

# Best Practice Trends for Surgical Gloving

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 healthcare 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

Synthetic surgical gloves are recommended by most health safety authorities, including the National Institute for Occupational Health and Safety (NIOSH)<sup>1</sup>, the Association of periOperative Registered Nurses (AORN)<sup>2</sup> and the American Academy of Allergy, Asthma and Immunology (AAAAI).<sup>3</sup>

Reports of latex allergies first attracted attention in the 1980s. The first fatal reaction was reported in 1991.<sup>4</sup> Johns Hopkins Hospital, where latex surgical gloves were first used, banned their use altogether in 2008.<sup>5</sup>

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.<sup>6</sup> This makes healthcare professionals vulnerable. In fact, up to 17 percent<sup>7</sup> of healthcare workers are affected by a latex sensitivity compared to just 1-6 percent<sup>8</sup> of the general population.

The most common allergic reactions to latex are itchy skin, rashes (similar to poison ivy), sneezing and runny noses. However, latex reactions can range in severity; several hundred people suffer life-threatening anaphylaxis every year due to latex.<sup>9</sup>

The use of latex surgical gloves is on the decline, yet, in 2016, latex gloves still accounted for over forty percent of surgical gloves sold in the United States.<sup>10</sup> 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.



Up to  
**17%**

of healthcare workers<sup>7</sup> are affected by a latex sensitivity compared to just **1-6%** of the general population.<sup>8</sup>

No treatment exists for an allergy to natural rubber latex, thus, latex avoidance is recommended.

The interior glove reduces exposure to patient blood by as much as

**87%**

when the outer glove is punctured.<sup>19</sup>

Contrasting-colored undergloves increase awareness of perforations to synthetic outer gloves from 12 percent to 56 percent and reduce time to awareness from 67 seconds to 42 seconds.<sup>22</sup>

## Best Practice Trend #2: Double-gloving

Double-gloving is recommended for invasive surgeries by the Centers for Disease Control and Prevention (CDC)<sup>11</sup> and the Occupational Safety and Health Administration (OSHA)<sup>12</sup> as well as AORN<sup>13</sup> and ACS.<sup>14</sup> In fact, wearing two surgical gloves significantly reduces infection risk to operating room personnel.<sup>15</sup> The second glove protects against bloodborne pathogens when the outer glove is punctured.<sup>16</sup>

Operating rooms are the hospital environment with the greatest concentration of sharp objects. By their final year of training, 99 percent of surgical residents across 17 medical centers reported having suffered a needle-stick injury.<sup>17</sup> 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.<sup>18</sup> Up to 16 percent of injuries from sharp instruments occur in hand-to-hand transfers.<sup>19</sup>

For a 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.<sup>19</sup>

Surgeons report varying adjustment periods are needed to optimize protection, tactility and dexterity when starting to double glove.<sup>20</sup> To address tactile and comfort, specialized designs now differentiate undergloves and outer gloves. Undergloves are an average of 14 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 colored undergloves that contrast with the other gloves helps to improve occupational safety. Research shows that most punctures are tiny and identified only after surgery, not at the time of the incident.<sup>21</sup> One study found that contrasting-colored undergloves 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.<sup>22</sup>

Wearing two surgical gloves significantly reduces infection risk to operating room personnel.<sup>15</sup>

## Best Practice Trend #3: Allergy awareness

Healthcare workers often blame synthetic gloves for the reaction when other factors are the more likely cause of skin irritation.<sup>24</sup>

The shift from latex to synthetic has dramatically reduced allergic reactions to surgical gloves.<sup>23</sup> 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.<sup>24</sup> 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.<sup>25</sup>

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 can appear up to 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.<sup>24</sup> 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.<sup>24</sup> 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. In actuality, jewelry, tfragrances, detergents and other products are more common irritants than synthetic gloves.<sup>26,27</sup> 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

---

- 
- 1 Use synthetic gloves.**

Latex can cause potentially severe allergic reactions in healthcare workers and patients.
  - 2 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.<sup>22</sup> Contrasting-colored undergloves help identify punctures to outer gloves.
  - 3 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.

- 1 <http://www.cdc.gov/niosh/updates/latexpr.html>
- 2 AORN 2015 Guidelines for Perioperative Practice: Guidelines For A Safe Environment Of Care, Part 1. Recommendation VIII.a. Pg 251.
- 3 American College of Allergy, Asthma and Immunology; American Academy of Allergy, Asthma and Immunology: "AAAAI and ACAAI joint statement concerning the use of powdered and non-powdered natural rubber latex gloves," *Annals of Allergy, Asthma, and Immunology* Vol. 79, Issue 6, Page 487 (December 1997).
- 4 Ownby, Dennis R. A history of latex allergy. *J Allergy Clin Immunol* 2002, 110(2):S27 -S32.
- 5 Rubber Gloves: 'Born' - and now banished - at Johns Hopkins. [http://www.hopkinsmedicine.org/news/media/releases/rubber\\_gloves\\_born\\_\\_\\_and\\_now\\_banished\\_\\_\\_at\\_johns\\_hopkins](http://www.hopkinsmedicine.org/news/media/releases/rubber_gloves_born___and_now_banished___at_johns_hopkins)
- 6 Henderson, Philippe; "Cost/benefit analysis of synthetic surgical gloves in operating rooms." September 1, 2015.
- 7 Katz J, Holzman R, Brown R, et al. Natural rubber latex allergy: consideration for anesthesiologists. Park Ridge, IL: American Society of Anesthesiologists, 2005: 1 -30
- 8 Centers for Disease Control and Prevention. <http://www.cdc.gov/healthcommunication/toolstemplates/entertainmented/tips/latexallergy.html>
- 9 <http://www.aaaai.org/conditions-and-treatments/allergies/latex-allergy.aspx>
- 10 GHX, Q4 2016
- 11 Centers for Disease Control and Prevention. Guideline for prevention of surgical site infection, 1999. *Infection Control and Hospital Epidemiology*, April 1999, 20(4):247-278. <http://www.cdc.gov/hicpac/pdf/ssguidelines.pdf>
- 12 Bloodborne pathogens standard. 29 CFR 1910.1030. US Department of Labor – Occupational Safety and Health Administration. [https://osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=PREAMBLES&p\\_id=801](https://osha.gov/pls/oshaweb/owadisp.show_document?p_table=PREAMBLES&p_id=801)
- 13 AORN Guideline for Sterile Technique from 2015 Guidelines for Perioperative Practice.
- 14 "Statement on Sharps Safety." American College of Surgeons. October 2007. <https://www.facs.org/about-ac/s/statements/58-sharps-safety>
- 15 Tanner, J., Parkinson, H., Double gloving to reduce surgical cross-infection, *Cochrane Database Syst Rev*. July 2006
- 16 Arowolo, O., et al., Safety of the surgeon: Double-gloving during surgical procedures, *S Afr J HIV Med* 2014;15(4):144-147. DOI:10.7196/SAJHIVMED.1050
- 17 Makary MA, Al-Attar A, Holzmueller CG, et al. Needlestick injuries among surgeons in training. *N Engl J Med*. 2007;356:2693 -9. <http://www.nejm.org/doi/full/10.1056/NEJMoa070378#t=articleTop>
- 18 Arntzen, Hagen. The risk of perforations in gloves, *Journal of the Norwegian Medical Association*, March 2007; 127: 856-858.
- 19 Berguer R, Heller PJ. Preventing sharps injuries in the operating room. *Journal of the American College of Surgeons*. 2004;199(3):462-467.
- 20 Patterson JM, Novak CB, Mackinnon SE, Patterson GA. Surgeons' concern and practices of protection against blood borne pathogens. *Annals of Surgery* 1998;228:266-272. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1191469/>
- 21 Thomas-Copeland, Do Surgical Personnel Really Need to Double-Glove? *AORN Journal*, FEBRUARY 2009, VOL 89, NO 2; page 327. <http://isgweb.aorn.org/ISGWeb/downloads/CEA09095-9757.pdf>
- 22 Florman S, Burgdorf M, Finigan K, Slakey D, Hewitt R, Nichols RL. Efficacy of double gloving with an intrinsic indicator system. *Surg Infect (Larchmt)*. 2005;6(4):385-395.
- 23 Nitrile and Other Non-Latex Glove Allergies. (2014) <http://gloveuniversity.com/allergies/nitrile-non-latex-glove-allergies/>
- 24 Cao, L., Taylor, J., Sood, A., Murray, D., & Siegel, P. (2010) Allergic Contact Dermatitis to Synthetic Rubber Gloves. <http://archderm.jamanetwork.com/article.aspx?articleid=421910>
- 25 Gardner, N. (2008, May) If my hands could speak. [http://www.shieldscientific.com/include/USER\\_FileUpload/files/Press%20Release/H5ME-ifhandscouldspeak-middleeast-may2008%20article%20\(2\).pdf](http://www.shieldscientific.com/include/USER_FileUpload/files/Press%20Release/H5ME-ifhandscouldspeak-middleeast-may2008%20article%20(2).pdf)
- 26 Jurado-Palomo, J., Moreno-Ancillo, A., Bobolea, I., Bravo, C., & González, I. (2011) Epidemiology of Contact Dermatitis. <http://cdn.intechopen.com/pdfs-wm/25241.pdf>
- 27 Taylor, J., Amado, A. (2010) Contact Dermatitis and Related Conditions. <http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/dermatology/contact-dermatitis-and-related-conditions/>

