FACULTY OF MEDICINE SIRIRAJ HOSPITAL

SiCRS Siriraj Colorectal Surgery

Double Gloving

Protect Your Patients, Protect Yourself

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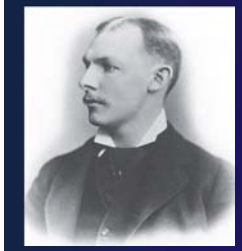
OUTLINE

- History of surgical gloves
- **Powder-free** gloves
- **Double gloving:** Protect your patients
  Protect yourself
- Changing Glove & **SSI Prevention**

History of Surgical Glove



William Halsted
Chief of Surgery
John Hopkins Hospital

Caroline Hampton
OR nurse 1888

Hand dermatitis
form Mercuric Chloride

First Surgical Rubber Glove

1889

June 1890
Caroline Hampton Halsted

Proc (Bayl Univ Med Cent) 2010;23(4):389-92

Evolution of Modern Surgical Glove

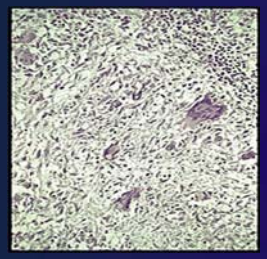
- Early 1900s, all surgeons & OR nurses were wearing sterile rubber gloves
- In 1964, "1st disposable latex medical gloves" were manufactured by Ansell Rubber Company
- Gloves sterilized by gamma irradiation
- Non-latex materials (e.g. polyvinyl chloride and neoprene) are now widely available

https://www.pastmedicalhistory.co.uk/the-history-of-surgical-gloves/

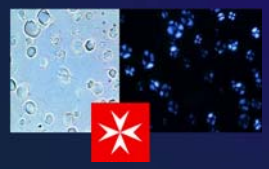
FDA

18 Jan 2017

Starch (corn) Granuloma



- Spherical – hexagonal
- Very pale in H&E (maybe small central dark spot)
- Better seen in Periodic Acid Schiff (PAS)



- Polarized light: "Maltese cross" birefringence

http://www.ihcworld.com/royellis/artefacts/ans4.htm

MORE Powder → MORE Adhesion

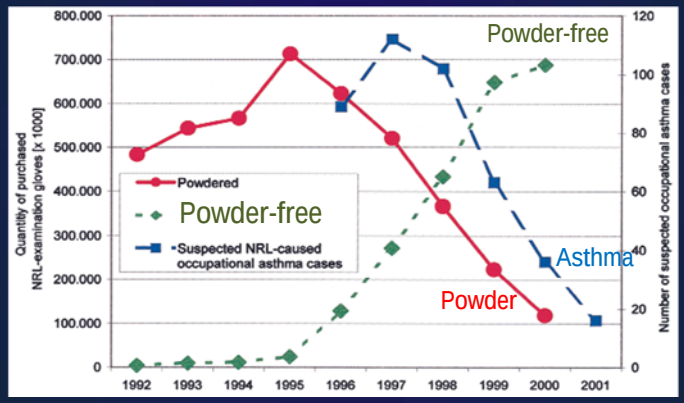
Types of adhesions	Powdered gloves, No. (%)	Powder-free gloves, No. (%)
1 Absent	0 (0)	14 (46.7)[a]
2 Thin and easily separable	8 (26.7)	4 (13.3)
3 Fibrotic requiring sharp dissection	8 (26.7)	8 (26.7)
4 **Extensive & dense**	14 (46.7)	4 (13.3)
Total	30 (100)	30 (100)

P=0.013

Rat Laparotomy + 5 abrasions of 3 cm @ cecum and abd wall
Next 14 days blind grading

Aghaee et al. Iranian Red Crescent Med J 2013;15(5):442-3.

Powder-free Glove *reduced* NRL-related Asthma



Germany

Allmers et al. J Allergy Clin Immunol 2002;110:318-23

GAMMEX®

INNOVATIVE SURGICAL GLOVES

A.R.T™ Pinhole Barrier Technology

DERMASHIELD™ Donning Aid Technology

GAMMEX® POWDER-FREE WITH AMT™

PRODUCT DESCRIPTION

Material	Natural Rubber Latex
Colour	Cream
Shape	Anatomic
Cuff	Straight cuff with adhesive band
External Surface	Micro-Textured, Chlorinated
Internal Surface	Polymer coated (Polyurethane), Chlorhexidine gluconate based antimicrobial coating

Double Gloving

Protect Yourself. Protect Your Patients.

Needle Stick Injuries (1)

- 64% of HCW experienced NSI
- 73% of these HCM had >1 NSI
- Working in surgery: ↑ risk by 1.6 times
- HCV: most commonly transmitted via NSI

Afridi et al. Blob J Health Sci 2013;4:85-92
Hosseinipalangi et al. East Mediterr Health j 2022;28:233-41

Needle Stick Injuries (2)

- WHO: Resident at risk: 7 NSI during training (rush, inexperience, fatigue)
- WHEN it happen in OR
  - 60% during muscle & fascia closure
  - evening /night shift
  - work more than 12 hours

Waljee et al. Plast Reconstr Surg 2013;131:784-91

Blood Borne Pathogen

	Seroconversion	Post-Exposure Prophylaxis
HBV	30%	Full HBV vaccine → Booster dose Otherwise HBIG + HBV vaccine within D1
HCV	10%	Check anti-HCV antibody, HCV-RNA on D0, 6wk, 3 mo, 6 mo; Interferon 24-48 wks if seroconversion
HIV	0.3%	2 antiretroviral drug within hours

HCV from HCW to patient (Esteban et al. NEJM 1996;334:555-60)

Syphilis, malaria, herpes, …

Cost for work-up 376 USD (14,000 baht)

Cost for Rx if HIV-NSI 2456 USD (90,000 baht)

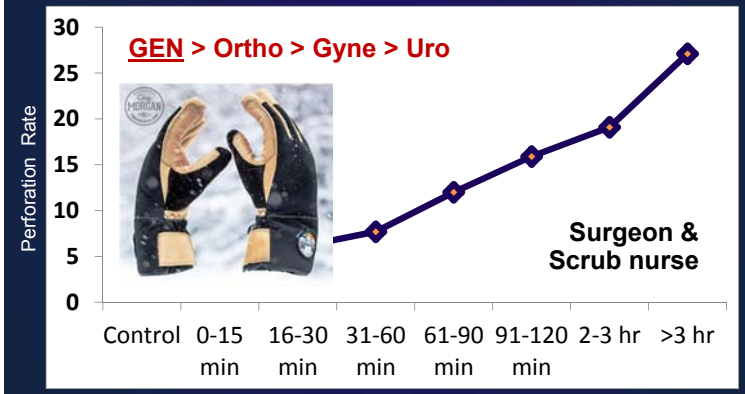
Waljee et al. Plast Reconstr Surg 2013;131:784-91

Strategies to Reduce NSI

- Education
- Sharp alternatives: blunt tip needle, staples, electrocautery, advanced energy devices
- Safety devices: retractable needle / scalpel
- Neutral zone
- Double gloving

Berguer. AORN J 2011;94:91-6

OR time & **Glove Perforation**

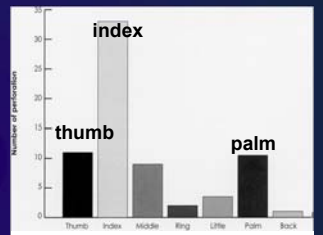


Air-leak test, UK

Fell et al. Ann Royal Coll Surg Engl 1989;71:7-10

Double Gloving (Ortho 1)

- 596 gloves/ 71 ortho sx
- Glove perforation **12%** (1 in 8 exposed blood)
- **Double glove *reduced* exposure …**
  - Surgeon 54% → 10%
  - 1st assist 27% → 3%
  - 2nd assist 7% → 0



Perforation site

More perforation in **NON-dominant hand**

Fluid infusion, Nigeria

Thanni & Yinusa. J Natl Med Assoc 2003;95:118-8

Double Gloving (Ortho 2)

- 792 gloves/ 100 ortho sx
- Glove perforation **8.7%**
  - Single glove 9.6%
  - Double glove 0.8%
- Surgeon = Scrub nurse >> (x2) >> assistant

Risk for Glove Perforation

Duration >3 h ($p<0.01$)
Spine operation ($p<0.01$)
Bony procedures ($p<0.001$)
Major instrumentation ($p<0.001$)

Fluid infusion, HK

Yinusa et al. International Orthopaedics 2004;28:36-9

Double Gloving (Gen Sx)

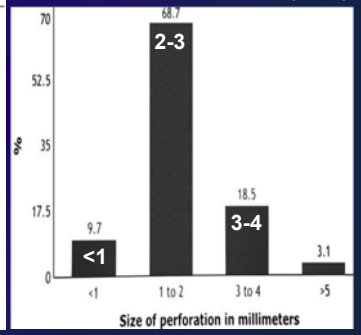
- 1536 gloves (Latex) / Air insufflate + Water Leak
- Glove perforation **15.2%** (unused 0.8%)
  - Elective = Emergency
  - Resident 30.8%
  - Gen Sx 17.4%
- Inner glove perforation **1.2%**
- **Double gloving = Protective benefit of 98.8%**

Nigeria

Makama et al. Surg Infect (Larchmt) 2016;17:436-42

Item	Total number of gloves used	Frequency of perforation	Rate
Type of surgery			
Emergency	412	64	15.5
Elective	1,124	161	14.3
Time of surgery			
Morning (8am–12pm)	398	41	10.3
Afternoon (12pm–4pm)	401	50	12.5
Evening (4pm–8pm)	454	64	14.1
Night (8pm–8am)	283	70	24.7
Status of primary surgeon			
Consultant	522	50	9.6
Senior registrar	721	97	13.5
Registrar	201	62	30.8
Senior house officer	92	15	17.3

Size of Perforation (mm)



Makama et al. Surg Infect (Larchmt) 2016;17:436-42

Glove Perforation in MIS

1.1% - 3.3%

Matsuoka et al. Surg Endoc 2022;36:3489-94 (CRS, Japan)
Laine et al. Scand J Surg;2004:9373-6 (LC, Finland)

Double Gloving

- SA+MA of 7 RCTs (7090 gloves)
- Compare to single glove, double gloves …
  - ↓ glove perforation
  - ↓ blood contamination to HCW skin
    - OR 0.05 (95%CI 0.03-0.07)

Zhang et al. J Adv Nurs 2021;21:3630-43

Double Gloving
Help Detecting Intraoperative Glove perforation

- 2462 gloves/ 885 operations / Water Leak
- Glove perforation **7.8%**
- Detection of perforation during operation
  - – 36.8% with single glove
  - – 86.5% with double glove

Finland

Laine & Aarnio. Am J Surg 2001;181:564-6

Indicator Glove System
Help Detecting Intraoperative Glove perforation

Single (White)	Double (White)	Double (Green - White)
23%	36%	90%

Finland

Laine & Aarnio. J Bone Joint Surg [Br] 2004:898-900.

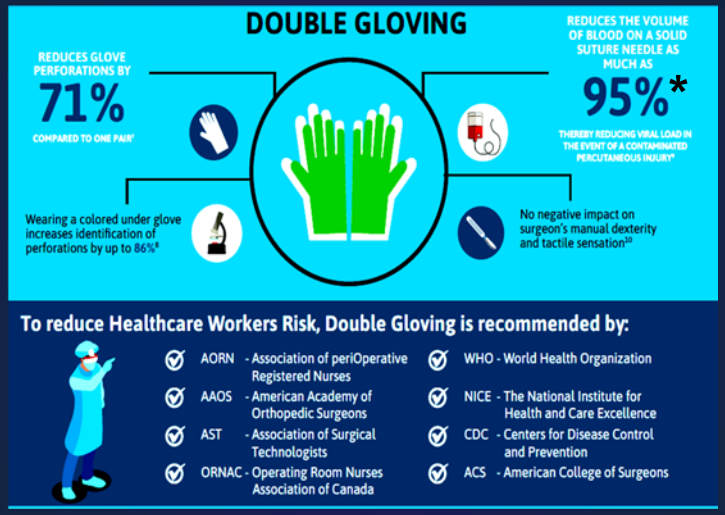
Color-coded Indicator Glove System

Copyright of Images: Varut Lohsiriwat *From 21% to 77%. Tanner & Parkison. J Perioper Pract 2007;17:216-8

Double Gloving (for HCW)

- Effectively (self-)protect HCW against blood borne pathogenic infection during surgery
- **NO** loss of tactile sensitivity, 2-point discrimination, or loss of dexterity (including microsurgery)

Twomey. Jt Comm J Qual Saf 2003;29:369-78
Hardison et al. Otolarygol Head Neck Surg 2017;157:419-23



7. Mischke et al. Cochrane Database Syst Rev 2014;CD009573 8. Laine & Aarnio. Am J Surg 2001;181:564-6
9. Bennet & Howard. J Am Coll Surg 1994;178:107-10 10. Fry et al. J Am Coll Surg 2010;210:325-30

Changing Gloves (Protect Your Patients)

- 15% fingertip bacterial contamination during draping
  - trainee >> staff
  - dominant >> non-dominant
  - coagulase negative staphylococci (1-5 colonies)
- Tumor cells on glove**
  - Scrub glove 30%, Gauze 19%, Instrument 14%, Surgeon glove 10%
  - Wound recurrence after CRC Sx 0.6-1.1%
- Glove perforation: 4.2x SSI if no ATB, 1.3x SSI if ATB
- Glove change while maintain sterile technique

**Yu et al. OncoTargets and Therapy 2014;7:1869-73(CA stomach), Makki et al. Ann R Coll Engl 2014;96:434-6
Reilly et al. DCR 1996;39:200-7, Misteli et al. Arch Surg 2009;144:553-8, Vukasin et al. DCR 1996;39:S20-3

Clinical Practice Guideline

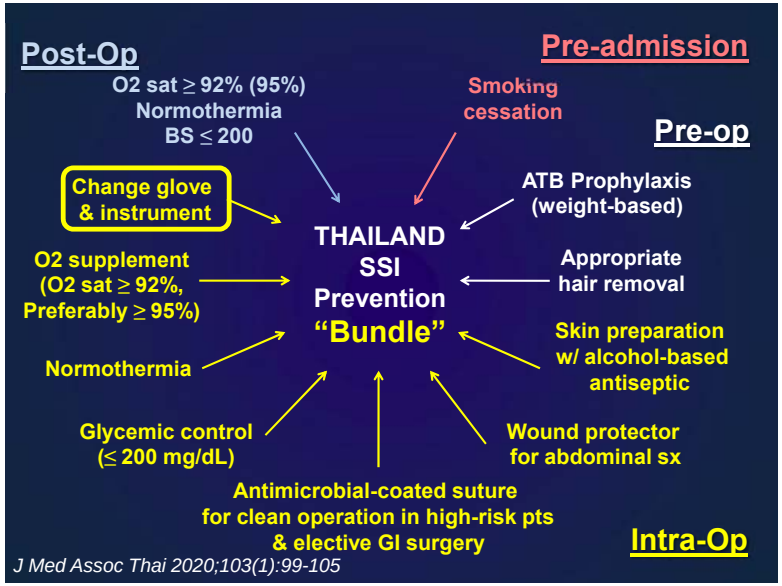
Guidelines for the Prevention of Surgical Site Infection: The Surgical Infection Society of Thailand Recommendations (Executive Summary)

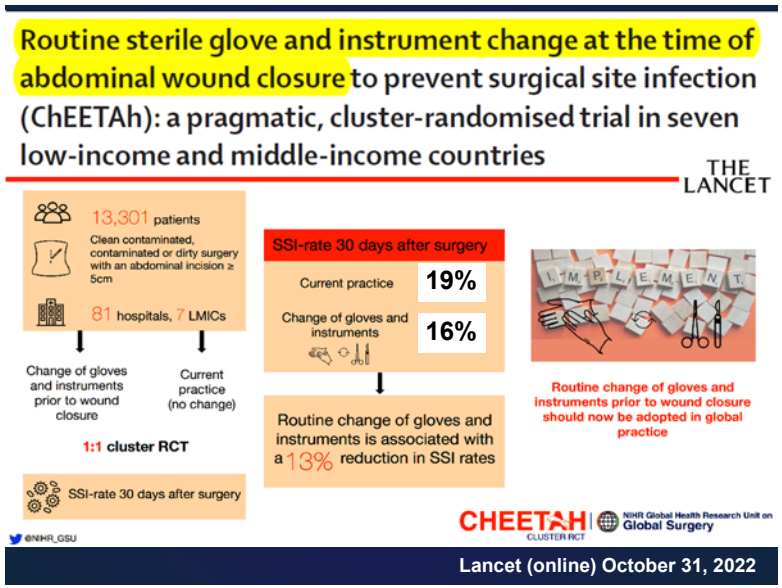
Lohsiriwat V, MD, PhD[1], Chinswangwatanakul V, MD, PhD[1], Lohsiriwat D, MD[1], Rongrungruang Y, MD[2], Malathum K, MD[3], Ratanachai P, MD[4], Butsripoom B, MS, PhD[5], Asdornwised U, MS, PhD[6], Boontham P, MD, on behalf of the Surgical Infection Society of Thailand

Double gloving with powder-free gloves

Changing contaminated gloves & instruments before wound closure especially in CRS

J Med Assoc Thai 2020;103(1):99-105





Good Practices in Surgical Gloving

- NON-powdered glove
- Double gloving (standard or color-coded)
- Inspection after donning
- Change if
  - Defect / Perforation seen (or suspected)
  - Contaminated to clean field
  - After removal of cancer
  - Before wound closure (*except* clean wound)