



WHITEPAPER

Curbing the Infection Risk of Healthcare Garments

Curbing the Infection Risk of Healthcare Garments

omestic laundering of healthcare worker uniforms lacks the control and decontamination monitoring of hospital-grade washing. When a home laundry process fails to eliminate contamination, it can spread to other items in the laundry load. Leaving laundry damp encourages microbial survival and growth of residual micro-organisms.¹

A healthcare facility averts this risk by having these garments professionally laundered by a Hygienically Clean Healthcare certified linen and uniform service. Evidence is growing that the risk-reduction value of such a practice is worth the additional cost to a healthcare facility that currently makes employees responsible for such washing.

TRSA, the world's largest association dedicated to strengthening and promoting linen, uniform and facility services, prepared this compilation of recent findings on healthcare uniform laundering. TRSA administers Hygienically Clean Healthcare certification.

Home laundering may not reliably kill all pathogens as they may survive as biofilm or "microbial slime"

. . .

Workers carry pathogens out of healthcare facilities.

A 2021 study investigated the environmental stability of two human coronaviruses on different textile fiber types and the persistence of one such virus on textiles during domestic and industrial laundering. This study demonstrated these remain infectious on polyester for at least 72 hours; cotton, 24; and polycotton, 6. One virus was also able to transfer from polyester to PVC or polyester after 72 hours.²

On cotton swatches with nothing but one of the viruses, both industrial and domestic wash cycles without temperature and detergent resulted in non-detection of the virus, suggesting that the dilution and agitation of wash cycles are sufficient to remove human coronaviruses from textiles. However, in the presence of other soil ("interfering substances"), the virus was detected in domestic laundering, unlike industrial laundering, where the virus was completely removed. Infectious levels of the virus can be removed when washed domestically with detergent. However, when nurses and healthcare workers take their uniforms home, they can leave traces of the virus on other surfaces in their homes or cars before these HCTs are washed.

A Connecticut hospital found that if a worker enters a room with a patient with methicillin-resistant *Staphylococcus aureus* (MRSA), this bacterium is transmitted to the worker's garments about 70% of the time, even if the person never actually touched the patient. If the worker doesn't change into street clothes before leaving work, the risk of this bacteria spreading to the outside world increases.³

Brief contact with a scrub-wearing healthcare worker on the subway probably would not lead to infection, according to Association of Professionals in Infection Control and Epidemiology (APIC) guidelines for eliminating MRSA in hospitals. The risk is likely low, but probably not zero.⁴

A French study demonstrated that MRSA could be transmitted from healthcare workers who had acquired it in their hospital to members of their households. Combine evidence that MRSA has been documented on healthcare workers' uniforms with evidence of MRSA cross-contamination in the home environment and it's logical to conclude that exposing households to contaminated uniforms can be a threat.⁵

Workers bring pathogens into healthcare facilities.

Studies have measured the specific risk factors of patients being exposed to pathogens brought into the surgical area. A polymicrobial outbreak in patients who had undergone cardiac surgery was affirmed in one report, which cited "microbial contamination in 14 of 22 postsurgical patients." Staff members' wearing "scrubs and uniform jackets that had been home-laundered was reported as a strong correlate."⁶

A similar case study found three instances of *Gordonia bronchialis* sternal wound infection transmitted to patients by a healthcare worker. The home washer was deemed the likely environmental reservoir for the infection as both the nurse anesthetist and her roommate's scrubs and hands (from touching scrubs) were colonized and later tested negative with the removal of the machine.⁷

The researchers described home laundering practices of scrubs as remaining "nonstandardized and potentially risky." They noted that home laundering may not reliably kill all pathogens as they may survive as biofilm or "microbial slime," containing bacteria and fungi that have grown and multiplied on a surface. Biofilms can occur on any surface that contacts water and are commonly found on washing machines and water taps. "Many facilities choose to allow home laundering of scrub attire with little or no guidance on water temperature, detergent, or machine care. Given our experience, and recent publications on risks associated with home laundering scrub attire, the optimal prevention measure would be to provide hospital-laundered scrub attire to staff," they concluded.

A Bioscience Laboratories, Inc. study found significantly greater contamination among home-laundered attire than scrubs laundered by the healthcare facility or outsourced for laundering. Home-laundered scrubs were no cleaner than those worn for a day that had been facility- or third-party laundered.⁸

Outbreak case studies⁹ have provided preliminary evidence for infection transmission by contaminated domestic washing machines, suggesting that contaminated healthcare worker uniforms could transmit pathogens back into the clinical environment. Microorganisms, particularly thermotolerant species or spores, can survive domestic laundering, particularly at low temperatures rather than higher ones recommended by uniform policies.

Linen and uniform service laundering processes are routinely monitored to ensure that textiles are decontaminated and infection control procedures not possible with domestic laundering minimize potential for cross-contamination. These include maintenance of washing machines, routine environmental disinfection and the physical separation of areas for clean and dirty linen.

A 2018 study involved recreating in a laboratory setting nurses' most common laundering practices and assessing the survival of *S. aureus* and *Escherichia coli* on cotton and polyester fibers. The data showed that both bacteria were able to survive on polyester for up to seven days and on cotton for up to 21 days. The study's author observed, "This raises the question of the storage of dirty uniforms at home, especially regarding potential cross-contamination with surfaces in the home environment."¹⁰

Mixed polyester and cotton and 100% polyester fabric samples inoculated with high bacterial loads – to mimic a worst-case scenario – were washed at 104 degrees F/40 degrees C and 140 degrees F/60 degrees C using biological detergent. To determine whether cross-contamination could occur in the wash, sterile samples were included. The 104/40 wash did remove most microorganisms, but excess cells remained and similar numbers were transferred to the sterile items. This highlights the risk that other items of clothing in the home could become contaminated or domestically laundered uniforms could re-contaminate the homes and/or healthcare environment. Many staff were failing to follow guidelines across a range of areas related to cleaning their uniforms

Management can't be certain employees follow laundering directions.

A 2021 U.K. survey of nearly 1,300 healthcare wearers found that 86% laundered their uniforms domestically. Respondents were confident in laundering their uniforms appropriately (71%); however, 17% failed to launder at the recommended temperature (140/60). Most participants (68%) would prefer their employer launder their uniforms, with mixed negative emotions towards domestic laundering. Limited provision of uniforms and changing/storage facilities were a barrier to following guidelines.¹¹

The survey's takers cited previous research that suggested healthcare worker uniforms may deviate from laundering policies, which could further reduce the efficacy of uniform decontamination. In one prior study, only 4% to 32% of respondents complied with all key parameters within the local hospital uniform policies on laundering temperature, use of detergent and drying conditions. Another prior study reported that 76% of nurses and healthcare assistants change at home after a shift, and 26% to 29% wash at 104/40 rather than the stipulated 140/60.

Given the above, concerns have been raised that there could be a risk of microbial transmission from contaminated healthcare worker uniforms.

A 2015 study found that almost half of 265 wearers at four English hospitals failed to clean their uniforms in line with the National Health Service (NHS) guidance calling for washing at the highest temperature suitable for the fabric and indicating that a 10-minute wash at 140/60 is sufficient to remove most microorganisms. These findings called into question the NHS policy of ultimately allowing individual hospitals to set requirements. Stipulated wash temperatures varied among the four hospitals from 122/50 degrees to 167/75.¹²

The researchers also concluded that many staff were failing to follow guidelines across a range of other areas related to cleaning their uniforms, which could increase the risk of spreading infection.

Two hospitals called for uniforms to be washed separately from other items; the other two provided no set requirement. Yet 40% of those surveyed had mingled their uniforms with everyday clothes. (Staff in surgical wards, critical care units and emergency departments, however, were less likely to do so.)

Two thirds of respondents either rarely or never tumble-dried their uniforms, not complying with three of the hospitals' guidelines that recommended tumble-drying or drying quickly.

Employees may not wash their garments often enough to mitigate the risk.

A 2012 study of nurses' uniforms showed that the average bacteria colony growth per square inch was 1,246 and 5,795 for day and night shift, respectively. After 48 hours, MRSA positives were present on four of the day shift and three of the night shift uniforms. Additional bacteria identified include: *Bacillus sp., Micrococcus luteus, S. aureus, Staphylococcus epidermidis, and Micrococcus roseus.*¹³

"The significant presence of bacteria on the uniforms 48 hours after the shift ended necessitates further study, discussions and policy consideration regarding wearing health care uniforms outside of the work environment," that study concluded.

One study of various 100% cotton garments and 60% cotton/40% polyester blend scrub suits and lab coats found that all bacteria survived for at least one day. (Which would require an employee to do laundry every day to eliminate it.)

Three out of the four hospitals in the 2015 study stated that uniforms should be changed daily. Nearly one fourth of respondents said they don't comply—they change their uniform after every other shift, including 3% who said they changed their uniform after three shifts or more.

Home laundering technology still may not be sufficient.

The typical water temperature of home washers poses another threat to meeting the standard of producing hygienically clean linen. Washing machines typically operate at temperatures of 140/60 for 30- to 40-minute cycles. Lower temperature is a key to improving home washing efficiency: newer domestic washing machines using Energy Star technology consume 37% less energy and 50% less water than their counterparts.¹⁴

Thus, laundering scrubs uniforms at 160/71 per U.S. Centers for Disease Control and Prevention (CDC) recommendations¹⁵ is not achievable using most home washing machine temperatures and evidence suggests that bacterial eradication from clothing is less effective using consumer chemistry at lower temperatures. Bleaching has been found to reduce microorganisms found on uniforms that were home-laundered but this may not be a routine practice. Greater control over all aspects of the process has been the key differentiator for linen and uniform service laundering

. . .

. . .

A 2022 assessment of six domestic washing machines of different ages and manufacturers confirmed the inadequacy of six models to consistently achieve the heat, chemistry and mechanical action needed for decontamination. None achieved 160/71.¹⁶

The Association of Surgical Technologists points out that typical home washers have few settings for water temperature. Compounding this deficiency: most consumers use cold or warm settings for washing and rinsing to prevent the fading of colored fabrics, such as scrub attire. And temperatures are set by combining cold water with hot water from home water heaters typically at 900/482 to 1100/583. Commercial laundry facilities heat water to 1600/871, comfortably eliminating microbes such as *E. coli and S. aureus.*¹⁷

In an analysis of swatches from operating room scrubs (unwashed, facility-laundered, home-laundered, new cloth, new disposable), researchers found a significantly higher total bacterial count on home-laundered swatches than facilitylaundered. There was no statistical difference in the bacteria counts between hospital-laundered scrubs and unused new and disposable scrubs. Some 44% of home-laundered swatches were positive for coliform bacteria.¹⁸

A 2007 study examined the capacity of a typical homelaundering process (wash cycle with detergent alone, rinse cycle and a 28-minute permanent press drying cycle), finding that significant concentrations of tested viruses *(adenovirus, rotavirus, and hepatitis A virus)* survived the process. The study further demonstrated these viruses could be transferred from contaminated garments to uncontaminated ones.¹⁹

Previous research indicated washing uniforms at 140/60 to 150/65 can decontaminate with proper drying or ironing after the wash—but it's often been noted this practice may not be consistent.

Greater control over all aspects of the process has been the key differentiator for linen and uniform service laundering in delivering proper hygiene: the ability to tailor wash parameters more accurately to match the soil level of the load and more flexibility in the choice of detergent and laundry additives (such as sours).

Hygienically Clean Healthcare certification is pioneering microbiological testing in North America.

In healthcare laundries across the globe, routine microbiological testing of clean textile quality has been a mainstay for 40 years. Hygienically Clean Healthcare introduced this concept to North America in 2011. Certified laundries pass three rounds of outcome-based microbiological testing to qualify for initial certification and repeated such testing quarterly to maintain the designation.

Just as important, Hygienically Clean Healthcare certified laundries are required to apply best management practices following quality assurance principles aligned with ISO standards. These requirements and controls include product handling and sorting, water temperature, chemical formulations and injections, water extraction, drying, folding, packaging and delivery.

These process and outcome measures "work together to virtually eliminate bacteria that is present on uniforms worn in a hospital."²⁰

A 2019 assessment of techniques for eliminating microbial contamination from textiles noted the global underpinnings of TRSA Hygienically Clean certification. The program is grounded in the European Union standard (EN 16616) that requires textiles to be disinfected to levels appropriate for the different businesses in which they are used. Microbiological content thresholds for healthcare, for example, are more stringent than those for food processing, restaurants or hotels. Proof is required of absence of bacteria (*E. coli, S. aureus, P. aeruginosa and Enterococcus hirae*), yeasts (*C. albicans*) and mold (*Aspergillus brasiliensis*) after laundering.²¹

Also underlying Hygienically Clean is the EU standard for risk analysis and biocontamination control (EN 14065) requiring documentation of laundry techniques that ensure prevention of microbial contamination on persons or products within the laundering process and textile utilization cycle. This standard leaves threshold-setting requirements to EN 16616 but requires testing to evaluate antimicrobial efficacy.

Legal restrictions on wearing healthcare garments outside the workplace are scant

Some countries require health service providers to clean and provide clean uniforms to healthcare workers. Employees change into hospital-provided scrubs when they arrive at work and even wear sanitized plastic shoes, also provided by the hospital. At the end of work shifts, employees change back into their street clothes before going home.²²

Ensuring healthcare garments are not taken outside the hospital has combined with hand washing, sterilization and screening to be credited in Denmark to reducing to 1% staph infections involving resistant strains of bacteria. In recent years in the United States, these infections have surged to 50% in some hospitals.

The U.S. Occupational Safety and Health Administration (OSHA) states that "employers are required to launder employee-owned scrubs that have become visibly contaminated during work; scrubs not soiled with blood or virulent matter may be laundered at home." But no regulation stops hospital employees from wearing their healthcare garments to and from work. Nor is there a nationally sanctioned scrub laundering method adopted as the standard of care. The CDC offers no recommendation on how or where to launder garments.²³

While it's common practice in Germany, Austria and the United States for healthcare worker uniforms to be laundered by the employer, either by its own laundry or a contracted linen and uniform service, there has been an increase in adoption in home laundering of uniforms in the United Kingdom, Australia and the Republic of Ireland. Some healthcare facilities in the United States prefer home laundering to reduce employer costs and for the convenience of staff.²⁴

In response to COVID-19, the U.K. government initially recommended that uniforms should be laundered professionally where possible. This guidance was then superseded by recommendations to follow local domestic uniform laundering guidelines in August 2020 from Public Health England. Top NHS officials delegate responsibility for setting such guidelines to local operations, each operated by a separate trust. It was reported that information provided on laundering uniforms varied between the trusts and there were some instances of incorrect information being given.

NHS implementation guidelines don't rule out home washing. They seem to favor industrial laundering but hedge, advising wearers to:

- Change into and out of uniform at work or cover uniform completely when traveling to and from work. There is no evidence of an infection risk from traveling in uniform, but many people perceive it to be unhygienic.
- Put on a clean uniform at the start of every shift.

The guidelines tell wearers not to:

- Go shopping in uniform or engage in other activities outside work. Even though there is no evidence of infection risk, people perceive there is one.
- Overload the washing machine; it will reduce wash efficiency.

In advising on home washing practices, hints are dropped that it takes time to get it right:

- Clean washing machines and tumble dryers regularly in accordance with manufacturer's instructions. Regular cleaning and maintenance protect washing efficiency. Dirty or underperforming machines may lead to contamination of clothing, although there is no published evidence that this presents an infection risk.
- Wash heavily soiled uniforms separately. This will eliminate any possible cross-contamination from high levels of soiling and enable the uniform to be washed at the highest recommended temperature.

Employers are advised to have at least enough uniforms available for staff to change each day so they can start each day with a clean uniform, presenting a professional appearance.

Outpatient surgery facilities still have staff wash at home

. . .

AORN recommends garment processing by certified healthcare laundries.

The Association of periOperative Registered Nurses (AORN) has long been the leading U.S. voice on uniform hygiene, examining risks to patients and surgery workers from the use of home laundered scrubs and issuing its own guidelines for laundering surgical attire. AORN recommendations are specific to the potential risk in the operating room environment, but they highlight an issue that is critical in all areas of patient care throughout the healthcare environment.²⁵

Commenting on its updated 2019 attire guideline, AORN suggests laundering scrubs at healthcare-accredited laundry facilities or onsite if a healthcare facility has the proper equipment and can meet state regulatory requirements or the CDC's recommendations for laundering. Rationale in the guideline provides a review of the evidence on home laundering.

AORN takes aim at outpatient surgery facilities, noting they still frequently have their staff members wash their scrubs at home when home washing machines are not monitored for quality, consistency or safety, and many energy-efficient home washers don't get hot enough or agitate enough. In addition, retail detergents usually aren't powerful enough to properly clean soiled scrubs. 60% of consumers admitted concern about scrubs worn outside medical facilities.

. . .

. . .

The Joint Commission passes the buck.

This contrasts somewhat with the statement of the Joint Commission, the nation's oldest and largest standardssetting and accrediting body in healthcare, on laundering attire including surgical scrubs and uniforms. Its standards do not prohibit employer laundering. Instead, the Joint Commission calls for healthcare organizations to adhere to applicable federal (e.g. OSHA), state and local regulations (e.g., licensing requirements), and if deemed, Centers for Medicare and Medicaid (CMS) Conditions of Participation and/or Conditions of Coverage.²⁶

While CMS has no laundering requirements, CMS and the Joint Commission recommend consulting evidence-based guidelines for best practices and considering their adoption. These include those from AORN, AST and the American College of Surgeons.

The Joint Commission advocates in its Perspectives (2019) for a hierarchical approach to infection control standards in developing infection control related policies. This includes procedures for laundering surgical scrubs or attire not designated as personal protective equipment (PPE) and worn in the healthcare setting.

The Joint Commission also notes that the OSHA bloodborne pathogens standard requires uniforms soiled with blood or potentially infectious materials to be laundered by the employer at no cost to the employee. For non-visiblycontaminated non-PPE, organizations should determine what requirements apply for providing clean attire. Some states require that hospitals and ambulatory care facilities provide hospital laundered scrubs for restricted or semi-restricted areas. State requirements may be more stringent and prescriptive than those from OSHA.

TRSA studies reveal poor optics.

In August 2021, TRSA surveyed 1,000 consumers, each of whom had recent experience with industries including healthcare that use linen and uniform services. Respondents were a nationally representative mix of gender, age, ethnicity, and regional demographics to ensure a variety of perspectives.

More than half (60%) of respondents admitted concern about scrubs being worn outside of medical facilities and the possibility of resulting germ transfer. After mentioning that some hospitals make staff responsible for cleaning their own scrubs, even more (two-thirds) said they were concerned about such laundering and germ transfer. A strong majority (81%) expressed preference for a policy in which medical facilities use professional laundering. For almost half of patients, the absence of professional laundering changes patient behavior and compromises trust.

A 2015 TRSA study of 700 adults regarding consumer perceptions of linens and uniforms asked respondents if they were concerned about medical professionals bringing germs into the outside world or back to healthcare facilities by wearing healthcare garments outside such facilities. More than two thirds said they were somewhat or very concerned.

The same survey found that more than eight in 10 respondents believe that professional cleaning will result in cleaner lab coats than a policy that charges workers with washing their own.

Healthcare wearers perceive the problem and favor change.

Respondents to a 2021 survey of infection prevention personnel were asked about their awareness regarding healthcare apparel contamination.²⁷ About three in four said they knew that:

- Doctors' neckties carry infectious bacteria
- Most clinician uniforms are contaminated with potentially infectious bacteria
- Clothing and linens can contribute to MRSA outbreaks
- Bacteria like VRE can be transferred to and from fabrics and people

Almost 95% were aware that it had been recommended that any apparel worn at the bedside that contacts the patient or patient environment should be laundered after daily use.

Asked for their opinions:

- Healthcare worker apparel poses a potential risk for pathogen transmission (91% agreed)
- Clearer guidance and recommended best practices are needed as to the dangers of such transmission (97%)
- Healthcare workers should change clothing immediately before and after working a shift within my healthcare facility to prevent cross contamination between work, the community, and my home (91%)
- Favor my healthcare facility providing and laundering my work apparel (77% strongly agree or agree)

A 2021 survey of healthcare workers in various professions and nursing students indicated 86% laundered their uniforms domestically. Respondents were confident they laundered their uniforms appropriately (71%). However, 17% failed to launder at the recommended temperature (140/60). Most participants (68%) indicated a preference for employerlaundered uniforms, with mixed negative emotions towards domestic laundering.

A limited number (12%) were offered industrially laundered scrubs in place of their uniform in response to the COVID-19 pandemic. Most continued to wear their normal uniform (87%). Employees working in an area where patients were acutely unwell were more likely to receive this offer than those in non-acute areas. The 86% majority of laundering at home was not surprising considering that only 1% said laundering was available on-premises and 1% said industrial laundering was being performed.

Despite NHS workwear guidelines that call for a fresh uniform at the start of each shift, 12% of respondents stated that they did not have enough. The median number of uniforms issued to each nurse was three. There was no significant association between not having enough uniforms and working on COVID-19 wards or with acutely unwell patients.²⁸

Mainstream media is paying attention.

A 2020 *Forbes* column in the early COVID-19 days noted that healthcare workers had borne the brunt of public opinion regarding the risk of wearing their uniforms in public. The author noted "regrettable" social media reports of harassment of wearers. Given that they are on the front line, some have gotten very sick and a number have died. They deserve compassion and admiration.²⁹

The *Forbes* author noted a *Washington Post* op-ed in which a pediatric emergency physician describes her routine for taking off her scrubs on her doorstep when she arrives home at 7 a.m. after a shift. It starts with shoes, which she thought about leaving at work, but would still have to exit the building in other shoes, which would defeat the purpose. She puts her contaminated shoes in a box where they will remain until the next shift.³⁰

Next is her jacket, which had been carefully wiped down with bleach before she left the hospital. Pants are rolled down from the waist, shirt rolled up. "There is no evidence that you can catch the virus from breathing in particles that pass over your mouth from a shirt that may be a fomite, but you hold your breath anyway as you pull the shirt past your face," she writes.

All are thrown into a towel she'd left on a porch prior to leaving for work. Standing in her underwear and socks, she texts her partner to keep the kids away, adds the socks to the towel and rolls it up, walks through the door and heads immediately for a shower.

In the United Kingdom, it's a disciplinary offense in most NHS hospitals to wear scrubs to and from work, the *Forbes* author

noted. (So those wearers at least change at work.) In the 15 years he lived there and the Netherlands, he "hardly ever saw" nursing or physician staff wearing scrubs in public places. He recounted that decades ago, in many U.S. hospitals, "the original policy regarding the wearing of scrubs was that the clothing was not allowed uncovered outside the hospital grounds."

He added that modern-day "scrubs" (short-sleeve V-neck shirt, drawstring pants) became commonplace attire for medical professionals by the 1970s. Originally intended to protect patients in the operating room, they were designed as an infection control barrier, to be worn only in a "scrubbed" environment.

More than half of respondents are dissatisfied with changing facilities

Industrial-scale laundering fosters cleanliness best

In institutional or industrial laundering, economic incentives ensure best practices are followed to remove soil. A hospital or healthcare co-op laundry manager, to maintain his/her employment, must ensure washing, drying and finishing equipment functions properly. An outsourced laundry business owner, to keep the operation viable, must do the same. Home laundering carries no such economic incentive.

It's more likely that an industrial-scale laundry (linen and uniform service) will be certified by a third party for cleanliness than a smaller on-premises laundry. TRSA's Hygienically Clean Healthcare certification program now has more than a decade of quantifying microbiological content of laundered items. Before the program's inception, there were no North American thresholds for such content. Now such measurement is routine for certified launderers.

To qualify, they must pass three rounds of outcome-based microbial testing indicating diminished presence of yeast, mold and harmful bacteria; to maintain certification, they must pass such tests quarterly. This helps ensure that as laundry conditions change, such as water quality, textile fabric composition and wash chemistry, laundered product quality is consistently maintained.

Inspection and re-inspection of laundries verify that items are washed, dried, ironed, packed, transported and delivered using best management practices (BMPs) to meet key disinfection criteria. Experts in bacteriology, infection control, nursing and other healthcare professions serve on the Hygienically Clean Healthcare Advisory Board, working with these linen and uniform service providers to ensure the certification continues to enforce the highest standards for producing clean healthcare textiles. Certified companies meet as the Hygienically Clean Healthcare User Group to report updates to the Advisory Board, which implements improvements. This collaboration serves to steadily improve BMPs for sorting, handling, processing and finishing linens and garments.

Changing clothes at work must become routine for all healthcare wearers

In the 2021 survey of healthcare workers in various professions and nursing students, 64% said they change out of their uniforms at the hospital. A total of 16% said they change on the home doorstep (2%), immediately on home entry (13%) or within 30 minutes of arriving at home (1%). The other 20% indicated they do so somewhere else (other) or they didn't answer the question.

When questioned on what facilities are needed in their hospital to change uniforms, less than 1% (just nine of the 1,277 respondents) stated that there were sufficient facilities for this while 13% called for such facilities to be added to their own department. But the most popular responses suggested that all wards could benefit (40%) as well as all areas of the hospital (28%). Given the chance to address this matter in a free-text question, more than two thirds of such responses (148 of 219 free-text respondents) referred to the need to provide or improve such facilities.

Slightly over half of all respondents were dissatisfied with current changing facilities at their workplaces (51%), compared with 37% who were satisfied and 56% who said they had to launder at home due to a lack of appropriate changing facilities. The researchers point to this as evidence that improved changing facilities could compel healthcare workers to change at work, affecting both laundering and travel to and from work.

In free-text answers, comments that changing facilities should be increased in number—and that hospitals need to offer more space, lockers, toilets and showers—included:

- "Impossible to social distance in current staff locker rooms. One shower in [designated] male locker room for numerous staff often [means queues] of people waiting on a morning following walking, running or cycling to work!"
- "At the moment, the only private facility I have to change at work is a single staff toilet cubicle used by approximately 25 people at the busiest time! People occasionally get changed in the staff room, but there is no lock on the door, so anyone, male or female can come in at any time."

- "If I change at work, we cannot socially distance and there is always the risk a member of staff of the opposite sex will come in while we are changing. [There] is no shower."
- "I use public transport so I agree it is safer for me to change before and after work. However getting changed in the staff toilet or a box linen room that you can't move in is not nice. I would also like to leave my belongings in a secure place."
- "I worry about changing in the toilets. It does not seem hygienic."
- "Larger changing facilities and shower facilities are a must to prevent further risk and spread of multi-resistant infections around hospitals, communities and our homes."

The survey's authors' conclusions point to renting uniforms as an effective fix.

They don't mention this form of laundry outsourcing as such, but their observations play to its strengths, such as:

Inventory is commingled between hospital customers, providing more abundant supply that linen rental services manage for these customers.

Some wearers said they don't have enough uniforms to wear a fresh one for each shift, a key recommendation in the NHS uniform guidelines. This leads them to rely on continuous cleaning and drying of their uniforms, which shortens garment life. Short inventory is also problematic when uniforms need to be changed during a shift due to contamination. Reusing worn and contaminated uniforms could pose an infection control risk.

Combining better changing facilities with a rental uniform program could control operating costs.

Economies in garment purchasing achieved by uniform rental companies benefit customers such as hospitals that don't get the same volume discount from buying their own uniforms. They receive the greatest value from rental when they negotiate charges based on a fixed number of garments provided for an appropriate time period (extras can be ordered) and encourage workers to leave their uniforms at work for the rental service to pick up, launder and re-deliver. While improving changing facilities would incur capital costs, savings from rental would pay off this investment.

Rental laundries are incentivized to maximize hygiene. Combining better changing facilities with a rental uniform program would control operating costs.

Economies in garment purchasing achieved by uniform rental companies benefit customers such as hospitals that don't get the same volume discount from buying their own uniforms. They receive the greatest value from rental when they negotiate charges based on a fixed number of garments provided for an appropriate time period (extras can be ordered) and encourage workers to leave their uniforms at work for the rental service to pick up, launder and re-deliver. While improving changing facilities would incur capital costs, savings from rental could pay off this investment.

The authors point out that while most wearers said they follow home laundering guidelines, this is no guarantee. Laundering may be influenced by variation in job role in addition to demographic factors such as age and educational attainment: older people tend to use higher wash temperatures and people with higher education tend to use the correct amount of detergent in each wash. Laundering policy adherence is also dubious because it relies on a hospital's dedication to informing and policing wearers. This contrasts with outsourcing to rental laundry professionals, who are financially incentivized to ensure contamination removal and are guided by third-party certification to achieve it.

Most employees in the survey (67%) said they believe home laundering is normal and expected. Nearly as many, though (65%), said that if given a choice, they would prefer their workplaces handle this task. Add to this the public's view of wearing healthcare uniforms outside healthcare facilities as unhygienic and ceasing home laundering and encouraging in-facility changing is the popular choice as well as the scientific consensus.

References

- Sally F. Bloomfield, et al., "The Infection Risks Associated With Clothing and Household Linens in Home and Everyday Life Settings, and the Role of Laundry," *International Scientific Forum on Home Hygiene*, April 2011
- Lucy Owen, Katie Laird, Maitreyi Shivkumar, "The stability of model human coronaviruses on textiles in the environment and during health care laundering," *mSphere* 6:e00316-21, April 2021
- Tara Parker-Pope, "The doctor's hands are germ-free. The scrubs too?" New York Times, September 2008
- "Guide to the Elimination of Methicillin-Resistant Staphylococcus aureus (MRSA) Transmission in Hospital Settings, 2nd Edition," Association of Professionals in Infection Control and Epidemiology (APIC), 2010
- Carolyn L. Twomey, Heather Beitz, Helen Boehm Johnson, "Bacterial Contamination of Surgical Scrubs and Laundering Mechanisms," *Infection Control Today*, July 2011
- Christina M. Vera, Tony Umadhay, Marquessa Fisher, "Laundering Methods for Reusable Surgical Scrubs: A Literature Review" AANA Journal, August 2016
- Shaneka N. Wright, Joanna S. Busowski, et al., "Gordonia bronchialis sternal wound infection in 3 patients following open heart surgery: intraoperative transmission from a healthcare worker," *Infection Control* & Hospital Epidemiology, December 2012
- "Study Shows Bacterial Contamination Associated with Home-Laundered Surgical Scrubs Is Significantly Greater Than Other Options," *Infection Control Today*, January 2010.
- Owen and Laird, "The role of textiles as fomites in the healthcare environment: a review of the infection control risk," *PeerJ* 8:e9790, August 2020
- **10.** Owen and Laird, "Domestic laundering of nurses' uniforms: what are the risks?" *Nursing Times*, January 2018
- Owen, Laird, et. al., "Healthcare worker knowledge and attitudes towards uniform laundering during the COVID-19 pandemic," *American Journal* of *Infection Control*, December 2021
- **12.** Nicola Merrifield, "Half of hospital staff failing to adequately wash uniforms at home," *Nursing Times (U.K.)*, March 2015
- **13.** Marie-Anne Sanon and Sally Watkins, "Nurses' Uniforms: How Many Bacteria Do They Carry After One Shift?" *Journal of Public Health and Epidemiology*, December 2012.
- 14. Vera, Umadhay, Fisher, Ibid

- U.S. Centers for Disease Control and Prevention, Guidelines for Environmental Infection Control in Health-Care Facilities, Laundry and Bedding, https://www.cdc.gov/infectioncontrol/guidelines/environmental/ background/laundry.html, November 2015
- "How hazardous are nurses' uniforms?" Laundry Cleaning and Technology, January 2023
- Association of Surgical Technologists, AST Guidelines for Best Practices for Laundering Scrub Attire, April 2017
- Jeanne M. Nordstrom, Kelly A. Reynolds, Charles P. Gerba, "Comparison of bacteria on new, disposable, laundered, and unlaundered hospital scrubs," *American Journal of Infection Control*, December 2011
- Carolyn L. Twomey, Heather Beitz, Helen Boehm Johnson, "Bacterial Contamination of Surgical Scrubs and Laundering Mechanisms," *Infection Control Today*, July 2011
- 20. Chuck Rossmiller, "Is Home Laundering of Scrub Attire Safe And Effective?" *The Advantage: The Online Magazine for Universal Unilink Members*, November 2015.
- 21. Dirk P. Bockmüh, Jan Schages, Laura Rehberg, "Laundry and textile hygiene in healthcare and beyond," *Microbial Cell*, January 2019
- **22.** Samon and Watkins, Ibid
- Christina M. Vera, Tony Umadhay, Marquessa Fisher, "Laundering Methods for Reusable Surgical Scrubs: A Literature Review," AANA Journal, August 2016
- 24. National Health Service, Uniforms and workwear: guidance for NHS employers, April 2020
- Joe Paone, "Infection Prevention: The Latest on Surgical Attire Recommendations," *Outpatient Surgery*, January 2022
- Joint Commission, "Laundering Attire Including Surgical Scrubs and Uniforms," October 2021
- Kelly M. Pyrek, "Healthcare Personnel Attire: Domestic Versus Industrial Laundering and the Implications for Infection Prevention," *Healthcare Hygiene Magazine*, August 2021
- 28. Owen, Laird, et. al., 2021, Ibid
- Joshua Cohen, "Wearing Medical Scrubs In Public In The Age Of Coronavirus," *Forbes*, April 2020.
- Sabreen Akhter, "Your hospital shift is done. You ditch your contaminated scrubs on your porch," Washington Post, March 2020.



Hygienically Clean Linens and Uniforms

1800 Diagonal Road, Suite 200 Alexandra, VA 22314 877.770.9274 To3.519.0029 www.hygienicallyclean.org