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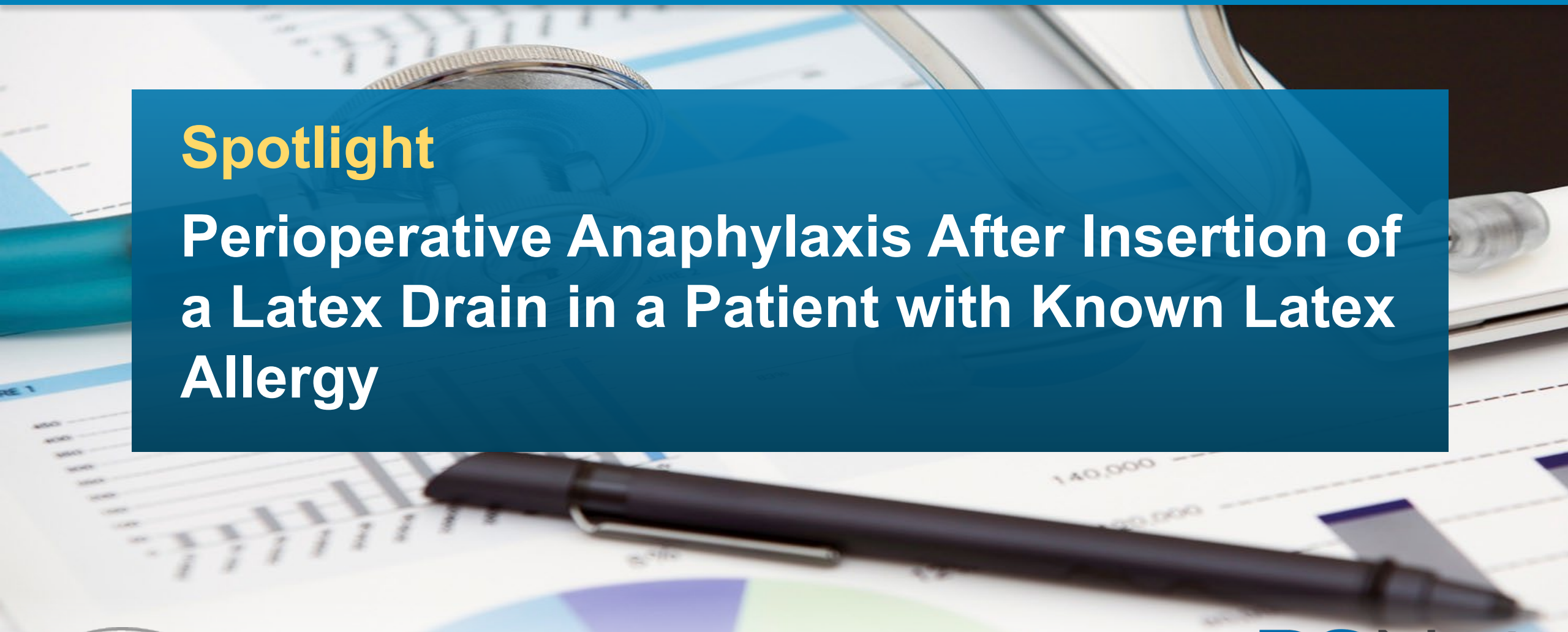


Spotlight

Perioperative Anaphylaxis After Insertion of a Latex Drain in a Patient with Known Latex Allergy

AHRQ Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

PSNet
PATIENT SAFETY NETWORK

Source and Credits

- This presentation is based on the August 2022 AHRQ WebM&M Spotlight Case
  - See the full article at https://psnet.ahrq.gov/webmm
  - CME credit is available
- Commentary by Kevin J Kelly, MD
- AHRQ WebM&M Editors in Chief: Patrick Romano, MD, MPH and Deb Bakerjian, PhD, APRN, RN
  - Spotlight Editors: Patrick Romano, MD, MPH and Amy Nichols, EdD, RN
  - Managing Editor: Meghan Weyrich, MPH

Objectives

At the conclusion of this educational activity, participants should be able to:

- Understand the history, epidemiology, cause of latex allergy and the reason that some individuals continue to be at high risk of allergic reactions or sensitization.
- Describe the risk to patients with latex allergy from contact with latex products in the hospital and operating room.
- Discuss the process for assuring latex avoidance in patients with latex allergy.
- Reinforce the principles of identification and treatment of anaphylaxis in the hospital and perioperative setting.

Objectives, cont.

At the conclusion of this educational activity, participants should be able to:

- Appreciate the importance of patient's self-identification of latex allergy
- Understand risk factors associated with allergic sensitization to latex proteins.
- Describe hospital safety practices that will eliminate or limit the risk of exposure to latex products that are most likely to cause problems in latex-allergic patients.

PERIOPERATIVE ANAPHYLAXIS AFTER INSERTION OF A LATEX DRAIN IN A PATIENT WITH KNOWN LATEX ALLERGY

This case highlights the continued risk to patients with latex allergy in the hospital and perioperative setting and current opportunities to reduce this risk by double patient checklist, latex product buying practices, and medical safety committee oversight.

Case Details (1)

- A 65-year-old female with documented latex allergy underwent cricopharyngeal (CP) myotomy and trans-cervical diverticulectomy for right-sided Zenker's diverticulum.
- The patient was stable after rapid sequence intubation and maintenance of anesthesia with methohexital, fentanyl, and a neuromuscular blockade agent.
- No antibiotics were administered during the procedure and repair of the diverticulum was uneventful.

Case Details (2)

- Near the conclusion of surgery, a latex Penrose drain was placed in the neck surgical incision.
- The patient developed generalized urticaria, bronchospasm requiring high airway pressure to ventilate the patient, and hypotension within 5 minutes of placement of the drain.
- The inadvertent use of a latex device insertion was rapidly recognized, and the drain was replaced with a silicone drain.

Case Details (3)

- Epinephrine 0.3 milligrams IM, IV saline, and vasopressors were administered post-operatively to the patient.
- Symptoms resolved within 4 hours, and she was extubated successfully with hemodynamically stable vital signs.
- The team further recognized that despite a known diagnosis of latex allergy, the devices used and allergy history were not double checked by the entire procedure team during the time out.

PERIOPERATIVE ANAPHYLAXIS AFTER INSERTION OF A LATEX DRAIN IN A PATIENT WITH KNOWN LATEX ALLERGY

THE COMMENTARY

By Kevin J. Kelly, MD

BACKGROUND

Background (1) – Perioperative Anaphylaxis

- Perioperative anaphylaxis is a life-threatening complication that occurs in at least 1 in every 20,000 cases. The most common causes include:
  - Neuromuscular blocking agents*
  - Latex*
  - Antibiotics*
  - Quaternary ammonium anesthetics
  - Narcotics
  - Chlorhexidine
- In the 1990's, latex became the leading cause of perioperative allergic reactions
- In response, health care organizations improved safety by:
  - Reducing occupational exposure to allergenic proteins contained in latex, thereby preventing allergy among health care workers and patients at high risk.
  - Eliminating the use of latex products and substituting appropriate non-latex products in patients with known latex allergy.

*Most common agents causing perioperative anaphylaxis

Background (2) – Natural Rubber Latex Science

Poinsettia - The most recognized lactifer in the US

Hevea brasiliensis Collected

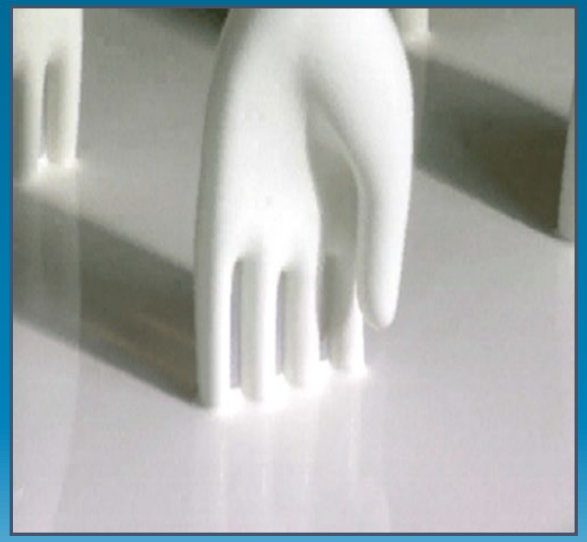
One of >2000 lactiferous plants Anti-coagulated / Stabilized

Dry Coagulated Rubber

90% of rubber used – especially for tires

High heat sulfur vulcanization

Proteins denatured and destroyed



Dipped Rubber

10% of rubber used commercially – especially for gloves, condoms

Low heat sulfur vulcanization

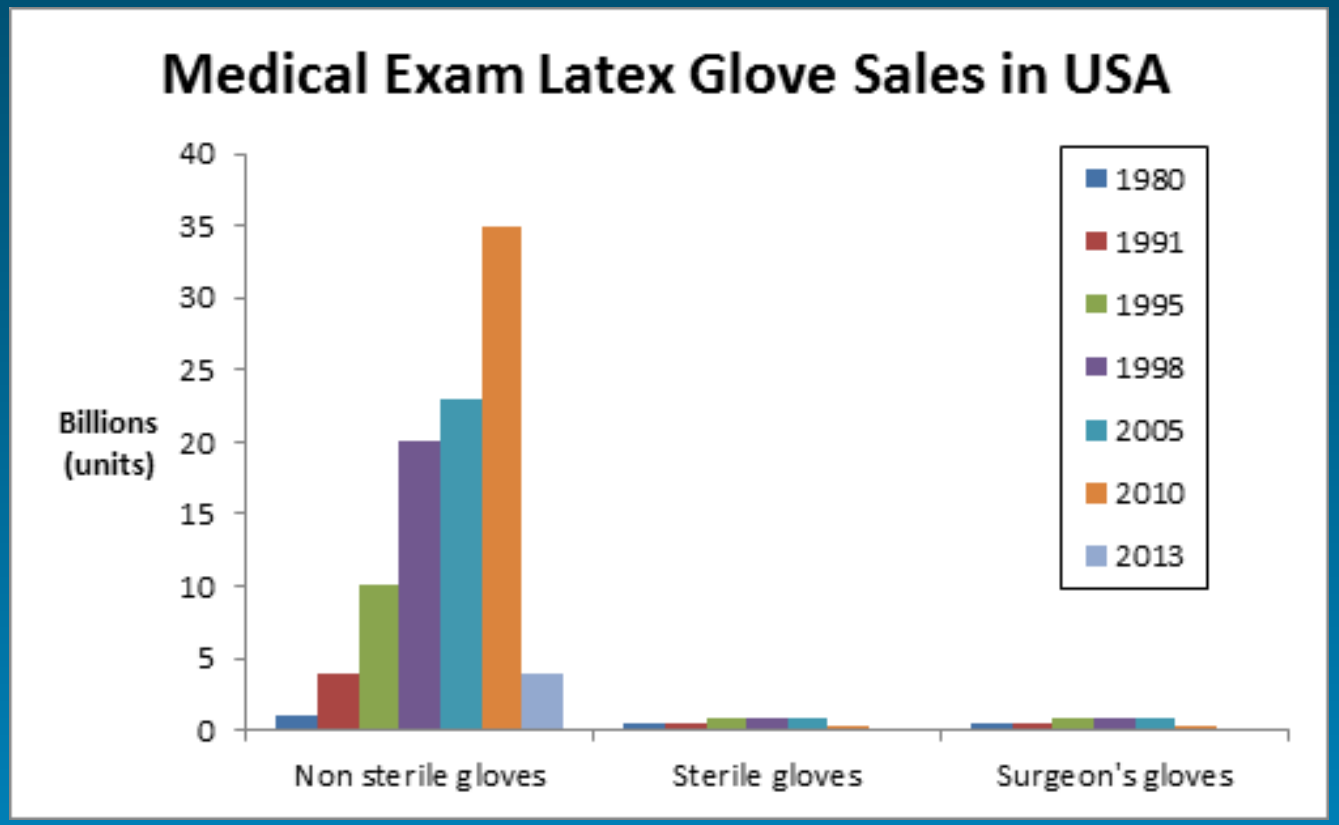
Proteins intact and allergenic

Background (3) – Mechanism of Latex Allergy

- Rubber is a polymer of cis-1,4-polyisoprene that gives it the properties of elasticity (stretch), impermeability (barrier protection), and modulus (return to the same shape after stretching).
- Latex allergy is an IgE-mediated hypersensitivity reaction to proteins retained in finished products made of natural rubber latex (latex) collected from the rubber tree *Hevea Brasiliensis.*
  - *Hevea Brasiliensis* is a lactiferous plant that produces latex as an intracellular cytosol that is secreted into its circulation when the plant is injured.
  - The polyisoprene component of natural occurring latex forms cross-linkages that coagulate and stop further loss of fluid from the plant.
  - Proteins in the latex are enzymes that catalyze the polymerization of the isoprene as well as act as immune defense proteins to hinder the invasion of harmful bacteria or fungi.
  - 15 of these polypeptides have been classified as allergenic to humans.
  - Most allergic reactions to latex are associated with low-heat vulcanized rubber products, because the proteins in natural rubber are not denatured from low heat.

Background (4) – Epidemiology of Latex Allergy

- Latex materials became one of the most important products (e.g., gloves) for barrier protection from blood borne pathogens after introduction of universal precautions (now “standard precautions”) in the 1990’s.
- Widespread use of non-sterile latex gloves probably led to higher prevalence of latex allergy.
- Subsequent substitution of non-latex materials has been associated with reduced prevalence of allergy.
- Helpful manufacturing advances include pre-washing and eliminating cornstarch, substituting halogen lubricants that do not go airborne.



Source: Kelly KJ, Kelly BT: Latex Allergy. In: Pediatric Allergy – 3nd Edition. Leung (ed). Elsevier Saunders Edinburgh, Chapter 56, 505-513, copyright 2016.

Background (5) – Populations Susceptible to Latex Allergy

Recognizing populations that are susceptible to latex allergy is key to preventing allergic reactions.

Work Industries	Medical Diseases	Immune Susceptibility
Health care workers	Spina bifida	Atopic individuals
Hairdressers	Premature Infants	Food allergic individuals
Painters	Urogenital anomalies	Contact dermatitis
Food handlers	Tracheoesophageal fistula	Irritant dermatitis
Security personnel	Patients with multiple surgeries	
Condom users	Multiple anomalies	
Florists	Ventriculoperitoneal shunt	
	Type 1 diabetes (insulin injection)	

Background (6) – Populations Susceptible to Latex Allergy

- Latex allergy reached epidemic levels in the 1990's in specific risk groups with the following highest reported sensitization rates:
  - About 70% of patients with spina bifida
  - 10-17% of health care workers
  - 5% of patients who had multiple surgeries
  - Approximately 1% of the general population
  - Other high-risk individuals (e.g., patients with gastrointestinal anomalies or type 1 diabetes) have been described in the medical literature, but without clear prevalence.
- One medical center in the early 1990's reported that 1 out of every 8 anesthetic procedures among spina bifida patients involved latex-induced anaphylaxis – over 500 times the rate of expected anaphylaxis compared to known rates in general populations.

APPROACH TO IMPROVING PATIENT SAFETY

Approach to Improving Patient Safety (1) – Recognition

- The most prominent symptoms of anaphylaxis may be difficult to recognize in the anesthetized patient who may be covered by surgical drapes and unable to communicate to the healthcare team
- Skin signs of urticaria, angioedema, skin rash may be hidden
- Abdominal cramping, pruritis, chest tightness, and altered mental status from hypotension may not be communicated by the patient
- Thus, unexplained hypotension, tachycardia, and high airway pressure needed to ventilate the patient due to bronchospasm are key findings by the anesthesiologist

Approach to Improving Patient Safety (2) – "Latex-safe"

LATEX SAFE PRECAUTIONS

- For many reasons, latex gloves and products could not be eliminated from the health care environment immediately due to inadequate substitutes and insufficient science.
- NIOSH eventually banned the use of powdered latex gloves (due to airborne allergens) but not other latex products. By 2013, latex exam gloves had almost completely been replaced with synthetic neoprene or butadiene rubber (both synthetically made without allergenic proteins).
- In addition, multiple non-latex product substitutes are now available, and latex-containing products that touch patients are now clearly labeled.
- Latex-safe care refers to eliminating sources of airborne latex and preventing patients' skin or mucosal contact with low heat vulcanized latex products (e.g., Penrose drains). If medical personnel are unclear about the allergen content of a latex product, exclusion from use is prudent.

Approach to Improving Patient Safety (3) – "Latex-safe"

- Note "latex-safe" does not mean "latex-free" care, as a latex-allergic patient may safely use a wheelchair with high-heat vulcanized tires (for example).
- Sensitization rates for high-risk individuals and the general public have likely declined based on studies around the world. However, economic challenges and limited medical infrastructure have resulted in less success in reducing latex allergy in resource-constrained countries.
- In the US, patients with latex allergy continue to need hospital, medical, and surgical services.
- The decline of latex allergy events compared to the 1990's may have led to relaxation of latex-safe precautions, as this once-prevalent problem has fallen from visibility ("off the radar" per se).
- In 2022, numerous medical products are still made from natural rubber latex and used frequently in patient care settings.

Approach to Improving Patient Safety (4) – PPSA Findings

- The Pennsylvania Patient Safety Authority (PPSA) reported 616 latex allergy-related cases across the state from 2014 through 2016, including 72 avoided exposures and 544 documented exposures, 7 of which resulted in temporary harm to patients.
- Most exposures did not result in allergic reactions, which may increase the risk of complacency by medical and nursing staff.
- The most common sources of exposure in this series were:
  - Bladder catheters (75.0%)
  - Surgical gloves (9.7%)
  - Penrose drains (3.5%)
  - Red rubber catheters (3.1%)
  - Intravascular balloon catheters, tourniquets, rubber bands, condom catheters, and others
- Examples in the PPSA report include:
  - Patient identified that their wrist band did not identify latex allergy
  - Patient medical record was missing latex allergy designation
  - Latex devices were in use for a patient with known latex allergy
  - Latex allergy was not communicated to all team members, in time outs, etc.

LATEX ALLERGY LOOP CLOSURE

Latex Allergy Loop Closure (1)

- Every medical institution and practice needs an oversight committee whose responsibility is to reduce or eliminate allergic reactions to latex by supporting “latex-safe environments.”
- Oversight committees may have different membership in different settings, but should include personnel with medical, surgical, anesthesia, allergy, and nursing expertise, since latex-free products may have functional disadvantages.
- The committee needs authority to make purchasing decisions that substitute equivalent non-latex products for latex products, so administrative leadership should also be represented.
- The buying process and the product choice process (on the patient care unit) can be engineered to eliminate unnecessary latex products and to encourage use of non-latex substitutes.

Latex Allergy Loop Closure (2)

- For a patient with known latex allergy, latex products that contact mucosa, skin, or tissue should not be used. Non-latex substitutes are almost always available, although historical practices may continue to favor latex products.
- Electronic health record enhancements are critical. The patient's medical record should automatically and prominently warn the user of the presence of latex allergy so that inadvertent exposures to latex are avoided
- Tracking errors and near misses is critical in order to confirm improvement is being made. These would include:
  - Exposures to latex with resultant allergic reactions
  - Exposures to latex without resultant allergic reactions
  - Near miss events where a latex product is nearly used for a latex allergic patient but is caught beforehand
  - Total number of latex products eliminated from use each year in the hospital

Latex Allergy Loop Closure (3)

- Finally, some patients state they have latex allergy but do not have this medical diagnosis, for various reasons.
- What should be done?
  - Consider carrying out the procedure in a “latex safe” environment where no latex products are used in the care of the patient
  - After the procedure is complete, consider having the patient reevaluated by an allergy/immunology specialist to confirm or refute the diagnosis.
  - Confirming a diagnosis of latex allergy is challenging, as there is no FDA-cleared skin test available in the US, and serologic assays have low sensitivity.
  - A thorough medical history is the most sensitive and specific diagnostic test.

TAKE HOME POINTS

Latex Allergy Take Home Points (1)

- Latex allergy is a persistent problem in healthcare resulting in untoward allergic reactions to proteins retained in latex finished products.
- Reduction in the prevalence of latex allergy and latex allergen content of finished products may have resulted in fewer allergic reactions to latex.
- However, this reduction of allergic reactions to latex and disease prevalence may lead to complacency and oversights in care of individual patients.
- A systematic review of the need for products that contain latex in every healthcare setting is warranted. If an equivalent or better substitute product is identified, the non-latex containing product should be eliminated from use.
- Electronic health record enhancement to encourage exclusive use of non-latex products in latex allergic patients could be engineered with potential improved results.

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