

Wearing white coats and sitting on beds: why should it matter?

Simon Hill

Introduction

A healthcare-associated infection (HCAI) is defined as any infection acquired as a consequence of a person's treatment by a healthcare provider, or which is acquired by a healthcare worker in the course of their duties.¹ The Health and Social Care Act 2008 makes it clear that prevention and control of HCAI should be part of everyday practice and applied consistently by everyone.¹ In 2006, about 8% of inpatients in acute hospitals in England were identified as having a HCAI.²

HCAIs obviously waste NHS resources. A patient with a methicillin-resistant *Staphylococcus aureus* (MRSA) bacteraemia spends an average additional 10 days in hospital and for *Clostridium difficile* the additional length of stay is 21 days. Infections can cost a trust an extra £4,000–£10,000 per patient.³ Although it is not possible to prevent all infections,¹ the emphasis placed on MRSA bacteraemias and *C. difficile* has shown it is possible to reduce numbers of these specific infections.

A national target was introduced by the Department of Health (DH) in November 2004 to reduce MRSA bloodstream infection by 50% by 2008, against the baseline figure for 2003–4. Aggregate numbers for 2007–8 showed a 42% decrease, and a 61% decrease for 2008–9.⁴ Following the mandatory surveillance scheme introduced in January 2004, a national target was introduced in October 2007 to reduce numbers of *C. difficile* infection by 30% across all age groups by 2010–11, against the 2007–8 baseline. By December 2008, the numbers reported showed a 41% reduction.⁴

Although these two infections have been the main focus of the DH's national approach to reducing HCAI, they represent only 15% of all such infection.⁵ Bloodstream infections represent 7% of infections of which 19% are *Staphylococcus aureus* (4% are MRSA).⁵

The overall prevalence of HCAI in England has remained relatively constant over the past two decades, although a modest decrease in prevalence from 9% to 8.2% has been shown between the national prevalence surveys carried out in 1993–4 and 2006.⁵ However during this period hospital infection prevention and control teams have had to meet the challenges posed by additional new or increasingly common pathogens such as vancomycin-resistant *Enterococci* (VRE), extended spectrum beta lactamase (ESBL) producing coliforms, virulent *C. difficile* 027 strains and the newly recognised multiantibiotic resistant carbapenemase producing (NDM-1) coliforms, with

increasing numbers of elderly and immunocompromised patients being treated within hospitals.

Hospital medical staff in recent years have been expected to completely change the way they dress and hence how they may be perceived by patients. Compare the consultants of the 1970s, 1980s and 1990s wearing smart suits or long white coats over double cuff shirts and ties with the average hospital doctor in a short sleeved open necked shirt with no white coat. The impetus for the change was the publication of the bare-below-the-elbows (BBE) dress code.^{6,7} This requirement has been challenged on many fronts including not having a wristwatch^{8–10} and the lack of evidence that it is necessary to achieve adequate hand hygiene^{11,12} and the effect it has on patient perception.¹³ Other measures introduced for infection control reasons have also been challenged, such as not sitting on patients' beds¹⁴ and doing away with white coats.^{15–17}

The challenges are understandable given the uncertainty about which measures introduced for infection prevention and control purposes are actually crucial and which ones have little or no effect.¹⁸ There is a concern that putting excessive time and resource into promoting hand decontamination will mean that other equally important initiatives are not fully implemented including prudent antimicrobial prescribing, ensuring optimal wound, urinary catheter and intravascular catheter care together with increased nurse:patient ratios, reduced bed occupancy and optimal cleaning. Decontaminating hands needs to be viewed as just one component of a hospital's infection prevention and control programme¹⁹ which is seen as part of the responsibility of all healthcare workers.¹

The BBE campaign is just one part of the important hand decontamination initiative but there is a danger that the importance of the message about hand hygiene will be lost in the debate about specific components of the programme. There is, however, an argument that healthcare workers who roll up their sleeves, remove wrist watches and ties are taking their role in infection prevention and control seriously and offers a visible sign that the hospital is a different environment to other workplaces.

So which infection prevention and control interventions matter?

The white coat

The DH published guidelines in 2007²⁰ (updated in 2010²¹) for healthcare workers regarding work wear, suggesting that good practice meant that white coats should not be worn during patient activity.²¹

Simon Hill, consultant microbiologist and director of infection prevention and control, Poole Hospital NHS Foundation Trust

The possibility of a doctor's white coat being contaminated with microorganisms has been the subject of debate and research for decades. Cuffs and pockets of coats were found to be the most highly contaminated area, with *Staphylococcus aureus* isolated from a quarter of the coats examined²² and, more recently, sampling of lapels, pockets and cuffs found 23% contaminated with *S. aureus*, of which six (18%) were MRSA.²³

Nurses' uniforms become similarly contaminated during routine shifts on wards with heavy levels of contamination (more than 400 colonies per site sampled) throughout a shift²⁴ with *S. aureus*, *C. difficile* and VRE all being detected.²⁵ Fungi, including *Aspergillus* spores and *Candida* have also been found on healthcare workers' overalls including those in an infectious diseases department.²⁶

Experiments have demonstrated that MRSA and VRE can survive on various fabrics including smooth cotton (clothes) or cotton terry (towels) for days, with some organisms such as enterococci surviving for over 90 days. Smaller inocula (100 organisms) survived for shorter times but still generally for days.²⁷

A study of the viability of pathogenic bacteria on the fabric of a white coat showed that immediately after inoculation for *S. aureus* only 0.16% of the inoculum of 3.7×10^5 colony forming units survived. The number of viable cells decreased further to 0.046% after one hour and 0.014% after 24 hours. There was a similar decrease in viable cells for *Serratia marcescens* (a gram negative bacillary coliform) and *Pseudomonas aeruginosa* with no recovery possible after eight hours and three hours respectively.²⁸

Experiments carried out in the 1950s demonstrated that two to eight million *S. aureus* organisms were required to cause a pus-forming intradermal infection by injection of humans. However, the dramatic effect of sutures reducing the required inoculums, in some cases 100 *S. aureus*, to produce a stitch abscess.^{29,30}

There are circumstances, therefore, where even the low surviving inoculum of pathogens on white coats could cause an infection of a vulnerable wound if a foreign body, such as sutures or an intravenous catheter, was present.

It is true, however, that the hypothesis that uniforms/clothing could be a vehicle for the transmission of infections is not supported by existing evidence from a search of the small number of relevant studies published.³¹

A recent study¹⁶ demonstrated that bacteria, including MRSA contamination, occurred at similar levels on newly laundered short sleeved uniforms and physicians' white coats, with no difference found in contamination of the skin at the wrists of physicians wearing either garment. Bacterial contamination was found to occur within hours of putting on uniforms, so by three hours, nearly 50% of the organism total count after eight hours was already present.

The 'bare-below-the-elbows' policy

Pathogens are readily transmitted on healthcare workers hands and hand hygiene is recognised as the best way of pre-

venting transmission of microorganisms between patients.³² The BBE policy is relevant if it can be demonstrated that having long sleeves or wearing a wrist watch could result in less effective hand decontamination. Alcohol gel is recommended for hand decontamination in most clinical situations,³³ but its efficacy is affected by hand-washing technique.^{34,35}

Studies have demonstrated that a group of non-BBE doctors and medical students missed significantly more of the wrist compared with a BBE group.³⁶ However, both groups missed significantly more areas on the wrists than on the hands, emphasising the importance of technique. This study showed that being BBE does improve wrist washing; however as is so often the case in infection control, there is no evidence to date that effective wrist washing actually reduces HCAI.

Other studies, while demonstrating that hand washing did produce a significant reduction in the number of bacterial colonies on staff hands, being non-BBE did not impede this reduction when BBE and non-BBE groups were compared.¹¹

Specifically regarding wrist watches, it has been demonstrated that wearing a wrist watch results in increased bacterial contamination of the wrist, but excess hand contamination was not found unless the watch is manipulated.³⁷

Balanced against this is the fact that there is a clinical value to a wrist watch as estimating heart and respiratory rate without being able to see a second hand is very inaccurate.³⁸

It is worth observing that infection control manuals throughout the country recommend removing wrist watches before performing sterile procedures or surgical operations: should the same standard not apply to day-to-day direct patient contact?

Do not sit on the bed

The general prohibition on staff sitting on beds in acute hospitals in the UK has been questioned.¹⁴ There is a case to be made that sitting down with the same eye level as a patient enhances the interaction. However, the overall infection control evidence suggests that there are real concerns about it being accepted as common practice.

Bed components, including bed frames and mattresses, become contaminated by microorganisms through direct contact with skin scales, and body fluids including urine and faeces, and thus become a source of infection.³⁹ Studies conducted in isolation rooms have found MRSA isolated from mattresses, bed frames and air with the isolates found being identical to the patients' strains suggesting contact and aerial spread.^{40,41} Although MRSA can be found on numerous sites in hospital rooms occupied by patients colonised or infected with the organism, sites such as linen, curtains, beds, lockers and over-bed tables have been found to harbour MRSA more frequently than others with contamination of near-patient hand-touch sites providing the largest risk.⁴²⁻⁴⁶

Transmission of MRSA from environmental surfaces to gloves or hands of healthcare workers has been documented. Forty-two per cent of 12 nurses contaminated their gloves by touching

objects in rooms of patients with MRSA in a wound or urine, even if they had no direct patient contact.⁴⁵ Thirty-one per cent of volunteers who touched bed rails and over-bed tables in patient rooms contaminated their hands with *S. aureus* (35% of which were MRSA).⁴⁷

VRE are capable of surviving on various surfaces for prolonged periods and for at least 11 days on most fabrics.²⁷ Environmental contamination occurs with VRE – 46% of environmental cultures from rooms of VRE-positive patients who had diarrhoea were contaminated, while 15% of surfaces were found positive even if the patients did not have diarrhoea.⁴⁸ In hospital settings, the sites most often contaminated with VRE include bed rails and bedside tables.⁴⁹ Transmission of VRE from contaminated surfaces to healthcare workers' hands or gloves has been documented,^{47,50,51} with organisms also proven to be transmitted from positive sites to negative sites in the environment on healthcare workers' hands.⁵²

C. difficile as a spore-forming anaerobe has been recovered in large numbers from the environment near symptomatic patients.⁵³ Environmental contamination with spores is a definite risk factor for patients acquiring *C. difficile* infection.⁵⁴

A person with *C. difficile* infection can excrete between 1×10^4 and 1×10^7 of *C. difficile* per gram of faeces.⁵⁵ In elderly hospitalised patients, excretion of *C. difficile* may occur for over 10 days even if treated with oral metronidazole or vancomycin,⁵⁶ so the potential for environmental contamination continues even though the diarrhoea may have settled, albeit at a probable lower rate.

Pyjamas and sheets become contaminated by a variety of organisms even after a single overnight use with *Enterococci*, *S. aureus* and a variety of Gram-negative bacilli including *Pseudomonas* being detected.⁶⁹

The norovirus viral load in stool ranges from 2.2×10^4 to 7.7×10^{10} viruses per gram⁵⁷ and in vomit can range up to 10^6 per ml.⁵⁸ The small infecting inoculum makes norovirus one of the most infectious agents described with an estimated median infectious dose of just 18 viruses.⁵⁹

It has been established that long-term shedding of norovirus can occur for more than one month in children⁶⁰ and for a median of three months in immunocompromised hosts.⁶¹ Of importance also is evidence that up to 32% of immunocompetent hosts challenged with norovirus develop asymptomatic infection.⁶² Norovirus is also environmentally stable and resistant to many cleaning agents.⁶³

The period of infectivity of excreted virus has not been clarified, but basic infection control precautions should be taken possibly for up to four weeks for known infected patients who remain in hospital, even after symptomatic recovery. Within a hospital where norovirus cases have occurred there may be asymptomatic excretors who have acquired the organism and may also have contaminated the environment, including their bed. Considering the large viral load excreted and the very small infectious dose, not sitting on any hospital bed as a standard infection control precaution seems justified.

The role of the hospital environment

As discussed, it is known that the hospital bed and bed linen is frequently contaminated with potential pathogens. The same is true of other hospital surfaces which is one of the reasons for including hand decontamination after touching potentially contaminated surfaces in the World Health Organization (WHO) 'five moments of hand hygiene' initiative.⁶⁴ Frequently touched surfaces of general public areas, such as the handrail of an escalator, inside buttons of escalators and registration counters, were found contaminated with potentially pathogenic bacteria in over 85% of samples taken.⁶⁵ Organisms found included MRSA. MRSA has also been found on hospital curtains⁶⁶ and hospital bed handsets.^{67,68}

Environmental contamination has been recognised as making an important contribution to hospital infection,⁷⁰ including MRSA, VRE, *C. difficile*, *Acinetobacter* species and norovirus,⁷¹ with effective environmental cleaning being vital to the control of HCAs.^{72,73}

It would, therefore, be appropriate to consider all surfaces in the ward environment as being potentially contaminated, but especially the frequently touched ones. The appropriate control measure is adequate regular cleaning. The WHO 'five moments of hand hygiene' initiative is sensible in principle but an element of practicality has to be applied to the concept of decontaminating hands after contact with every contaminated surface. If taken literally this would be after every contact with a patient's notes, notes trolley, patient chart, keyboard, telephone, door knob etc. Following recommended hand hygiene procedure for each contact would be extremely time consuming. As has been observed, having an aggressive zero tolerance approach to when healthcare workers are observed to fail observation audits when they have not decontaminated their hands after touching a patient's notes or ward surface, is not likely to be helpful in achieving the highest level of hand hygiene when it is most appropriate.¹⁸

Can any conclusions be made?

Infection control precautions do make a difference as can be judged from the decrease in MRSA bacteraemia and *C. difficile* infections seen recently. The explanation is likely to be multi-factorial and understanding which interventions are the most important is difficult. There is evidence that lower MRSA infection rates are linked to hand hygiene and isolation and a lower rate of *C. difficile* infection being linked to cleanliness, good antimicrobial prescribing practices and surveillance of infection.⁷⁴

The DH's *Saving lives* initiative with an emphasis on high impact interventions and care bundles, which includes peripheral intravenous cannula, central venous catheter, urinary catheter, surgical site infection and *C. difficile*, helps concentrate resource on medical interventions known to be associated with nosocomial infection.⁷⁵

Near-patient hand-touch sites frequently become contaminated with pathogens so the answer is to ensure that they are cleaned sufficiently often and carefully enough to reduce

the risk of such sites acting as a reservoir of infection to a minimum.

Beds and bed linen do become contaminated with pathogens and not necessarily only from patients with symptomatic infections due to identified pathogens. Avoiding potentially widespread contamination of a healthcare worker's clothes by not sitting directly on the bed is an appropriate response and does not necessarily make medical care less compassionate: there is always the option of sitting on a chair to be at the same eye level as the patient.

Being BBE does provide a visible sign of infection control and is an unambiguous policy. Allowing long sleeves or wrist watches brings with it the uncertainty of what is then acceptable: would double cuffs with large cuff links or wrist watches with wide fabric/velcro bands be appropriate? There is evidence that being BBE allows more efficient wrist washing and that increased bacterial counts are found under watches – what is lacking is the evidence that this may directly lead to infection, although there are clinical scenarios involving vulnerable wounds in immunocompromised patients where a very small inoculum of pathogenic bacteria could cause infection. If wrist watches are removed and sleeves rolled up before performing a 'sterile procedure', why not maintain the same standards for all patient contact since it is easily achievable. A fob watch is the answer to the lack of a wrist watch.

All uniforms, be they long sleeved white coats or short sleeved uniforms may become contaminated with potential pathogens during normal patient care. White coats would not be an issue if they were available as clean laundered items every day, although it can be argued as previously suggested, they should have short sleeves.

Patients when questioned may prefer to see doctors in formal attire as being professional and the easiest way of identifying a person as a doctor, if given a choice between a doctor in formal attire, scrubs or BBE.⁷⁶ However, if the reasons for the BBE policy are explained or why surgical scrubs are worn, the preference often disappears.⁷⁷ Patients appreciate being able to readily differentiate staff groups but it can be argued that there are ways of ensuring doctors are easily identifiable without the need for them to wear long white coats or suits.

The goal of most professionals working in infection prevention and control is to get all healthcare workers to accept responsibility about infection prevention and understand what measures are known to be critical, such as appropriate hand decontamination before and after direct patient contact, the high impact interventions care bundle, appropriate patient isolation, appropriate antimicrobial stewardship and appropriate environmental cleaning.

When there is 100% compliance with all of these measures then it would be worth re-evaluating the evidence for not wearing white coats or being BBE but, until then, sufficient evidence exists to show that the BBE policy may prevent some infections, as does the policy of not sitting on beds or wearing long sleeved white coats.

References

- 1 The Health and Social Care Act 2008. *Code of Practice for the NHS on the prevention and control of healthcare associated infections and related guidelines*. London: Department of Health, 2009.
- 2 *The third prevalence survey of healthcare associated infections in acute hospitals in England 2006*. Hospital Infection Society, September 2007.
- 3 Department of Health. *Clean, safe care. Reducing infections and savings lives*. London: DH, 2008.
- 4 Health Protection Agency. Healthcare associated infection surveillance system.
- 5 National Audit Office. *Reducing healthcare associated infection in hospitals in England*. London: The Stationery Office, 2009.
- 6 Department of Health. *Uniforms and workwear: an evidence base for developing local policy*. London: DH, 2007.
- 7 Scottish Government Health Directorates. *NHS Scotland dress code*. Edinburgh: SGDH, 2008.
- 8 Henderson J, McCracken S. Bare below the elbows: clinical value of a wristwatch. *BMJ* 2008;336:10.
- 9 Bhusal Y, Laza S, Lande TW, Schultz K, Hansen C. Bacterial colonization of wristwatches worn by healthcare personnel. *Am J Infection Control* 2009;27:476–7.
- 10 Jeans AT, Moore J, Nicol C, Bates C, Read RC. Wristwatch use and hospital-acquired infection. *Hosp Infect* 2010;74:16–21.
- 11 Burger A, Wijewardena C, Clayson S, Greateorex R. Bare below the elbows: does this policy affect handwashing efficacy and reduce bacterial colonisation. *Ann R Coll Surg Engl* 2010;93:13–16.
- 12 Farrington RM, Rabindran J, Crocker G *et al*. 'Bare below the elbows' and quality of hand washing: a randomized comparison study. *J Hosp Infect* 2010;74:86–8.
- 13 Bond L, Clamp PJ, Gray K, Van Dam V. Patients perception of doctor's clothing: should we really be 'bare below the elbow'? *J Laryngol Otol* 2010;124:963–6.
- 14 Heath I. Do not sit on the bed. *BMJ* 2010;340:625.
- 15 Burd A. Bring back the white coat. *BMJ* 2010;341:82.
- 16 Burden M, Cervantes L, Weed D *et al*. Newly cleaned physician uniforms and infrequently washed white coats have similar rates of bacterial contamination after an 8 hour work day: a randomized control trial. *J Hosp Med* 2011;6:177–82.
- 17 Mayor S. Short or long sleeves make no difference to bacterial contamination of doctors' wrists. *BMJ* 2011;342:405.
- 18 Dancer SJ. Pasts, policies and paranoia. *J Hosp Infect* 2010;74:10–15.
- 19 Gould D, Hewitt-Taylor J, Drey NS *et al*. The clean your hands campaign: critiquing policy and evidence base. *J Hosp Infect* 2007;65: 95–101.
- 20 Department of Health. *Uniforms and workwear: an evidence base for developing local policy*. London: DH, 2007.
- 21 Department of Health. *Uniforms and workwear: guidance on uniform and workwear policies for NHS employers*. London: DH, 2010.
- 22 Wong D, Nyek K, Hollis P. Microbial flora on doctor's white coats. *BMJ* 1991;303:1602.
- 23 Treacle AM, Thom KA, Furuno JP *et al*. Bacterial contamination of healthcare worker's white coats. *Am J Infect Control* 2009;37: 101–5.
- 24 Callaghan I. Bacterial contamination of nurse's uniforms: a study. *Nursing Standard* 1998;13:27–42.
- 25 Perry C, Marshall R, Jones E. Bacterial contamination of uniforms. *J Hosp Infect* 2001;48:238–41.
- 26 Lacroix C, Pavie J, Bouakline A *et al*. Fungal contamination of hospital healthcare worker's uniforms. *J Hosp Infect* 2007;66:88–90.
- 27 Neely A, Maley M. Survival of Enterococci and Staphylococci on hospital fabrics and plastics. *J Clin Microbiol* 2000;38:2:724–6.
- 28 Van der Reijden WA, Rood M, Heijers JM, Vandenbroucke-Grauls CMJE, de Soet JJ. Survival of bacteria on uniforms in relation to risk management in dental clinics. *J Hosp Infect* 2009;73:283–5.

- 29 Elek SD. Experimental Staphylococcal infections in the skin of man. *Ann N Y Acad Sci* 1956;65:85–90.
- 30 Elek SD, Conen PE. The virulence of *Staphylococcus pyogenes* for man. A study of the problems of wound infection. *Brit J Exper Path* 1957;38:373–86.
- 31 Wilson JA, Loveday HP, Hoffman PN, Pratt RJ. Uniform: an evidence review of the microbiological significance of uniforms and uniform policy in the prevention and control of healthcare-associated infections. Report to the Department of Health (England). *J Hosp Infect* 2007;66:301–7.
- 32 Pillet D, Hugonnet S, Harbarth *et al.* Effectiveness of a hospital wide programme to improve compliance with hand hygiene. Infection control programme. *Lancet* 2000;356:1307–12.
- 33 Teare L, Cookson B, Stone S. Hand hygiene. Use alcohol hand rubs between patients: they reduce the transmission of infection. *BMJ* 2001;323:411–12.
- 34 MacDonald DJM, McKillip ECA, Trotter S, Gray AJR. Improving hand-washing performance – a crossover study of hand washing in the operating department. *Ann R Coll Surg Engl* 2006;88:289–91.
- 35 Pittet D, Allegranzi B, Boyce J. The World Health Organization guidelines on hand hygiene in health care and their consensus recommendations. *Infect Control Hosp Epidemiol* 2009;30:611–22.
- 36 Farrington RM, Rabindran J, Crocker G *et al.* 'Bare below the elbows' and quality of hand washing: a randomised comparison study. *J Hosp Infect* 2010;74:86–7.
- 37 Jeans AR, Moore J, Nicol C, Bates C, Read RC. Wristwatch use and hospital acquired infection. *J Hosp Infect* 2010;74:16–21.
- 38 Henderson J, McCracken S. Bare below the elbows: clinical value of a wristwatch. *BMJ* 2008;336:10.
- 39 Ayliffe GAJ, Fraise AP, Geddes AM, Mitchell K. *Control of hospital infection, a practical handbook*, 4th edn. London: Arnold, 2000.
- 40 Sexton T, Clarke P, O'Neill E, Dillance T, Humphreys H. Environmental reservoirs of methicillin-resistant *Staphylococcus aureus* in isolation rooms: correlation with patient's isolates and implications for hospital hygiene. *J Hosp Infect* 2006;62:187–94.
- 41 Boyce JM, Potter-Bynoe G, Chenevert C, King T. Environmental contamination due to methicillin-resistant *Staphylococcus aureus*: possible infection control implications. *Infect Control Hosp Epidemiol* 1997;18:622–7.
- 42 Dancer SJ, White L, Robertson C. Monitoring environmental cleanliness on two surgical wards. *Int J Environ Health Res* 2008;18:357–64.
- 43 White L, Dancer SJ, Robertson C, McDonald J. Are hygiene standards useful in assessing infection risk. *Am J Infect Control* 36:381–84.
- 44 Lemmon SW, Hafner H, Zolldan D, Stazel S, Lutticken R. Distribution of multi-resistant Gram-negative versus Gram-positive bacteria in the hospital inanimate environment. *J Hosp Infect* 2004;56:191–7.
- 45 Dancer SJ. How do we assess hospital cleaning? A proposal for microbiological standards for surface hygiene in hospitals. *J Hosp Infect* 2004;56:10–15.
- 46 Dancer SJ. Importance of the environment in methicillin resistant *Staphylococcus aureus* acquisition: the case for hospital cleaning. *Lancet Infect Dis* 2008;8:101–13.
- 47 Bhalla A, Pultz NJ, Gries DM *et al.* Acquisition of nosocomial pathogens on hands after contact with environmental surfaces near hospitalised patients. *Infect Control Hosp Epidemiol* 2004;25:164–7.
- 48 Boyce JM, Opal SM, Chow JW *et al.* Outbreak of multidrug-resistant *Enterococcus faecium* with transferrable Van B class vancomycin resistance. *J Clin Microbiol* 1994;32:1148–53.
- 49 Weber DJ, Rutala WA. Role of environmental contamination in the transmission of vancomycin-resistant enterococci. *Infect Control Hosp Epidemiol* 1997;18:306–9.
- 50 Tenoris AR, Badri SM, Sahgal NB *et al.* Effectiveness of gloves in preventing personnel hand carriage of vancomycin-resistant *Enterococcus* (VRE) after patient care. *Clin Infect Dis* 2001;32:826–9.
- 51 Ray AJ, Hoyer CK, Taub TF, Donksey CJ. Nosocomial transmission of vancomycin-resistant enterococci from surfaces. *J Am Med Assoc* 2002;287:1400–1.
- 52 Duckro AN, Blom DW, Lyle EA, Weinstein RA, Hayden MK. Transfer of vancomycin-resistant enterococci via healthcare worker hands. *Arch Int Med* 2005;165:302–7.
- 53 Verity P, Wilcox MH, Fawley W, Pannell P. Prospective evaluation of environmental contamination by *Clostridium difficile* in isolation side rooms. *J Hosp Infect* 2001;49:204–8.
- 54 Kaatz GW, Gitlin SD, Schaberg DR *et al.* Acquisition of *Clostridium difficile* from the hospital environment. *Am J Epidemiol* 1998;127:1289–94.
- 55 Dumford DM 3rd, Nerandzic MM, Eckstein BC, Donskey CJ. What is on that keyboard? Detecting hidden environmental reservoirs of *Clostridium difficile* during an outbreak associated with North American pulsed-field gel electrophoresis type 1 strains. *Am J Infect Control* 2009;37:15–19.
- 56 Parks R, Wallis S, Wilson J. Continuing diarrhoea after ten days of oral metronidazole or oral vancomycin for presumed hospital-acquired *Clostridium difficile* colitis in elderly hospital patients. *J Hosp Infect* 2010;74:403–5.
- 57 Chan MC, Sung JJ, Lam RK *et al.* Fecal viral load and norovirus-associated gastroenteritis. *Emerg Infect Dis* 2006;12:1278–80.
- 58 Caul EO. Small round structured viruses: airborne transmission and hospital control. *Lancet* 1994;343:1240–2.
- 59 Teunis PF, Moe CL, Liu P *et al.* Norwalk virus: how infectious is it? *J Med Virol* 2008;80:1468–76.
- 60 Beersma MF, Schutten M, Vennema H *et al.* Norovirus in a Dutch tertiary care hospital (2002–2007): frequent nosocomial transmission and dominance of G11b strains in young children. *J Hosp Infect* 2009;71:199–205.
- 61 Roddie C, Paul JP, Benjamin R *et al.* Allergenic haematopoietic stem cell transplantation and norovirus gastroenteritis: a previous unrecognised cause of morbidity. *Clin Infect Dis* 2009;49:1061–8.
- 62 Graham DY, Jiang X, Tanaka T *et al.* Norwalk virus infection of volunteers: new insights based on improved assays. *J Infect Dis* 1994;170:34–43.
- 63 Le Guyader FS, Mittelholzer C, Haugarreau L *et al.* Detection of norovirus in raspberries associated with a gastroenteritis outbreak. *Int J Food Microbiol* 2004;97:179–86.
- 64 Sax H, Allegranzi B, Chraïti MN *et al.* The World Health Organization hand hygiene observation method. *Am J Infect Control* 2009;37:827–34.
- 65 Wang YL, Chen WC, Chen YY *et al.* Bacterial contamination on surfaces of public areas in hospitals. *J Hosp Infect* 2010;74:195–6.
- 66 Klakus J, Vaughan NL, Boswell TC. Methicillin-resistant *Staphylococcus aureus* contamination of hospital curtains. *J Hosp Infect* 2008;68:189–90.
- 67 Young JM, Naqvi M, Richards L. Microbial contamination of hospital bed handsets. *Am J Infect Control* 2005;33:170–4.
- 68 Brady RR, Kalima P, Damani NN, Wilson RG, Dunlop MG. Bacterial contamination of hospital bed-control handsets in a surgical setting: a potential marker of contamination of the healthcare environment. *Ann R Coll Surg Engl* 2007;89:656–60.
- 69 Malnick S, Bardenstein R, Huszar M, Gabbay J, Borkow G. Pyjamas and sheets as a potential source of nosocomial pathogens. *J Hosp Infect* 2008;70:89–90.
- 70 Boyce JM. Environmental contamination makes an important contribution to hospital infection. *J Hosp Infect* 2007;65:50–4.
- 71 Weber DJ, Rutala WA, Miller MB, Huslage K, Sickbert-Bennett E. Role of hospital surfaces in the transmission of emerging health care-associated pathogens: norovirus, *Clostridium difficile* and *Acinetobacter* species. *Am J Infect Control* 2010;38(5 Suppl 1):525–33.
- 72 Dancer SJ. The role of environmental cleaning in the control of hospital-acquired infection. *J Hosp Infect* 2009;73:378–85.

- 73 Dettenkofer M, Spencer RC. Importance of environmental decontamination – a critical view. *J Hosp Infect* 2007;65(S2):55–7.
- 74 Mears M, White A, Cookson B *et al*. Healthcare-associated infection in acute hospitals: which interventions are effective? *J Hosp Infect* 2009;71:307–13.
- 75 Department of Health. *Saving lives: reducing infection, delivering clean and safe care*. London: DH, 2007.
- 76 Bond L, Clamp PJ, Gray K, Van Dam V. Patients' perceptions of doctor's clothing: should we really be 'bare below the elbow'? *J Laryngol Otol* 2010;124:963–6.
- 77 Monkhouse SJW, Collis SA, Dunn JJ, Bunni J. Patients attitudes to surgical dress: a descriptive study in a district general hospital. *J Hosp Infect* 2008;69:408–9.

Address for correspondence: Dr S Hill, Medical Microbiology, Poole Hospital NHS Foundation Trust, Longfleet Road, Poole, Dorset BH15 2JB.
Email: simon.hill@poole.nhs.uk

Working party report

Local adult neurology services for the next decade Report of a working party

Neurological disorders are very common, accounting for about one in ten general practitioner consultations, around 10% of emergency medical admissions (excluding stroke) and disability for one in 50 of the UK population.

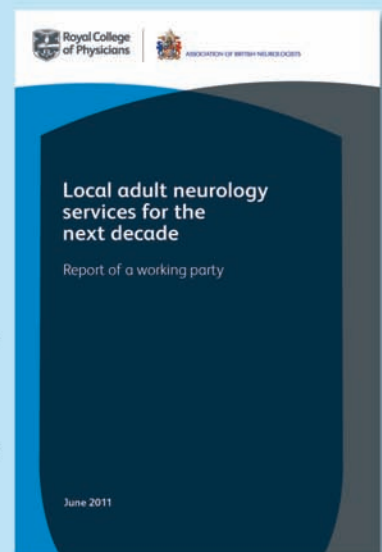
Patients require access to different parts of the neurological care pathway at different stages of their illness (acute admission, outpatient care and long-term care). However, these are currently poorly planned and organised. Good management requires better integrated primary, secondary and tertiary resources to achieve a neurology network that is easily accessible,

provides local care where appropriate and, when necessary, involves the regional neurosciences centre.

Highlighting the need for acute neurology services in district general hospitals and the community, this report emphasises the value of multidisciplinary interaction with nurses and GPs, and urges a better structured and integrated approach. Other improvements proposed include a rise in the number of district general hospital neurologists, and dedicated nursing staff and neurology wards. The report also stresses the need for neurologists to take an active role in the planning and commissioning of services. ■

Published: May 2011 **ISBN:** 978 1 86016 444 6

Price: £5.00 UK, £7.00 overseas (inc post and packing)



**Royal College
of Physicians**

10% discount for fellows and members

Quote the reference *Clinical Medicine* when making your order