Re-visiting contact precautions – 25 years on

Editorial

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In a recent attempt to conduct a systematic review for evidence for the efficacy of contact precautions in preventing the transmission of respiratory viruses of concern, no evidence was found. Understandably, in the early days of the COVID-19 pandemic when there was little information about routes of transmission and high levels of concern, a full range of precautions were applied including contact precautions (CP). However, the legacy of this approach needs careful evaluation in the context of widespread unsafe use of personal protective equipment (PPE), and significant transmission of both SARS-CoV-2 and other pathogens during the pandemic. There is a danger that CP is perceived as the best 'precautionary' approach to minimising transmission of infection with scant regard for evidence for its efficacy or consideration of the rationale and risks associated with it.

The term 'contact precautions' was first used by the Healthcare Infection Control Practices Advisory Committee (HICPAC) in a guideline on isolation precautions published in 1996. This guideline introduced the concept of Standard Precautions (SP), which was designed to reduce transmission of organisms by direct and indirect contact in all areas of healthcare. In applying these principles in the care of all patients, it enabled many diseases or conditions to be managed without additional precautions. By making this a standard approach for all patients, specific additional precautions for infections spread by contact with blood and body fluid became redundant.

In addition to Standard Precautions, Garner (1996) recommended using CP for '*specified patients known or suspected to be infected or colonized with epidemiologically important microorganisms that can be transmitted by direct contact with the patient (hand or skin-to-skin contact that occurs when performing patient-care activities that require touching the patient's dry skin) or indirect contact (touching) with environmental surfaces or patient-care items in the patient's environment'*. CP was suggested for use with infections deemed to be of 'special clinical or epidemiological significance' (either locally or nationally), those where skin contamination was likely e.g. impetigo or some infections in infants, and infections such as *C. difficile* where prolonged environmental survival was possible. This guidance was not based on the standards of systematic evidence review that would be expected today. Recommendations were categorised as 'strongly recommended' if '*reviewed as effective by experts in the field and a consensus of HICPAC on the basis of strong rationale and suggestive evidence, even though definitive scientific studies have not been done*.'

The concept of CP remained the same when the guideline was updated and again was not subject to systematic review of epidemiological evidence of need or efficacy. Recommendations were based on 'theoretical rationale' and whilst evidence for problems with adherence was considered, recommendations for strategies to improve adherence were not included (Siegel et al, 2007).

There is a clear inconsistency in applying a routine standard of care to minimise transmission of pathogens by direct and indirect contact (SP) whilst at the same time designating additional precautions (CP) for organisms deemed to be 'epidemiological significant'. As Jackson and Lynch pointed out at the time CP were conceived, this implies that SP are not adequate for reducing the risks of contact transmission for any organisms (Jackson and Lynch, 1996). Most pathogens can be spread by contact of one sort or another, with the extent to which they contaminate the environment related to the nature of the patient's illness and the ability of the pathogen to survive for prolonged periods on surfaces. This is precisely why SP incorporates decontamination of equipment, the environment and hands as critical to interrupting transmission, and also includes consideration of patient placement (Siegel, 2007). The imprecise definition of why a specific pathogen may merit CP has led to it being applied widely with a lack of clarity about what the additional precautions are aimed at, or likely to achieve. In some examples of transmission-based precautions (Scottish National Infection Control Manual, 2021) a wide range of organisms are deemed to be transmitted by contact and require single room accommodation with CP. These include infections for which

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person-to-person transmission is specifically related to contact with blood and body fluid or infected lesions and where SP provides appropriate controls e.g. salmonella, shingles, *Bacillus cereus*, extrapulmonary tuberculosis, various bacterial infections in normally sterile sites such as urinary tract or wound infections. The evidence and theoretical rationale for categorising these infections in this way is not clear.

If an assumption underpinning CP is that contact with the environment is a major factor in transmission, then it should be expected that PPE becomes readily contaminated though contact with the environment. A few pathogens such as *C. difficile* and enterococci are recognised to persist in the environment and may therefore justify the use of CP, although the extent to which the environment contributes to transmission and PPE reduces the risk is less clear. A recent study by Jackson et al (2018) found that VRE was isolated from the gloves or gowns of 15% of healthcare staff following contact with VRE patients (with gloves twice as likely as gowns to be contaminated). Those who had direct contact with the patient were most likely to be contaminated, with the independent predictors of contamination being touching the patient's skin (OR, 2.18; 95% CI, 1.15–4.13) and transferring the patient in or out of bed (OR, 2.66; 95% CI, 1.15–6.43). Of course, removal of the gloves would remove contamination (provided hand hygiene was performed after removal) but similarly hand hygiene without the use of gloves would also eliminate contamination.

Undoubtedly the evidence underpinning IPC practice is often poor quality or absent. However, this does not obviate the need to systematically evaluate all the available evidence and ensure that recommendations are clearly underpinned by it. A systematic review by Cohen et al (2015) identified 6 studies that measured the effect of CP on MDRO transmission, 5 of which concluded that CP did not significantly improve MDRO control and one reported a decreased colonisation rate of drug resistant *A. baumannii* when CP were used compared to no patient isolation. Studies commonly introduce CP in combination with enhanced screening and isolation and therefore the specific effect of CP cannot be distinguished (Marshall et al, 2013). Bearman et al (2018) used an interrupted time series study with sequential introduction of different infection control measures and found that stopping CP on MRSA colonised/infected patients significantly reduced rather than increased new acquisitions of MRSA (CP not in place 2.88 vs CP in place 5.19/100,000 PD, $p = 0.026$).

In specific guidance on the application of CP, staff are recommended to don PPE on room entry and discard on exit, in order to contain pathogens. In addition, gloves and gowns are recommended when touching patients' intact skin or surfaces in close proximity to the patient. However, specific guidance on the importance of changing gloves between tasks to protect the patient from infection is lacking. This is a major oversight given that patients colonised with multidrug resistant organisms (MDRO) are vulnerable to infection if these organisms gain access to invasive devices or non-intact skin (Siegel et al, 2007).

The purpose of standard precautions is to use hand hygiene to interrupt transmission of pathogens acquired by touch from patients or surfaces. The same principles apply for pathogens acquired by touch when a patient is known to have an infection or pathogen of concern – so why the need for gloves? Perhaps the rationale for CP is that staff cannot be trusted to wash their hands therefore it is better that they wear gloves (Jackson and Lynch, 1996). However, this strategy is of little benefit if staff do not change their gloves and then cross contaminate both susceptible sites on the same patient or other surfaces and patients with contaminated gloves. There is a wealth of evidence that gloves are commonly contaminated and misused in this way (Loveday et al, 2014; Wilson et al, 2017a). Making clean gloves available in isolation rooms is a critical step in encouraging staff to change gloves between tasks and yet all too often gloves are placed outside of the room in a misguided attempt to prevent contamination of fomites. Given that SP requires that gloves should be worn for contact with body fluids, the only additional value of gloves relates to contact with the patient's skin or environmental surfaces where the concentration of pathogens will be considerably lower.

As predicted by Jackson and Lynch (1996), focusing on PPE as a control measure for general contact with patients, especially for patients colonised with MDRO, has created the impression among staff that SP are not adequate, that gloves are essential to preventing infection and protecting themselves and should therefore be worn routinely for contact with patients (Wilson et al, 2017a, 2017b). In so doing, staff lose sight of the risk that gloves present to the patients they are caring for and stop applying the principles of the 5 moments of hand hygiene (Wilson et al, 2017b). The SARS-CoV2 pandemic has clearly demonstrated that the persistent use of PPE in ICU settings has transmitted pathogens between patients and caused marked increases in bloodstream infections as pathogens are introduced to susceptible sites on vulnerable patients (Baskaran et al, 2021; Patel et al, 2021). Gloves worn for caring for a patient in isolation may prevent direct contamination of staff hands, but hand hygiene readily removes pathogens and patients would be better protected from healthcare associated infection if gloves were not worn except for contact with blood and body fluids, and the focus was directed at hand decontamination.

Since CP have become established a significant body of evidence has emerged of sub-optimal adherence to the precautions. Kilpatrick et al (2008) summarised a range of evidence on the challenges of implementing single room isolation and reported that adherence to CP in particular was sub-optimal, with estimates ranging between 19% and 73%. They noted the lack of research to establish reasons for this, citing Prieto and Clark (2005) to illustrate the complex perceptions and emotions that underpin inappropriate use of

PPE in relation to contact precautions. These are not easily changed, even by intensive efforts at developing and role modelling guidance.

So what *is* the purpose of contact precautions? Evidence for their effect in preventing transmission of pathogens is lacking, the categorisation of infections deemed to require contact rather than SP is opaque, and the risks of transmission associated with the overuse and misuse of PPE are clear. The guidance that was used to establish the principle of CP is 25 years old, much has changed and a body of evidence has accumulated in this time. Transmission-based precautions need to be reconsidered to take account of what has been learnt about their efficacy and application, there needs to be a clear evidence-based rationale for when SP is not sufficient to prevent transmission, and infection prevention precautions need to be integrated into the Hierarchy of Controls approach. It is therefore high time the evidence for contact precautions is subjected to a thorough and robust review to develop evidence-based recommendations that create a safer approach to minimising the risk of transmission of pathogens in healthcare settings.

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