

Top Clinical Concerns Related to Surgical Gloves

William Halstead, M.D., the great surgical innovator, introduced sterilized surgical gloves in the late 19th century, saving countless lives over many generations. Gloving material and techniques have advanced considerably since then, especially in recent years as knowledge of how to maximize safety for patients and health professionals has advanced.

This article summarizes recent surgical glove innovations, relevant research and current best practices for surgical gloving. It further discusses trade-offs and concerns common in operating rooms transitioning from older gloving practices to newer, safer ones.

Best Practice Trend #1: Synthetic gloves

Reports of latex allergies attracted attention in the 1980s. The first fatal reaction was reported in 1991.¹ Johns Hopkins Hospital, where latex surgical gloves were first used, banned their use altogether in 2008.²

Allergic reactions to latex are triggered by proteins found in natural rubber latex and mediated by the IgE antibody. Touching latex or inhaling particles shed from gloves can cause a reaction. Sensitivity increases over time and with repeated use. This makes health care professionals vulnerable. An estimated 8 to 12 percent of health care workers are affected by latex sensitivity.³

The most common allergic reactions to latex are itchy skin, rashes (similar to poison ivy), sneezing and runny noses. In addition, several hundred people suffer life-threatening anaphylaxis every year due to latex.⁴ No treatment exists for an allergy to natural rubber latex; thus, latex avoidance is recommended.

The use of latex surgical gloves is on the decline, yet, in 2015, latex gloves still accounted for nearly half of surgical gloves sold in the United States.⁵ Historically, gloves made with natural rubber latex have been popular because of their comfortable fit and feel. The decline of latex gloves sales has been accelerated, in part, by technological improvements to make synthetic gloves more closely mimic the fit, feel and comfort of latex.

Synthetic surgical gloves are recommended by most health safety authorities, including the National Institute for Occupational Health and Safety (NIOSH), the Association of periOperative Registered Nurses (AORN) and the American Academy of Allergy, Asthma and Immunology (AAAAI).^{6,7}



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Most recently, in March 2016 the FDA announced a proposed ban on powdered medical gloves stating that, "...they pose an unreasonable and substantial risk of illness or injury to healthcare providers, patients and other individuals who are exposed to them, which cannot be corrected through new or updated labeling."⁹

Best Practice Trend #2: Powder-free gloves

The Food and Drug Administration's "Medical Glove Powder Report" in 1997 documented adverse health effects that can result from glove powder.⁸

Most recently, in March 2016 the FDA announced a proposed ban on powdered medical gloves. As stated on its website, the FDA determined that, "While the use of powdered gloves is decreasing, they pose an unreasonable and substantial risk of illness or injury to healthcare providers, patients and other individuals who are exposed to them, which cannot be corrected through new or updated labeling."⁹

Some of the potential risks associated with using powder include:

- Delaying wound healing and contributing to post-operative complications such as adhesions, infections and granulomas.¹⁰⁻¹²
- Potentially contributing to longer hospital stays and increased healthcare costs.¹³⁻¹⁹
- Compromising skin health and contributing to Irritant Contact Dermatitis (ICD), which causes dry, itchy and irritated skin.²⁰

While powdered surgical glove usage is declining as a result of the FDA proposal to ban powdered gloves, as of 2015 powdered gloves still accounted for 15 percent of U.S. surgical glove sales.⁵ A Cardinal Health survey of healthcare workers (surgeons, operating room managers and purchasing managers) found the most common reasons given by those using powdered gloves were that the gloves had worked well in the past and no serious adverse effects had been observed personally.²¹

Professional associations advocating the use of powder-free gloves include the American College of Surgeons (ACS), AORN, AAAAI and the American Nurses Association (ANA).^{22,23} In addition, the United Kingdom and Germany have banned powdered surgical gloves.²⁴

Wearing two surgical gloves significantly reduces infection risk to operating room personnel.²⁵

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when the outer glove is punctured.³⁰

Colored undergloves — that contrast with outer gloves — increased awareness of perforations to synthetic outer gloves from 12 percent to 56 percent and reduced time to awareness from 67 seconds to 42 seconds.³⁷

Best Practice Trend #3: Double-gloving

Wearing two surgical gloves significantly reduces infection risk to operating room personnel.²⁵ The second glove protects against bloodborne pathogens when the outer glove is punctured.²⁶

Operating rooms are the hospital environment with the greatest concentration of sharp objects. Perforation of surgical gloves is common.²⁷ By their final year of training, 99 percent of surgical residents at two Canadian teaching hospitals had suffered a needle-stick injury.²⁸ A separate study found glove perforations occurred in 44.5 percent of gastrointestinal surgeries, 34.7 percent of orthopedic surgeries and 31.1 percent of gynecological operations.²⁹ Up to 16 percent of injuries from sharp instruments occur in hand-to-hand transfers.³⁰ Hepatitis B, hepatitis C and HIV are common serious risks. Follow-up to percutaneous injury is expensive: about \$600 without prophylactic drug treatment and \$3,000 with it.²⁷

For relatively low cost, double-gloving helps provide a high level of protection. The interior glove reduces exposure to patient blood by as much as 87 percent when the outer glove is punctured.³⁰ Double-gloving is recommended for invasive surgeries by the Centers for Disease Control and Prevention (CDC)³¹ and the Occupational Safety and Health Administration (OSHA)³² as well as AORN³³ and ACS.³⁴

Surgeons report varying adjustment periods are needed to optimize protection, tactility and dexterity when starting to double glove.³⁵ To address tactile and comfort, specialized designs now differentiate undergloves and outer gloves. Undergloves are an average of 15 percent thinner than outer gloves. Synthetic gloves may include an inner coating to reduce slippage and contain a low-protein formula to make donning and removing gloves easier.

In addition, using differently-colored undergloves helps to improve occupational safety. Research shows that most punctures are tiny and identified only after surgery, not at the time of the incident.³⁶ Colored undergloves — that contrast with outer gloves — increased awareness of perforations to synthetic outer gloves from 12 percent to 56 percent and reduced time to awareness from 67 seconds to 42 seconds.³⁷

Healthcare workers often blame synthetic gloves for the reaction when other factors are the more likely cause of skin irritation.³⁹

Best Practice Trend #4: Allergy awareness

The shift from latex to synthetic has dramatically reduced allergic reactions to surgical gloves.³⁸ Medical providers still experience allergic reactions on hands and wrists, primarily from irritant contact dermatitis, a non-immunologic response to an irritant or skin damage. Healthcare workers often blame synthetic gloves for the reaction when other factors are the more likely cause of skin irritation.³⁹ Potential irritants include products related to medical practice (harsh anti-microbial soaps, surgical scrub brushes) and those outside the work environment (detergents, fragrances). Seasonal weather changes, frequent hand-washing and wearing jewelry contribute to susceptibility to non-immunologic dermatitis.⁴⁰

Allergic contact dermatitis (ACD), an immunologic response to a chemical, causes irritation in smaller number of cases. Although not life-threatening, ACD can be a problem for healthcare workers. Rashes, dryness and other symptoms can be acute or chronic and appear 48 hours after exposure to the irritant. The source of hypersensitivity can be elusive because more than 4,000 chemicals are known to have the potential to trigger allergic reactions.³⁹ Chemical accelerators, used to make synthetic and latex gloves stronger and more elastic, are an allergen that causes a Type IV (delayed) allergic reaction, albeit infrequently. In a Cleveland Clinic study, a patch test found 23 of 626 synthetic glove users with suspected ACD were found to react to an accelerant.³⁹ For this small group, switching to a glove not made with chemical accelerators may be beneficial.

Treatment for skin irritation must accurately respond to the cause, not a hunch. Focus first on common non-immunologic reactions, such as soaps and vulnerability from damaged skin. Approved moisturizers, rehydrating products and glove liners can help. The use of jewelry, fragrances, detergents and other products more common irritants than synthetic gloves.^{41,42} If ACD is suspected, the glove user should have a patch test done to isolate the cause of the immune response. Patch tests exist for all accelerants and are very reliable for diagnosing ACD. Switching to non-accelerant gloves should be done if it is determined that the accelerant causes an immune response. However, “glove shopping” — frequently switching gloves as a response to a dermatitis — is counterproductive because it does not allow time for adjusting to new gloves or provide an understanding of delayed allergic reactions. As in medicine generally, an accurate diagnosis is a prerequisite for the right cure.

Best Practice Summary

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- 1 Use synthetic gloves.**

Latex can cause potentially severe allergic reactions in health care workers and patients.
 - 2 Use powder-free gloves.**

Cornstarch and other high-protein powders can carry bacteria into wounds and cause other clinical problems.⁴
 - 3 Double-glove using colored undergloves that contrast with the outer glove.**

Using two surgical gloves dramatically reduces the risk of bloodborne infections to health care professionals.³⁶ Differently-colored undergloves help identify punctures to outer gloves.
 - 4 Determine the accurate cause of skin irritation and allergies.**

Focus on common non-immunologic reactions, such as soaps and vulnerability from damaged skin. If ACD is suspected, the glove user should have a patch test done to isolate the cause of the immune response.

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