

REVIEW OF LITERATURE

TEAM UNDERTAKING REVIEW: Parts A and B – Health Protection Scotland. Part C – Welsh Healthcare Associated Infection Programme (WHAIP)	
CONTACT PERSON: Dawn Hill	
TOPIC: Hand hygiene as an infection control measure – the importance of drying hands.	
PRINCIPAL RESEARCH QUESTION/OBJECTIVE: To assess the evidence in relation to hand drying methods following hand hygiene/decontamination.	
METHODOLOGY	
i) Search strategy for identification of studies	
<i>Period of publication</i>	Part A: 1966 – 2004
	Part B: 2004 – 2006
	Part C: 2007-2008

<p>Strategy key words for Part C</p> <p>From Health Protection Scotland literature review [2007]</p> <p>Supplemented with terms from SURE proposal to HTA</p>	<p>Hand hygiene, hand washing, handwashing, hand sanitizing, hand cleansing, hand decontamination, Hand\$1 adj2 wash\$.ti,ab Hand\$1 adj2 clean\$.ti,ab Hand\$1 adj2 decontamin\$.ti,ab Hand\$1 adj2 saniti\$.ti,ab Hand\$1 adj2 antiseptis\$.ti,ab Hand\$1 adj2 disinfect\$.ti,ab Exp hand/ Exp sterilization/ Cross infection Nosocomial Healthcare associated infection Health-care associated infection Healthcare acquired infection Hospital acquired infection Compliance,Adherence,Attitudes Perceptions,Professional compliance Health behaviour , health behaviour Attitude , attitude of health personnel Health knowledge, attitudes, practice/ Comply\$4.ti,ab Complies\$41.ti,ab Adher\$.ti,ab, obey\$.ti,ab, conform\$.ti,ab, follow\$3.ti,ab , fulfil\$.ti,ab observ\$.ti,ab abide\$.ti,ab Barrier\$.ti,ab obstacle\$.ti,ab hurdle\$.ti,ab obstruct\$.ti,ab facilitate\$.ti,ab enable\$.ti,ab assist\$.ti, ab help\$.ti,ab promot\$3.ti,ab encourage\$1.ti,ab encouraging.ti,ab attitude\$1.ti,ab practice\$.ti,ab practising.ti,ab practicing.ti,ab Knowledge\$.ti,ab difficult\$.ti,ab impede\$.ti,ab hinder\$.ti,ab hindrance\$.ti,ab Care, care equipment, environment, contaminated contact , delivery of health care, exp Equipment and supplies, hospital/ Health facility environment, hospital, healthcare, occupational transmission, focal infection, cross infection/ Exp Hospitals/ Occupational diseases/ Infection/ focal infection/ infection control/ Bacteri\$, virus\$, equipment contamination. Handwashing solution, hand washing solution, procedure, soaps, chlohexidine, air dryer, paper towel\$, hand towel\$, soap, liquid soap, soap solution, alcohol rub, alcohol solution, alcohol, alcohol\$ adj2 handrub\$4.ti,ab Surgical scrub\$.ti,ab Ring\$, jewellery, nail\$ nail polish, nails/ Cosmetics,</p>																				
<p>Electronic databases for Part C</p> <p>(tick as appropriate)</p>	<table border="1"> <tr> <td>MEDLINE</td> <td>√</td> <td>PsycINFO</td> <td></td> </tr> <tr> <td>Science Direct</td> <td></td> <td>EMBASE</td> <td>√</td> </tr> <tr> <td>CINAHL</td> <td>√</td> <td>SIGLE</td> <td></td> </tr> <tr> <td>Cochrane Library</td> <td>√</td> <td>HMIC</td> <td>√</td> </tr> <tr> <td>British Nursing Index</td> <td>√</td> <td>Health technology Assessment</td> <td>√</td> </tr> </table>	MEDLINE	√	PsycINFO		Science Direct		EMBASE	√	CINAHL	√	SIGLE		Cochrane Library	√	HMIC	√	British Nursing Index	√	Health technology Assessment	√
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<i>Specialist web sites / portals for Part C</i>	Bandolier, EPIC, JBI-connect, national Electronic Library – Infections, National Library of Guidelines, CDC, Welsh Assembly Government (WAG), Scottish Executive health Dept. (SEHD), health protection Agency (HPA), Health protection Scotland (HPS), Department of health (DH), National patient Safety Agency – Cleanyourhands, Healthcare Associated Infection research Network, Department of health & Social Services & Public Safety (DHSSPS-NI) Northern Ireland, health Information and Quality Authority (Republic of Ireland – health), National Resources Infection Control (NRIC), WHO, Hospital Infection Society, Infection Prevention Society, Society for Healthcare Epidemiology of America (SHEA), NPHS Knowledge Base
<i>Hand searching journals (2008 only)</i>	American Journal of Infection Control, British Journal of Infection Control, BMJ, Infection Control and Hospital Epidemiology, Journal of Hospital Infection
ii) Selection criteria for inclusion of studies	
<i>Sample</i>	All health and social care workers.
<i>Outcome measure(s)</i>	Bacterial count on hands following different hand drying interventions.
<i>Other inclusion criteria</i>	N/A
<i>Language Limitations</i>	English language only.

iii) Quality assessment	
<i>Study quality assessment</i>	
<i>Part A (1966 – 2004)</i>	Identified articles were reviewed according to Roe’s model. Guidance documents, however, were unable to be subjected to all such criteria.
<i>Part B (2004 – 2006) and Part C (2007-2008)</i>	Identified articles were reviewed according to either the ROE model for critical appraisal of scientific studies, Sign 50 methodology for systematic reviews and meta-analyses and the AGREE instrument for the evaluation of guidance documents as appropriate.
<i>Data collation and analysis</i>	Qualitative analysis of data performed on studies uncovered was undertaken using a case study approach. Guidance documents reviewed for any relevant commentary.

RESULTS

Part A (1966 – 2004)

According to the literature, hand drying is a critical factor in the hand hygiene process. Insufficient hand drying would render the handwashing process ineffective. As Marples & Towers (1979) and Macintosh & Hoffman (1984) have previously recognised, residual moisture plays a significant role in cross contamination. Marpus & Towers (1979) and Hoffman & Wilson (1994) both found that wet surfaces transfer microorganisms more effectively than dry ones. More recently, Patrick et al. (1997) produced evidence to show that residual moisture left on hands after washing allows translocation of microorganisms from fingers to solid surfaces during touch contact. The authors then went on to show that the translocation of bacteria following touch contact is also related to the time spent drying in order to remove sufficient microorganisms.

Given these findings, Gould underlined the importance of drying hands following handwashing in her 2000 review of handwashing facilities in the clinical area, and she raised the issue of the best method for drying hands which has been the subject of much research and debate in recent years.

Many studies have been conducted to ascertain the most effective method of drying hands. Drying hands with disposable paper towels, cloth drying and warm air drying have all been compared as outlined in the APIC guideline (1995). Evidence has been uncovered in relation to the use of warm air dryers with many studies showing increased contamination of hands due to recirculated air and the saturation of filters with bacteria. However, as reported in the APIC guideline (1985), further studies exist which show no such increase. Furthermore, evidence would suggest that warm air drying is a slow method of drying hands in comparison with cloth towels. Patrick et al. (1997) compared these methods. Ten seconds drying with a cloth towel removed 96% of water while 45 seconds of drying with warm air was required to get same effect. Redway et al. (1994) also argue that drying hands with cloth towels is quicker and more effective than warm air drying and, therefore, it could be assumed that healthcare workers find this more suitable given the busy ward environment.

Generally, disposable paper towels appear to be advocated as they rub away transient organisms and dead skin cells and they remove bacteria from deeper layers because of associated friction and in the process remove moisture (Gould, 1994b).

	<p>Comparative studies of paper towels and cloth towels have revealed paper towels to be the most effective hand drying method (Gould, 2000). Ansari et al. (1991) found disposable paper towels to be more effective in reducing contamination than cloth towels.</p> <p>Although the use of paper towels is best supported in the literature, Heenan (1996) argues that attention should be paid to providing adequate supplies of paper towels which are user-friendly; otherwise harsh, non absorbent towels could discourage compliance.</p> <p>To avoid the potential for re-contamination of hands, several studies have referred to the need for foot-operated pedals on waste disposal units (Gould, 1992). If not available, guidance recommends that a paper towel should be used to open the unit to avoid recontamination, thereby completing the hand hygiene process and maximising its effectiveness.</p> <p>When using alcohol hand gel/rub to decontaminate hands, hand drying is equally as important. Evidence indicates that similar care should be taken to allow sufficient drying time following application in order to maximise effectiveness.</p>
Part B (2004 – 2006)	<p>The annual review aims to identify, review and critique any scientific studies or guidance, which have been published in the intervening period since the original literature review, to determine if changes to guidance are required.</p> <p>There were no additional scientific papers published during the period of the review, which specifically covered hand drying. The WHO Guidelines for Hand Hygiene document (WHO 2006) currently available as an advance draft, was reviewed for content on this subject, however no changes to practice were identified.</p>
Part C (2007 – 2008)	<p>No new scientific papers were identified in the literature search pertaining to hand drying in the hand hygiene process.</p>

CONCLUSIONS

Part A (1966 – 2004)

Hand drying is considered a critical factor in the hand hygiene process.

Evidence indicates that wet surfaces transfer microorganisms more readily than dry ones.

Studies show that residual moisture left on hands following washing enables translocation of microorganisms from fingers to solid surfaces during touch contact.

The most effective method for drying hands (e.g. paper towels, cloth towels, warm air) has been the subject of much research and debate.

Evidence supports the use of paper towels as the most effective method for reduction in contamination by removing moisture and remaining transient organisms and dead skin cells.

	<p>Paper towels must be user-friendly to encourage compliance.</p> <p>Waste disposal units should be foot-operated to avoid recontamination of hands.</p> <p>Care should be taken to allow hands to dry completely following use of alcohol hand gel/rub.</p>
Part B (2004 – 2006)	There are no additional publications specifically on this subject produced within the period of this annual review of the model policies. Therefore there is no change to guidance recommended.
Part C (2007 – 2008)	No additional conclusions.
RECOMMENDATIONS	
Part A (1966 -2004)	<p>Following washing, hands should be dried with paper towels.</p> <p>Paper towels supplied should be user friendly.</p> <p>Waste disposal bins should have foot-operated pedals.</p>
Part B (2004 – 2006)	No change to present guidance recommendations in literature review available 10/08/05.
Part C (2007 – 2008)	Nothing additional needs to be added to Infection Prevention Model Policy/Procedure 2 (version1) as a result of the literature review for Part C.
PRACTICAL APPLICATION	As the hand hygiene measures described have been recommended for some time, no significant change to practice should be required; however, the standards set down must be achieved.
RESOURCE IMPLICATIONS	As per current policies. All resources required for dealing with hand hygiene should already be in place.

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<i>Part B (2004 – 2006)</i>	World Health Organisation, (2006), <i>WHO Guidelines on Hand Hygiene in Health Care (Advanced Draft)</i> World Alliance for Patient Safety, WHO, Geneva
<i>Part C (2007 – 2008)</i>	None
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