, ineffective, renal, related to hypotension and decreased cardiac output (risk for/actual);
♦ X 18 (D2)—fluid volume, risk for deficient
♦ X 11 (D2)—acute confusion related to physiologic condition and decreased circulation;
♦ X 64 (D3)—verbal communication, impaired, related to hypotension and decreased cardiac output (risk for/actual);
♦ X 47 (D1)—sensory perception, disturbed, related to hypotension and decreased cardiac output (risk for/actual); and
♦ X 4 (D1)—anxiety, related to change in physiological status in response to latex.

D. Outcome Identification
The following is a partial list of nursing outcomes that may be associated with the latex-allergic individual (“O” = outcome, “D” = domain).
♦ O 2 (D1)—The patient is free from signs and symptoms of injury caused by extraneous objects.
♦ O 3 (D2)—The patient is free from signs and symptoms of chemical injury.
♦ O 11 (D2)—The patient has wound/tissue perfusion consistent with or improved from baseline levels established preoperatively.
♦ O 13 (D2)—The patient’s fluid, electrolyte, and acid-base balances are consistent with or improved from baseline levels established preoperatively.
♦ O 14 (D2)—The patient’s respiratory status is consistent with or improved from baseline levels established preoperatively.
♦ O 15 (D2)—The patient’s cardiac status is consistent with or improved from baseline levels established preoperatively.
♦ O 23 (D3)—The patient participates in decision making affecting the perioperative plan of care.

Table 7
<table>
<thead>
<tr>
<th>SYMPTOMS OF LATEX EXPOSURE AND POSSIBLE ANAPHYLAXIS</th>
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</thead>
<tbody>
<tr>
<td><strong>Conscious Patient</strong></td>
</tr>
<tr>
<td>Itchy eyes</td>
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<tr>
<td>Generalized pruritus</td>
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<tr>
<td>Shortness of breath</td>
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<tr>
<td>Sneezing</td>
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<tr>
<td>Wheezing</td>
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<tr>
<td>Nausea</td>
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<td>Edema</td>
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<td>Vomiting</td>
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<td>Abdominal cramping</td>
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<tr>
<td>Diarrhea</td>
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<tr>
<td>Faintness</td>
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</tbody>
</table>

E. Planning
The perioperative nurse develops a plan of care for the latex-allergic patient that prescribes interventions to attain expected outcomes. Interventions and activities are selected according to the procedure to be performed as well as to address the latex allergy. The following is a partial list of interventions that may be associated with the latex-allergic individual (“I” = interventions).
♦ I 30—Develops individualized plan of care.
♦ I 139—Implements latex-allergy precautions as needed.
♦ I 27—Ensures continuity of care.
The natural rubber latex-allergic individual should be identified by the admitting practitioner, and this information should be made available to the entire health care team, thus providing a continuous safe level of care. The latex-allergic individual should be treated in a latex-safe environment with emphasis placed on the removal of all latex-containing devices and products within the immediate care environment. Figure 1 provides a simple flow chart to assist with planning for a latex-safe procedure.

F. Implementation
Implementation refers to actually performing the activities comprising the interventions identified in the individualized plan of care. This includes taking latex-allergy precautions as appropriate. If the patient is to be cared for in a facility-wide, latex-
safe environment, no additional latex precautions should be needed. If latex or latex-containing products remain in the patient’s immediate care environment, those products should be removed.

Nursing interventions are composed of many and varied activities. To care for the latex-allergic individual, some or all the following activities will be appropriate, particularly if the patient is not in a facility-wide latex-safe environment.

Preoperative activities
The following activities should take place before the surgical procedure.
- Notify OR of potential or known latex-allergic patient 24 to 48 hours (or as soon as possible) before scheduled procedure.
- Identify the patient’s risk factors for latex allergy and communicate same to healthcare team.
- Schedule procedure as first case of the day if the facility is not latex-safe.
- Notify all other care providers of patient’s allergy status.
- Educate patient about latex-safe plan and ensure involvement of all providers.
- Involve patient, family members, and significant others in planning patient’s care.
- Plan for a latex-safe environment of care.
- Secure latex-free products for all latex-containing items on surgeon's preference card and those used by anesthesia care provider.
- Notify surgeon if no alternative product is available.
- Notify anesthesia care provider if latex-containing product is to be used, and develop plan for emergency care if needed.
- Remove all latex items from OR unless no nonlatex alternative exists.
  - Remove boxes of latex gloves and replace with nonlatex gloves (e.g., sterile, nonsterile).
  - Double-check all supplies and equipment for latex and remove any latex-containing items.

Intraoperative activities
The following activities should be performed during the surgical procedure.
- Continue implementing the perioperative latex-safe plan of care.
- Mark the OR room doors with “Latex precautions” signs.
- Mark the patient's admitting bed and transport vehicles.
- Provide latex-sensitive patients with a “latex allergy” identification band and ensure that the bed and chart also are clearly labeled.
- Remind all healthcare team members of the necessity for following latex avoidance procedures.
- Restrict traffic flow in the room before and during the procedure.
- Use latex-free IV tubing or replace injection ports with three-way stopcocks. Tape over any remaining ports to prevent inadvertent use.
- Use medication in ampules or latex-free vials when available.
- Use latex-free syringes.
- Use latex-free blood pressure cuffs and connecting tubing. If they are not available, wrap the patient’s arm to prevent blood pressure cuff tubing or tourniquet cuff tubing from coming into contact with the patient’s skin.
♦ Do not use latex tourniquets (eg, Penrose drains) to start IV lines or as drains in a wound.
♦ Use a 100% silicone (ie, not silicone coated) or polyvinyl chloride catheter if a urinary catheter is ordered for a procedure.
♦ Verify that additional items requested after the case is in progress are latex-free before delivering them to the sterile field.
♦ Be prepared for the possibility that the procedure may require more than the scheduled equipment (eg, laparoscopy to open).
♦ Monitor for anaphylactic reactions to latex throughout the procedure as reactions may occur immediately after induction (eg, IV exposure) or up to 40 minutes later.
♦ Have IV fluids and medications for treatment of allergic reaction available immediately.
♦ Inform postanesthesia care unit (PACU) staff members in advance of the patient’s arrival time.

Postoperative activities
The following activities should be performed after the surgical procedure.
♦ Continue the perioperative latex-safe plan of care.
♦ Ensure that latex-free supplies are available to follow the patient to all future locations within the health care facility.
♦ Provide a latex-free resuscitation bag, oxygen mask, and supplies.
♦ Transport the patient to a latex-safe area.
♦ Provide education for patient and his or her family members or significant others.

If the latex-allergic patient is not cared for in a facility-wide, latex-safe environment, he or she is at risk for reaction upon arrival in the PACU. When the patient re-enters the mainstream care environment, he or she is at risk because of the aerosolized powder-containing latex proteins being transferred through the air or shed from scrub attire of individuals working with or near powdered latex products. In a nonlatex-safe facility, it may be necessary to use a positive pressure isolation room if a latex-safe environment of care has not been previously established in preparation for the patient.

G. Evaluation of Outcomes
The perioperative nurse evaluates the patient’s progress toward attainment of outcomes. The perioperative nurse’s evaluation should be systematic and ongoing. The patient’s progress toward attainment of outcomes should be documented using the recognized, standardized perioperative nursing vocabulary. Outcome indicators will vary according to the specific desired outcome and may include
♦ physiological indicators (eg, neurological status, cardiovascular status);
♦ cognitive indicators (eg, repeats instructions correctly, asks appropriate questions);
♦ affective indicators (eg, verbalizes and demonstrates willingness to comply with treatment regimen); and
♦ supportive resources (eg family members participate in care planning and delivery).

Patient satisfaction
Evaluation of patient progress is based on observations of the patient’s responses to nursing interventions and the effectiveness of interventions in moving the patient toward the desired outcome. Desired patient outcomes, nursing interventions, and potentially applicable nursing diagnoses are articulated in the standardized perioperative nursing vocabulary which provides the basis for documentation of perioperative nursing practice. Ongoing assessment should be used to revise diagnoses, outcomes, and the plan of care as needed. Revisions in diagnoses, outcomes, and the plan of care should be documented. The patient, his or her significant others, and other health care providers should be involved in the evaluation process when appropriate.

III. Conclusion
This guideline has been designed to promote a safe health care environment for latex-sensitive and latex-allergic patients and health care workers. The document addresses prevalence, history, pathophysiology, risk factors, prevention, and nursing process applications. This guideline can be used as a resource by facilities developing latex-safe policies, procedures, and protocols. The guideline may not apply to every individual and may require alteration based on specific needs.

NOTES


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RESOURCES

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