The use & misuse of gloves
Practice, perception, and policy

Professor Jennie Wilson
Richard Well Research Centre
University of West London, UK

Background

• Hands recognised as major vehicle for transmission of infection in healthcare settings
• Hand hygiene interrupts transmission
• Non-sterile gloves required to protect vs BBV and reducing risk of transmission of pathogens from BBF
• Risk assessment for likely exposure to BBF should inform choice to use gloves
Purpose of clinical gloves
- to prevent exposure to blood & body fluids

Must be changed:
- between patients
- between procedures

Decontaminate hands after removal because risk of
- contamination from gloves to hands
- Tears/punctures

Exploring the patterns & determinants of glove use behaviour

1. Audited use of gloves in acute care
   - Investigate relationship between 5 moments of hand hygiene and glove use in 2 acute hospitals
2. Interviewed staff to determine drivers of glove-use behaviour
3. Surveyed public opinion
4. Surveyed students nurses
Record sequence of items touched

- Followed an episode of care
- Record every item touched – when gloves on/off & HH
- Analyse sequence to determine if risk of cross contamination occurred

### 3. Sequence of Items/objects touched in this episode of care with points of hand hygiene/glove use

Use to categorise the risk of cross-contamination in one or more of “My 5 moments of hand hygiene” at end of the observation

<table>
<thead>
<tr>
<th>Item</th>
<th>HH</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

Defining risk of cross contamination linked to 5 moments

<table>
<thead>
<tr>
<th>Moment for hand hygiene</th>
<th>Risk of cross contamination</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A patient touched by a contaminated glove/hand</td>
<td>Gloves/hands contaminated if they had contact with any part of the environment outside the patient’s zone before direct contact with the patient’s intact skin. If the HCW touches their own clothing, skin or hair, this is not considered part of the ‘patient zone’</td>
</tr>
<tr>
<td>2</td>
<td>A contaminated glove/hand touched a susceptible site e.g. wound, IV access site, phlebotomy</td>
<td>Gloves/hands contaminated if they had touched any other non-sterile objects or patient sites before the aseptic task e.g. patient skin, bed linen.</td>
</tr>
<tr>
<td>3</td>
<td>A glove/hand touched a surface or patient after contact with BBF</td>
<td>Gloves/hands contaminated if used for handling urine or assisting a patient with toileting then touched other surfaces or patient.</td>
</tr>
<tr>
<td>4</td>
<td>Gloves used for contact within patient zone not removed or hand hygiene not performed before contact with an object outside patient zone</td>
<td>Gloves/hands contaminated if touched another patient/objects outside patient zone; hand hygiene not performed after glove removal; or one glove/outer glove (where double gloves used) removed part way through procedure.</td>
</tr>
<tr>
<td>5</td>
<td>Failure to remove gloves and/or perform hand hygiene after contact with patient surroundings</td>
<td>Gloves not removed or adequate hand hygiene not performed on leaving the healthcare zone.</td>
</tr>
</tbody>
</table>
Key findings

• Gloves used **inappropriately on 57%** of occasions
  - for procedures where no risk of blood/body fluid exposure

• Risk of **cross contamination occurred in 49%** episodes of care where gloves used

• Hands not washed after **41%** of glove removals

• Similar practice among all types of staff
  - nurses, students, HCAs, doctors

• Similar practice observed in 2 acute hospitals
  - total of 178 episodes of care and 278 procedures

---

Widespread use of gloves for low risk procedures

<table>
<thead>
<tr>
<th>Task</th>
<th>% of all procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilisation</td>
<td>13</td>
</tr>
<tr>
<td>Bed making</td>
<td>13</td>
</tr>
<tr>
<td>Cleaning</td>
<td>13</td>
</tr>
<tr>
<td>IV device manipulation</td>
<td>10</td>
</tr>
<tr>
<td>Handling equipment</td>
<td>7</td>
</tr>
<tr>
<td>Toileting</td>
<td>7</td>
</tr>
<tr>
<td>Personal hygiene</td>
<td>7</td>
</tr>
<tr>
<td>Attention to patient</td>
<td>6</td>
</tr>
<tr>
<td>Examination of patient</td>
<td>6</td>
</tr>
<tr>
<td>No particular task</td>
<td>5</td>
</tr>
</tbody>
</table>

*N = 278*
Moments of HH associated with cross contamination

- n = 178 episodes using gloves
- Moment 1: 21%
- Moment 2: 12%
- Moment 3: 30%
- Moment 4: 10%
- Moment 5: 15%

More than one moment of HH breached in each episode

- 1 moment breached: 35 episodes
- 2 moments breached: 49 episodes
- 3 moments breached: 10 episodes
- 4 moments breached: 2 episodes
- 5 moments breached: 0 episodes
Moment 1…

...occurs between the last hand-surface contact in the healthcare area and first in patient zone (and, depending on what is touched in the patient zone, before touching the patient (WHO 2009)

Example of how gloves are used

**Same gloves: more than one task**
- Emptied catheter bag
- Gave patient mouth care
- Checked patients blood sugar

**Same gloves: more than 1 patient**
- Patient 1 (bed, then chart)
- Patient 2 (chart)
- Patient 1 (chart, then patient)
- Patient 1 (IV pump)

**Potential contamination of susceptible site**
1. Equipment trolley
2. Central line flush
3. IV monitor
4. Central line
5. IV infusion lines
6. Central line flush
7. IV pump
8. IV lines discarded into waste bin
9. Bed controls
10. IV pump
Drivers of glove use
Modeled from interviews with staff

Psychological barrier
Fear
Disgust
‘Ease of mind’

Looking out for self
Role modeling
Peer pressure
Training
Instinctive

Policy
Availability
Time-saving

Staff opinion
Patient feeling
Patient expectations

SOCIALISATION
Professional

SOCIALISATION
Organisational

SOCIALISATION
Empathetic

Emotion

Perception of risk
“I am going to touch a patient and need to protect myself”

Fear
“I find that when I’ve got gloves the gloves on I’m less OCD about needing to wash my hands”

Disgust
“Some older men or women don’t always get to… you know… can’t always wash their own clothes and things. They cannot always be as clean as they might have been when they were younger”

Psychological barrier
“arround their like private areas, I wear gloves just to protect myself and just for them it’s a bit nicer as well”

Fear
[Gloves] "make me feel safer, more relaxed, more comfortable, more confident"
Socialisation

Role modelling/training
You get told on the ward and when you're doing your training when and where to wear the gloves......it's just something you do rather than something you overly think about

Policy awareness?
“Obviously you’d wear them for washing, dressing and for taking patients to the toilet”

“I mean I am not sure why some of them use gloves to wash patients and others don’t”

Socialisation

Give impression of hygiene
“people I think like to see that you present yourself nice because they don’t know if we’ve washed our hands”

Empathy
“you don’t get to touch the patient, there’s that barrier ....”

Availability
“It takes what, 5 seconds to pull a pair of gloves from a dispenser and put them on”

Misconceptions
“I’m allergic to penicillin so I can not get any penicillin on me at all”

“even if you wash your hands you can’t guarantee that they are totally clean”
Obviously the idea is to protect yourself and the patient from infection, so I suppose you could say that you should wear them all the time, which all of us do to be honest.

You don’t know what patients have got infections, if you haven’t got [that] information then you need to treat everybody the same, so you’re protecting yourself and you’re protecting the public.

They combine the principles of Standard Precautions and Contact Isolation?

Challenging glove use is difficult….

“Well sometimes I’ve just mentioned that actually you don’t really need your gloves on and a couple of them have said ‘oh but I prefer to’ and I’m not going to say well take them off because that’s not really my place.”

Looking out for self
“it’s a personal decision as to whether you feel you want to wear gloves for...because you don’t want to touch that skin, that’s a completely personal point of view.”

Looking out for the patient
“Because the patient is awake, you don’t want to create a scene”
Survey of students nurses attitudes to use of non-sterile clinical gloves (NSCG)

Questionnaire survey

1. Tasks (46) would you routinely wear NSCG for?
2. Who influences decision to wear gloves (8 options)

Administered to cohort of 3rd Year students nurses

- Attending a university-based practical class (n = 67)
- Only had usual clinical training on use of NSCG

Summary of key tasks for which student nurses would routinely wear NSCG

![Bar chart showing percentages of students nurses who would routinely wear NSCG for different tasks.](chart.png)

<table>
<thead>
<tr>
<th>Task</th>
<th>Percentage</th>
<th>N = 67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removing an incontinence pad</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Dressing a wound</td>
<td>99%</td>
<td></td>
</tr>
<tr>
<td>Changing an IV cannula</td>
<td>99%</td>
<td></td>
</tr>
<tr>
<td>Emptying a baby's nappy</td>
<td>97%</td>
<td></td>
</tr>
<tr>
<td>Changing a patient's nappy</td>
<td>97%</td>
<td></td>
</tr>
<tr>
<td>Washing a patient's nappy</td>
<td>96%</td>
<td></td>
</tr>
<tr>
<td>Attaching/detaching IV line</td>
<td>82%</td>
<td></td>
</tr>
<tr>
<td>Giving IM/SC injection</td>
<td>79%</td>
<td></td>
</tr>
<tr>
<td>Cleaning/turning patient bed area</td>
<td>76%</td>
<td></td>
</tr>
<tr>
<td>Assisting patient from bed to chair</td>
<td>67%</td>
<td></td>
</tr>
<tr>
<td>Helping patient using walking frame</td>
<td>66%</td>
<td></td>
</tr>
<tr>
<td>Feeding a patient</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>Taking blood pressure</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>Taking a blood pressure</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Assisting patient bath</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Assisting patient bed</td>
<td>5%</td>
<td></td>
</tr>
</tbody>
</table>
## Indications for wearing gloves

<table>
<thead>
<tr>
<th>Gloves indicated</th>
<th>Gloves not indicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touching body fluids</td>
<td>Taking patient observations</td>
</tr>
<tr>
<td>Contact with mucous membranes</td>
<td>Handling used linen (unless soiled)</td>
</tr>
<tr>
<td>Insertion/removal invasive device</td>
<td>Injections</td>
</tr>
<tr>
<td>Contact with non-intact skin</td>
<td>Administration/preparation IV drugs</td>
</tr>
<tr>
<td>Vaginal examination</td>
<td>Manipulating IV lines</td>
</tr>
<tr>
<td>Tracheal suctioning</td>
<td>Bathing/dressing patient</td>
</tr>
<tr>
<td>Handling hazardous chemicals</td>
<td>Feeding patient</td>
</tr>
<tr>
<td>Taking blood</td>
<td>Mobilisation/Physiotherapy</td>
</tr>
</tbody>
</table>

## Influences on the decision of student nurses to wear non-sterile clinical gloves

![Chart showing percentages of respondents for various influences on decision to wear gloves.](chart.png)

n=67
The public perspective

Survey monkey questionnaire

- Sent out to HCAI Service Users Research forum
- Snowball sample via facebook

Responses:
1) Views how they feel about HCW glove use (n= 142)
2) Experience of HCW glove use (hospital in last 6 months) (n = 80)

Public opinion of when HCW should use gloves (n = 142)
Patients perception of glove-use by HCW

- 29% (23/80) of patients recently in hospital reported seeing inappropriate use of gloves by HCW
  - Bed making (8)
  - Writing notes/on phone (5)

- 27% (38/142) commented on glove use (63% negative)
  - over-used
  - not changed
  - used to protect HCW not patient
  - in place of hand hygiene

'**they were wearing gloves for the whole of my consultation, they didn’t wash their hands yet touched a large number of items in the room including a keyboard and phone’**

Challenging HCW practice is not easy…..

- 20% (29/142) had challenged a HCW about use of gloves

I asked the Dr to change his gloves after he answered the phone, adjusted my table, collected bottles and opened doors before taking my blood. He told me they were for his benefit not mine. I politely and firmly insisted he change them, which he did but rather dramatically!
In summary……..

• Emotion & socialization are key drivers of glove use
  – Gloves used to **protect the wearer** from things perceived to be ‘dirty’

• Messages about using gloves confused
  – Not always based on sound infection control
  – Risk assessment is ill-defined and staff lack competence

• Gap between policy & practice
  – Standard Precautions & Contact Precautions conflated
    • Treat all patients the same - ‘wear gloves with every patient’
  – Hand hygiene perceived to be ineffective
  – Gloves used in place of alcohol hand gel

  **Does inappropriate glove use matter?**

---

**Relationship to hand hygiene behaviour…..**

**Inherent ‘community’ hand washing**
- Patterns established early in life
- Driven by emotional concepts of ‘dirtyness’ and ‘cleanlines’
- Attitudes developed in ‘community’ translated to healthcare setting

**Elective hand washing**
- Indications for hand hygiene that are not covered by the inherent drivers e.g. touching patient, environment
- These need to be learnt……. (Whitby et al 2006)

**Gloves…..**
  - Emotional drivers trigger gloves use
  - **BUT** motivation for hand hygiene (or glove removal) reduced when gloves worn
Gloves become contaminated with pathogens

Gloves become contaminated with pathogens

Misuse of gloves: the foundation for poor compliance with hand hygiene and potential for microbial transmission?

*Infectieux, Centre lavoisien, Hospital Saint-Antoine, Assistance publique-Hôpitaux de Paris, France.
**Infectieux, Centre lavoisien, Hospital Saint-Antoine, Assistance publique-Hôpitaux de Paris, France.

Observed 120 HCW
64% gloves not changed, after contact
18.3% of contacts had potential for microbial transmission (before aseptic procedures)
22 gloves sampled (100% grew bacteria and 86% grew pathogens; 59% same m’org as patient

Hands involved in transfer of pathogens....

Outbreak of invasive group A streptococcus infection: contaminated patient curtains and cross-infection on an ear, nose and throat ward
N. Harnois, A. Bens*, D. Trigg, N. Vaughan†, T. Bowell††
*Department of Clinical Microbiology, University Hospital, Liverpool, UK.
††Department of Clinical Microbiology, University Hospital, Liverpool, UK.

2 patients with Gp A Strep bacteraemia (+1 colonised patient; 1 HCW)
33% (10 of 34) curtains contaminated with GAS………?

Does inappropriate glove use matter?

• Hands easily contaminated when gloves removed
  (as demonstrated by studies related to Ebola)
  – BUT hand hygiene less likely after gloves use (Fuller et al 2011)

• Costs
  – 1 large acute Trust spends £1million/annum on clean gloves!

• Environment
  – disposal as clinical waste (incineration)
How can practice be changed?

- Identify problems with current practice
- Clearly define & communicate policy
  - Focus on the IC principles not emotional factors
  - Vague references to ‘risk assessment’ not helpful
  - Tackle perverse perceptions of risk & ‘infection control folklore’
  - May require dialogue and reaching a consensus
  - Discuss and agree what is acceptable
  - Be consistent

Hierarchy of intervention effectiveness!

- Policy alone is inadequate
- Education least effective method of supporting interventions
- Socio-environmental factors

Cafazzo Healthcare Qtly 2012
Human Factors is a scientific discipline……

“Enhancing clinical performance through an understanding of the effects of teamwork, tasks, equipment, workspace, culture, organisation on human behaviour and abilities, and application of that knowledge in clinical settings.”

Clinical Human Factors Group

Creating socio-technical work environments

• Minimise the possibility for human error and potential impact of error
• Design systems that elicit desired behaviour
• Design systems that reduce error
• Avoid systems that rely on forcing behaviour change
Using a Human Factors Framework to change glove use
Wilson et al AJIC, 2017

Great Ormond Street Hospital
A programme to cut inappropriate use of non-sterile medical gloves

Key points
- Gloves worn by healthcare workers to protect themselves do not have to be sterile.
- Gloves for self-protection are only needed if exposure to blood or body fluids is likely.
- Overuse of gloves costs more money, creates extra waste and increases the incidence of health problems among staff.

Glove crackdown saves trust £90k and reduces waste

Authors Helen Dunn is lead nurse infection control, Nicole Wilson and Amy Leonard are lead practice educators, all at Great Ormond Street Hospital for Children NHS Foundation Trust.

Abstract Healthcare workers should only use non-sterile gloves for self-protection when exposure to blood or body fluids is likely. Overuse of gloves - even face masks and gloves - can have negative repercussions, including higher expenditure and waste, more skin problems and missed opportunities to decontaminate hands. At Great Ormond Street Hospital, infection control audits had shown that clinical staff were not always using non-sterile gloves appropriately or complying with hand hygiene requirements. In April 2016, an educational awareness programme was launched to help staff assess the use of gloves for self-protection. Created by practice educators and infection prevention and control nurses, with input from all those affected by the changes, the programme has had good initial outcomes.

Conclusions

• Messages about using gloves confused
  – Not based on sound infection control principles
  – Risk assessment is ill-defined and staff lack competence

• Gap between policy & practice
  – Emotion & socialization are key drivers of glove use

• To change practice need to systematically address:
  ➢ Environment
  ➢ Tasks
  ➢ People
  ➢ Organization