Royal College of Nursing

Raising the Bar

An RCN commissioned review of national and international guidelines and the evidence they present to underpin standard and transmission-based precautions

CORPORATE

Acknowledgements

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Contents

Summary

The pandemic has highlighted concerns and opportunities regarding infection prevention and control (IPC) guidance aimed at supporting health care professionals delivering care where infection risks exist to both themselves and their patients. At the heart of guidance on preventing the transmission of infection lies language and technical advice aimed at breaking the 'chain of infection'. Standard and transmission-based precautions are a core component of this and directly impact on the delivery of safe and compassionate nursing care.

The language and terminology surrounding infection prevention and control precautions has expanded since the mid-1980s, with reports that this has resulted in confusion among those responsible for implementation of guidance.

In November 2021, the RCN commissioned an independent review to identify and compare international definitions and guidance used to describe standard and transmission-based IPC precautions and reflect on the implications of these for contemporary nursing practice and the introduction of a National Infection Control Manual for England. The review inspected websites to compare terminology, paying particular attention to guidance for the use of gloves and face-coverings.

This review was undertaken prior to publication of the UK government's *Living with COVID-19 Strategy*, therefore readers should take this into account when interpreting the publication's findings and implications.

Main findings

- There is consensus across all the guidelines inspected. Standard precautions/ standard infection prevention and control precautions (SICPs) are the basic fundamental infection prevention and control strategies that should be used continuously with all patients by all staff engaged in health and social care.
- There is consensus across all guidelines. Transmission-based precautions are the additional infection prevention and control precautions required to prevent spread from patients known or suspected to have an infection when standard precautions alone would not be sufficient to contain spread.
- Similarity in terminology across guidelines is not surprising given the inter-relationships between the guidelines and the way that guidance offered by one organisation has influenced recommendations issued by the others. Confusion might exist because infection prevention and control teams have interpreted and implemented the guidelines differently.
- Since the introduction of the term 'transmission-based precautions' in 1996, three categories of precautions have been recognised and applied: contact, droplet, and airborne precautions.
- The need for contact precautions has been questioned on the basis that if standard precautions are followed correctly and conscientiously with adherence to hand hygiene, contact precautions would be unnecessary (in most cases), helping to reduce the inappropriate use of non-sterile gloves, contain the costs of health care and promote sustainability.
- Indications for the use of gloves (which type to use and when to wear them) are the same in all contemporary guidelines irrespective of whether they are used as part standard precautions or in addition to standard precautions. Recommendations for the use of gloves appear to be pragmatic good practice points and not based on empirical evidence.
- Indications for the use of face coverings (what type to use and when to wear them) are not the same in all guidelines. In the current pandemic situation, continuing use of the terms 'droplet' and 'airborne' precautions is unhelpful. It has resulted in conflict of opinion surrounding the use of personal protective equipment, specifically face coverings. Current IPC guidance does not appear to align with the World Health Organization definition of how Coronavirus disease is transmitted leaving many health care workers at risk from infection in the workplace due to variation in the application of use in personal protective equipment (PPE) (WHO, 2021).

Recommendations

Research undertaken during the 2020/2021 COVID-19 pandemic should be used to update information to prevent the spread of respiratory pathogens in transmission-based IPC guidelines as soon as practical. A clear statement regarding any assumptions/evidence that are used in the process should be included. Patients and front-line practitioners should be involved in the process of guideline development to ensure that they have confidence in the recommendations.

Information about the updated guidelines should be communicated to employers, managers and health workers as soon as practical, accompanied by an implementation plan.

Implementation of the updated guidelines should be monitored in premises where health and social care are delivered. The findings should be reported to trust boards with benchmarking between organisations and feedback to staff.

All organisations delivering health care in the UK undertake routine audit of hand hygiene adherence. Hand hygiene audit should be extended to cover the other key elements of SICPs, in particular glove use.

The updated guidelines should be evaluated in terms of acceptability, practicality and effectiveness within an agreed period following implementation and thereafter.

Recommendations for updated IPC guidelines should be developed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) and information and recommendations should be stated succinctly and be designed to be as acceptable to health workers and as practical as possible. Australian guidance, although not complete in the version presented on the website, is an example where GRADE is used very clearly. demonstrating clear links between the evidence and recommendations.

Although there is a plethora of guidance, much is either relatively old, or uses outdated methods, particularly for the translation of evidence into recommendations. It is important for practitioners and patients that decision-making, and recommendations are transparent; and we would suggest that clearer guidance where this is explicit is produced for the United Kingdom, along the lines of those from Australia.

Background

Introduction

The language and terminology surrounding infection prevention and control (IPC) precautions has been expanding since the mid-1980s. Confusion has been reported among managers and health workers responsible for implementation (Birnbaum et al., 1990; Curran, 2015). There is for example considerable uncertainty about when to wear gloves (Jain et al., 2017) and reports that they are over-used and used inappropriately (Wilson et al., 2015). More recently health workers have reported conflicting advice concerning the most appropriate personal protective equipment (PPE) when managing patients with respiratory infection (eg severe acute respiratory syndrome, middle eastern respiratory syndrome, COVID-19). Ease of use, acceptability to health workers and practicality are important factors to consider when guidelines are developed and implemented, especially when there is conflict between local and international recommendations (Houghton et al., 2020).

In this report historical events in the development of IPC guidelines are described. The report also identifies and compares international and national definitions and guidance used to describe the terms 'standard precautions' and 'transmission-based precautions' and offers recommendations to improve practice.

Aims of the review

1. Identify and compare international definitions and guidance used to describe standard and transmission-based IPC precautions.
2. Analyse the international evidence base underpinning standard and transmission-based precautions.
3. Summarise the findings and reflect on the implications for contemporary nursing practice, including the use of resources.
4. Make recommendations for contemporary UK nursing practice based on the findings.

Methods

The reviewers inspected websites to compare the terms used to describe IPC precautions, paying particular attention to guidance for the use of gloves and face-coverings. They assessed whether the guideline recommendations had been developed according to good practice using the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) or an equivalent guideline development tools. These include SIGN and AGREE.

Guideline development tools reviewed

Although the review considered methodologies below, the overarching purpose was not to provide a detailed critique of the method of guideline production but rather assess how the evidence has been translated into recommendations.

Grading of Recommendations, Assessment, Development and Evaluations

GRADE is widely used for rating the quality of a body of evidence used to answer a clinical question, presenting a summary of that evidence, and then turning it into a recommendation. Within this system there is clear separation between judgements about the quality of evidence and the strength of recommendations, as there are other factors that need to be taken into account when making recommendations. These are contained within the Evidence to Decision Frameworks, but in summary comprise: the balance between desirable and undesirable outcomes; an assessment of values and preferences and their variability; the resources used; cost-effectiveness; equity; acceptability and feasibility; as well as a judgement about the overall quality of evidence (Alonso-Coello et al., 2016). Making a judgement about each of these provides a guideline development group with evidence to make one of five recommendations: a strong recommendation for or against an action; a weak recommendation; or no recommendation at all. Importantly GRADE makes judgements on the body of evidence used to answer a clinical question and separates recommendations into those that are critical, important but not critical, or of limited importance for decision making (Schünemann et al., 2013).

For a guideline to safely make recommendations, it is important that the development team includes representatives of those who will use the guidance. Systematic reviewers are not usually able to weigh the relative trade-offs between the desirable and undesirable consequences of a recommendation (Balshem et al., 2011). There is a strong argument that this applies even if systematic reviewers have a background in the area of interest, unless they are current recipients of the guidance.

Methods that assess evidence simply based on methodology or risk of bias fail to recognise that a body of evidence comprises more than this. Confidence in effect estimates may be affected by imprecision, inconsistency, indirectness, and publication bias, as well as method. Furthermore, a strong body of observational evidence may be preferable to a weaker randomised controlled trial, and expert opinion is not a level of evidence, but rather an interpretation of evidence. It is the latter that is of concern when assessing guidance (Schünemann et al., 2013) and has been a central theme throughout the pandemic regarding the development of IPC guidance.

SIGN

Although SIGN 50 contains elements of a robust methodology, the recommendations ignore the other key factors included in GRADE. A major drawback of SIGN 50 is that it includes expert opinion as a level of evidence, contrary to GRADE. The guidance states "the grade of recommendation relates to the strength of the evidence on which the recommendation is based. It does not reflect the clinical importance of the recommendation" (p.51). Nevertheless, the document it is unclear about the other factors that should be taken into account when making a recommendation and providing a strength behind it. A strength of the method is that it allows considerable flexibility when involving patients and carers in guideline development (Scottish Intercollegiate Guidelines Network et al., 2008).

AGREE

The Appraisal of Guidelines for REsearch & Evaluation (AGREE) guidance and check-list have been developed to assess the quality of guideline development and reporting (Brouwers et al., 2010).

Findings

The findings are presented in terms of the aims of the review on page 7.

Section 1. International definitions and guidance used to describe standard and transmission-based infection prevention and control precautions

Much of the thinking around IPC guidance originated in the United States but is relevant to this report as it has influenced practice in many countries, including the UK. Section 1 outlines early guidance before presenting contemporary guidelines.

Early guidance

Category-specific isolation

Until the mid-1980s specific IPC precautions were reserved for patients known or suspected to have a specific infection. Guidelines developed in the UK by the Hospital Infection Committee of the Medical Research Council suggested three categories: standard, stool-urine-needle and strict isolation (Bagshawe et al., 1978). Throughout the 1970s seven categories of isolation precautions were adopted in the US (National Communicable Disease Center, 1970): strict, respiratory, protective, enteric, wound and skin, discharge and blood. The epidemic caused by the human immunodeficiency virus (HIV) in the mid 1980s changed this approach, highlighting the risks associated with handling blood and other body fluids.

Universal precautions

HIV was identified as an occupational risk to health workers when it became apparent that transmission could occur from asymptomatic carriers and those incubating infection through blood and body fluids. The Centers for Disease Control (CDC) in the US responded by introducing universal precautions which recommended adopting the same blood and body fluid precautions for all patients. Further recommendations included the use of PPE to protect health workers from exposure to mucous membranes and to wash hands after gloves had been used (Centers for Disease Control (CDC), 1988). Body fluid precautions did not apply during contact with faeces, nasal secretions, sputum, sweat, tears, urine or vomit unless they were visibly contaminated with blood.

Body substance isolation

The introduction of universal precautions coincided with increasing awareness of the risk of health care-associated infection, prompting the development of a new system of IPC precautions called body substance isolation. These new precautions incorporated and built on universal precautions (Lynch, 1987). CDC updated its guidelines (Centers for Disease Control (CDC), 1988) to align with body substance isolation in 1988. It advocated wearing gloves to avoid contact with moist bodily substances (excluding sweat) even when blood was not visible. The recommendations stipulated that gloves must be changed after every clinical procedure but did not call for hand hygiene in the absence of visible soiling. Guidance for infections spread by the airborne route was not included and risks following contact with dry surfaces were overlooked.

Standard precautions

Standard precautions were introduced by CDC in 1996 (Garner, 1996) in response to advice from the Healthcare Infection Control Practices Advisory Committee (HICPAC). They combined universal and body substance precautions and were intended for use with all patients on all occasions: hand hygiene, PPE, applying principles for the prevention of respiratory infection and handling contaminated and potentially contaminated equipment.

Transmission-based precautions

Transmission-based precautions were introduced contemporaneously with standard precautions (Garner, 1996). They were described as the added measures required to prevent transmission from patients known or suspected to have an infection. Use was recommended in addition to standard precautions (Siegel et al., 2007). Three categories were described: contact, droplet, and airborne transmission. Empirical precautions were recommended for patients with infections not yet diagnosed until clarification became available concerning their infectious status. For pathogens spread by multiple routes, more than one category of transmission-based precautions was necessary.

i. Contact precautions

Contact precautions were intended to prevent the transmission of pathogens spread by direct or indirect contact with the patient or patient environment and when risk was considered very high either because the environment was likely to be heavily contaminated (eg copious wound drainage, faecal incontinence) or because the infection was caused by a multi-drug resistant organism (Siegel et al., 2007). Contact precautions involved nursing the patient in a single room if possible and donning gloves and a gown on entry.

ii. Droplet precautions

CDC based its droplet precautions on research dating from the 1930s which reported simulations describing the theoretical behaviour of particles according to their size (Wells, 1936). From this work it was concluded that respiratory secretions are spread in two distinct ways according to their dimensions. Transmission was dichotomised into droplet and airborne routes with different recommendations to interrupt spread from each (see Table 1). According to this school of thought, droplets are thought unlikely to remain airborne for long periods. Instead, they fall through gravity because of their relatively large size and their period of infectivity is correspondingly brief. Aerosols were thought to stay suspended for much longer and to travel much further because of their minute size.

Table 1. Respiratory transmission

Term	Definition	Implications for practice
Droplet	Transmission by large droplets, diameter > 5 µm transported via turbulent airflow generated by violent expiratory events (eg coughing or sneezing).	Most likely at close range with pathogens deposited on the conjunctivae or mucus membranes of new hosts.
Airborne/ aerosol/ droplet nuclei	Transmission via inhalation of small respiratory droplets, typically <5 µm	Remain airborne long enough to transmit the pathogen over distance and does not depend on face-to-face transmission. Pathogens are deposited deep in the respiratory tract as far as the alveoli.

Single rooms were recommended to contain spread by the droplet route, but special ventilation systems were not considered necessary. Instead, emphasis was placed on hand hygiene to contain transmission from droplets that had settled onto surfaces in the near patient environment. Infections thought to be transmitted via droplet included influenza, Neisseria meningitidis and Group A streptococci.

iii. Airborne transmission

Airborne precautions were recommended by CDC to prevent the transmission of pathogens via aerosols spread over long distances (eg measles, varicella, Mycobacterium tuberculosis). Single rooms with good ventilation were recommended for these patients. For some conditions (eg multi-drug tuberculosis) negative pressure rooms are recommended.

Contemporary definition of standard precautions

CDC updated its guidelines for isolation in 2007 and again in 2019 (Centers for Disease Control and Prevention, 2019) in response to the threats posed by emerging infectious diseases (eg SARS, prions, viral haemorrhagic fevers) but the three categories of transmission-based precautions remain as above. Today the term 'standard precautions' is still used by CDC (see Table 2).

Table 2. Centers for Disease Control: components of standard precautions

1. Hand hygiene.
2. Personal protective equipment
3. Respiratory hygiene/cough etiquette.
4. Sharps safety
5. Safe injection practices (eg aseptic technique for parenteral medications).
6. Sterilisation of equipment
7. Cleaning and disinfection of environmental surfaces.

Standard precautions have been incorporated into the IPC guidance used in many other countries. Professional organisations in the US (eg Association of Infection Prevention and Control, Society for Healthcare Epidemiology of America, Association for Professionals in Infection Control and Epidemiology) base their definitions and recommendations on those proposed by CDC.

Other international and national guidelines

World Health Organization

The WHO definition of standard precautions dates from 2007. The original webpages presenting the guidance have been taken down, but information is presented on the existing website (World Health Organization, n.d.). The WHO definition of standard precautions is very similar to that offered by CDC. Standard precautions are intended as the minimum level of precautions necessary for all patients to reduce the risk of transmitting bloodborne and other pathogens from recognised and unrecognised sources

of infection. Hand hygiene is promoted as a major component of standard precautions. The use of PPE including gloves is recommended after undertaking risk assessment. Non-sterile gloves are required when handling blood, body fluids, secretions, excretions, non-intact skin, and mucous membranes. Gloves should be changed between activities for the same patient and after contact with potentially infectious material. They should be removed after use, before touching items/surfaces that are not contaminated and before attending to another patient. Hands should always be cleansed after gloves have been removed.

'Source control measures' (not defined in the document) are incorporated into standard precautions through lessons learned during the 2002-2004 SARS pandemic. Their purpose is to prevent the spread of respiratory pathogens by applying what WHO calls 'respiratory hygiene' and 'cough etiquette': encouraging patients to cover the mouth and nose when coughing or sneezing, hand hygiene after contact with respiratory secretions and physical distancing (1 metre) when patients have respiratory symptoms. In March 2020, WHO added further information to this guidance: 'COVID-19 virus is transmitted between people through close contact and droplets, not by airborne transmission. The people most at risk of infection are those in close contact with a COVID-19 patient or who care for COVID-19 patients.' Further amendments have been made to language on the transmission of COVID-19 during the pandemic with implications for implementation of transmission-basedprecautions and the use of PPE as a result.

In April 2021, the WHO updated its webpage to read "A person can be infected when aerosols or droplets containing the virus are inhaled or come directly into contact with the eyes, nose, or mouth. The virus can also spread in poorly ventilated and/or crowded indoor settings, where people tend to spend longer periods of time. This is because aerosols remain suspended in the air or travel farther than 1 metre (long-range)" (World Health Organization, 2021)

In December 2021, the WHO updated information on 'Coronavirus disease (COVID-19): How is it transmitted? WHO reinforced risks posed by close contact with infected individuals but updated information on the mode of transmission to state 'The virus can spread from an infected person's mouth or nose in small liquid particles when they cough, sneeze, speak, sing or breathe. Another person can then contract the virus when infectious particles that pass through the air are inhaled at short range (this is often called short-range aerosol or short-range airborne transmission) or if infectious particles come into direct contact with the eyes, nose, or mouth (droplet transmission).'

Facial protection (surgical or 'procedure' masks) and a visor or goggles are recommended to protect health workers' mucous membranes during activities likely to generate splashing with blood, body fluids, secretions, and excretions. It was not possible to trace overt mention of transmission-based precautions in WHO documentation.

European Centre for Disease Control

The European Centre for Disease Control was established to identify, assess, and communicate information about current and emergency threats from communicable diseases (European Centre for Disease Prevention and Control, 2021). Its operational procedures include providing independent scientific opinions, expert advice and data on a pan-European basis, a role that it has fulfilled for COVID-19. It was not possible to trace specific reference to standard or transmission-based precautions on the ECDC website.

European Society of Clinical Microbiology and Infectious Diseases

The European Society of Clinical Microbiology and Infectious Diseases is a voluntary organisation of clinicians, scientists, and others with an interest in clinical microbiology and infectious diseases. ESCMID endorses the use of standard and contact precautions for multi-drug resistant organisms but without offering definitions (Tacconelli et al., 2014). Respiratory transmission is not considered.

Australia

The Australian Commission on Safety and Quality in Health Care defines standard precautions as the 'basic infection prevention and control strategies that apply to everyone, regardless of their perceived or confirmed infectious status' (National Health and Medical Research Council, 2019). They include hand hygiene, PPE, cleaning, and sharps handling and disposal. Transmission-based precautions are identified as the specific interventions required for patients suspected or confirmed to be infected with pathogens transmitted by contact, droplet or airborne routes. They are recommended when standard precautions may be insufficient to prevent spread and during outbreaks, tailored to the specific pathogen and its mode of transmission. Risk assessment is not mentioned in this document.

United Kingdom

A range of guidelines are currently available from different organisations in the UK.

The epic guidelines

epic 1 was commissioned by the Department of Health in England in 1998 (Pratt et al., 2001). It was presented as a set of national evidence-based guidelines to prevent health care-associated infections in hospitals. The focus was on the use of short-term indwelling urethral catheters in acute care and central venous catheters in acute care. The guidelines were described as systematically developed statements (principles) of good practice suitable for use by all practitioners and to be incorporated into local protocols. epic 2 (Pratt et al., 2007) replaced the original document in 2007 and was superseded by epic 3 in 2014 (Loveday et al., 2014).

In the current epic 3 guidance standard precautions are identified as IPC precautions necessary for all patients. They are categorised into five groups of interventions: hospital environmental hygiene; hand hygiene; use of PPE; safe handling and disposal of sharps; and the principles of asepsis. The use of gloves and type of glove (sterile or non-sterile) is advised based on risk assessment. Occasions requiring use include: when undertaking invasive procedures; contact with sterile sites; contact with non-intact skin and mucous membranes; activities assessed as carrying risk of exposure to blood or other body fluids; and when handling sharps or contaminated devices. Gloves should be removed immediately after use and hand hygiene should take place. Respiratory protective equipment should be selected by risk assessment taking into account the pathogen, anticipated activity, and duration of exposure. There is no specific mention of transmission-based precautions. Recommendations in epic 3 broadly agree with those from CDC but with most discussion related to high-risk activities (insertion and management of invasive indwelling devices).

National Institute for Health and Care Excellence

The NICE guidelines *Healthcare-associated infections: prevention and control in primary and community care* published in 2012 and last updated in 2017 refer to 'standard principles' which cover hand hygiene, the use of PPE including gloves and the handling and disposal of sharps but do not specifically mention either standard or transmission-based precautions (National Institute for Health and Care Excellence, 2017).

NHS England and NHS Improvement

Standard infection control precautions (SICP) were introduced by NHS England and NHS Improvement in 2019 (NHS England and NHS Improvement, 2019). SICPs are an elaboration of the CDC's existing standard precautions. They also appear to have been influenced by guidance from the WHO (2007) as much of the wording is very similar (see Table 3). SICPs are always advocated for use by all health workers in all care settings, for all patients regardless of whether they have a known infection. Transmission-based precautions are the additional measures required to prevent transmission from patients with known or suspected infection when spread cannot be contained by standard precautions alone.

Table 3. NHS England and NHS Improvement: Standard infection control precautions

- Patient placement/assessment for infection risk
- Hand hygiene
- Respiratory and cough hygiene
- Personal protective equipment
- Management of care equipment
- Management of the care environment
- Management of linen
- Management of blood and body fluids
- Disposal of waste (including sharps)
- Occupational safety/managing prevention of exposure (including sharps).

Scottish National Infection Prevention and Control Manual

The Scottish National Infection Prevention and Control Manual (introduced in 2012 and last updated October 2021) is presented as the mandatory practice guide for IPC for NHS Scotland (National Infection Prevention and Control Manual, 2021). NIPCM promotes SICPs to be used continuously by all staff, in all care settings, at all times, for all patients whether infection is known to be present or not. SICPs are described as the basic IPC measures necessary to reduce the risk of transmission of infectious agents from both recognised and unrecognised sources of infection. The components of SICPs are the same as those suggested by NHS England and NHS Improvement. Application depends on risk assessment which should consider the activity about to be undertaken, level of the interaction and the anticipated level of exposure to blood or other body fluids. Ten SICPs are identified (see Table 3 above) including hand hygiene, respiratory and cough hygiene

and the use of PPE which should follow risk assessment. The use of gloves use is in line with WHO recommendations although respiratory precautions are dealt with in more detail than by WHO. Eye and face protection (fluid-resistant Type IIR surgical face mask and goggles or fluid-resistant Type IIR surgical face mask and full-face visor) are recommended when splashing is possible. Transmission-based precautions are the additional precautions required for patients with a known or suspected infection. The most recent version of the manual (October 2021) promotes IPC precautions according to transmission through contact, droplet or airborne routes, referring to the dichotomy between particle size adopted by CDC in 1996 although greater emphasis is placed on clinical decision-making when precautions are implemented.

Public Health Wales

Public Health Wales has teamed with NHS Scotland and is using the Scottish National Infection Prevention and Control Manual. The most recent (October 2021) policies for SICPs and transmission-based precautions are presented on its website.

Northern Ireland

The Northern Ireland Regional Infection Prevention and Control Manual (Public Health Agency, 2015) describes standard precautions as a set of activities designed to prevent the transmission of organisms between patients and staff in all settings with the aim of preventing the spread of health care-associated infection. Standard precautions include hand hygiene, use of PPE, handling and disposal of waste including sharps, linen, environmental cleaning, and decontaminating equipment. Risk assessment is required before taking the decision to wear gloves and selecting the most appropriate type of gloves. Requirements for sterile and non-sterile gloves mirror requirements in epic 3 and the advice from NIPCM. Need for hand hygiene after gloves have been worn is emphasised, pointing out the risks of transmission if they are worn inappropriately. Transmission-based precautions are described as the additional precautions required when a patient has a transmissible organism/disease that cannot be controlled by standard precautions and are based on the three routes originally described by CDC in 1996: contact, droplet and airborne. ‘Fluid shield masks’ are recommended when working within one metre of patients requiring droplet precautions. For patients requiring airborne precautions (eg tuberculosis), FFP3 respirator masks are recommended.

2. Analysis of the international evidence base underpinning standard and transmission-based precautions

Category-specific isolation

The category-specific isolation guidelines developed contemporaneously in the UK and US pre-dated the modern era of evidence-based practice and do not appear to have been subjected to formal evaluation (Lynch et al., 1990). Nevertheless, supporters of the system maintained that categorising infections into groups requiring the same suite of IPC precautions to all patients in that category was beneficial as it precluded individual decision-making every time an infectious patient was admitted. Critics pointed out that the system resulted in some patients enduring unnecessary, often distressing restrictions and questioned the logic of confining some patients to single rooms when they appeared to pose little risk to others. The challenge is to provide individualised care, without unwarranted variation (Cripps, 2017).

Universal precautions

Universal precautions offered a pragmatic solution to the occupational health risks posed by the HIV epidemic in the mid-1980s. Numerous studies have since been undertaken to assess and improve adherence (Brooks, 1999; Harris and Nicolai, 2010; Rydman et al., 1994) but effectiveness does not appear to have been questioned. Today the elements comprising universal precautions would probably be construed as Good Practice Points. It is hard to trace any studies establishing whether universal precautions can reduce bloodborne infections apart from national voluntary reporting systems documenting needlestick injuries, mucocutaneous exposure and seroconversion. Surveillance undertaken in the UK and many other countries reveals that the rate of seroconversion to HIV, hepatitis B and C through occupational health exposure is very low.

Body substance isolation

Body substance isolation was favourably evaluated in the organisation where it was developed (Lynch et al., 1990). The authors reported that between 1984-1988 training increased nurses' written knowledge of infection prevention. Directly observing practice suggested that glove use had increased. Rates of colonisation and infection by key nosocomial pathogens declined. In a later single-centre study in a different organisation, there were reports that the implementation of body substance isolation was followed by decrease in the transmission of specific non-blood-borne pathogens (Patterson et al., 1994).

Guidelines from Healthcare Infection Control Practices Advisory Committee and Centers for Disease Control

These guidelines were updated in 2007 and again in 2019 (Centers for Disease Control and Prevention, 2019). Part I of the updated document reviews the evidence supporting the IPC precautions recommended. Part II updated information concerning the principles of IPC included in the previous guidelines. Part III describes the three categories of transmission-based precautions, but the information is still based on the school of thought surrounding droplet and airborne routes of transmission dating from the 1930s (Wells, 1936) now considered outdated (Drossinos et al., 2021). Current CDC guidance is based on the updated 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care settings. These guidelines predated the widespread adoption of GRADE and the recommendations are based on 'evaluating studies for the purpose of determining if the results should change practice' (Siegel et al., 2007) (page 13). The guidelines are cumulative and build on previous guidance. Consequently, the extent to which they reflect contemporary guideline development is not clear. The updated guidelines do not adopt GRADE.

Numerous studies have attempted to evaluate the impact of contact precautions. There is some evidence to support effectiveness when they are introduced to prevent the transmission of multi-drug resistant organisms but comparison across studies is difficult because of differences in the way that contact precautions are defined, implemented and monitored (Büchler et al., 2021) and there are reports that adherence is hard to maintain when large numbers of patients are involved (Dhar et al., 2014).It appears that while national and international guidance for contact precautions are the same, the manner in which they are interpreted and implemented is subject to considerable variation.

World Health Organization

WHO endorses the use of GRADE in its guidelines for guideline development (World Health Organization, 2014) but perversely, it does not appear to have applied GRADE when constructing its own guidelines for standard and transmission-based precautions. Little information relating to the methodology used is available. WHO is one of the few organisations to remove older versions of its guidelines from its website and it is possible that this information has been lost when deletions were made.

European Society of Clinical Microbiology and Infectious Diseases

ESCMID uses GRADE in its guideline development, and its methodology includes a requirement for reviewers to be trained in its use (Scudeller et al., 2020)

The epic guidelines

epic 1 was compiled by a nurse-led, multi-professional team comprising infection prevention practitioners, clinical microbiologists and epidemiologists. The claim was that 'A rigorous guideline development process was used to inform the systematic reviews, the clinical and critical appraisal of relevant evidence, and linking that evidence to evolving guidelines'. A number of key professional organisations and key stakeholders were invited to comment on epic 3 and a link was supplied to a website describing the guideline development methodology. This link no longer operates. epic 2 was an update of the epic 1 document published in 2007. epic 3 appeared in 2014. The publication of epic 1 predates the use of GRADE and GRADE has not been used in either of the two updates.

NHS England and NHS Improvement

These guidelines appear to be pragmatic and based on pre-existing guidance from CDC and WHO. GRADE was not used.

Scottish National Infection Prevention and Control Manual

This guidance uses SIGN 50 methodology. Although this method has been considered to be a robust method, it predates the widespread adoption of GRADE, emphasising "the predictive power of the study designs from which these data were obtained" in the grading of recommendations (p.34); rather than the more nuanced grading process within GRADE which considers factors other than the strength of evidence.

Australia

The Australian Commission on Safety and Quality in Health Care guidelines are the clearest of the guidelines, although the published version on the website is not complete. There is clear use of GRADE, including Evidence to Decision Frameworks and evidence tables. The NHMRC has a legislative obligation to include public consultation in its guideline development process. The guidance and resultant recommendations are clearly presented. Of all the guidance reviewed here, this appeared to be the most transparent in how evidence has been translated into recommendations.

Section 3. Summary of the findings and implications for contemporary nursing practice

The guidance from CDC published in 1996 has influenced guideline development in other countries and continues to do so. The original CDC guidelines pre-dated the introduction of GRADE and the recommendations have evolved over the years.

In all the guidelines inspected there was consensus. Standard precautions/standard infection prevention and control precautions (SICPs) are the basic infection prevention and control strategies that should be used continuously with all patients by all staff engaged in health and social care. The precise components included in standard precautions vary slightly between guidelines (eg disposal of waste and linen are included in some guidance but not others). Nevertheless, all items included in any version of standard precautions can be considered central to IPC.

In the UK, standard precautions have been expanded into standard infection control precautions (SICPs). These are presented in a slightly different way across England, Scotland, Wales, and N. Ireland. The SICPs system has not been adopted by any organisation outside the UK.

The consensus across all guidelines is that transmission-based precautions represent additional IPC precautions required to prevent spread from patients known or suspected to have an infection when standard precautions alone would not be sufficient to contain spread.

Similarity in terminology across guidelines is not surprising given the inter-relationships between them and the way that guidance by one organisation has influenced recommendations issued by the others. Confusion might exist because IPC teams have interpreted and implemented the guidelines differently.

Terminology to describe respiratory protection is not consistent across guidelines. A mixture of terms is used including ‘respiratory hygiene’, ‘cough etiquette’, ‘surgical masks’, ‘procedure masks’. Specific types of respiratory protection are mentioned and are not the same in all documents when recommended for the same clinical procedures. There is a risk that health care workers’ access to the most appropriate respiratory protection may be inequitable.

Indications for the use of face coverings (what type to use and when to wear them) are not the same in all guidelines. In the current pandemic situation, there are implications for the use of face coverings and the safety of patients, the public and health workers.

Research undertaken during the 2020/2021 COVID-19 pandemic concerning the transmission of airborne particles has not been used to update information to prevent the spread of respiratory pathogens in transmission-based IPC precautions (Drossinos et al., 2021). Differentiation between the droplet and airborne routes is unhelpful as it is impossible to determine the size of particles exhaled by an individual and it is likely that as droplets dry out, they give rise to smaller particles able to remain airborne and potentially infectious for prolonged periods and could travel over long distances depending on ambient conditions (e.g. ventilation, humidity). This has major implications for the selection and use of PPE to protect health care workers from respiratory infections. The use of a guideline development tool to increase transparency of decision-making has been highlighted by other authors.

The need for contact precautions has been questioned on the basis that if standard precautions are followed correctly and conscientiously with adherence to hand hygiene, contact precautions would be unnecessary, helping to reduce the inappropriate use of non-sterile gloves, contain the costs of health care and promote sustainability (Curran 2015). Rigorous evaluations of the effectiveness of contact precautions are required.

Indications for the use of gloves (which type to use and when to wear them) are the same in all contemporary guidelines irrespective of whether they are used as part of standard precautions or in additional contact precautions. These recommendations appear to be pragmatic Good Practice Points.

WHO guidelines have influenced guidance in other countries as would be expected for recommendations provided by a major international body. Greater emphasis is placed on hand hygiene to prevent respiratory spread by the 'droplet route' than by CDC and this continues to influence WHO recommendations for the prevention and control of COVID-19.

Section 4. Recommendations for practice

An analysis of language and definitions used to describe standard and transmission-based precautions was commissioned to provide a baseline assessment of historical and contemporary literature and evidence pertaining to the fundamental but critical elements of nursing practice. These lie at the heart of infection prevention and control and influence many other guidelines and polices. They are critical for the protection of patients and health care workers. It is essential therefore that these fit the relevant country culture and health system status given their international use. In the UK, it is expected that a new National Infection Control Manual will be produced as the country adapts its response to the current pandemic and moves to a position of 'living with COVID' (Cabinet Office, 2022). It is imperative therefore that guidelines are unambiguous and accepted by users and stakeholders to ensure implementation without variation.

1. Research undertaken during the 2020/2021 COVID-19 pandemic as well as other emerging evidence/positions that impact on infection prevention and control should be used to update information to prevent the spread of respiratory pathogens in transmission-based IPC guidelines as soon as practical. A clear statement regarding any assumptions that are used in the process should be included. Patients and front-line practitioners should be involved in the process to ensure that they have confidence in the recommendations.
2. Information about the updated guidelines should be communicated to managers and health workers as soon as practical.
3. Implementation of updated guidelines should be planned and monitored in premises where health and social care are delivered. The findings should be reported to trust boards with benchmarking between organisations and feedback to staff.
4. All organisations delivering health care in the UK undertake routine audit of hand hygiene adherence. Hand hygiene audit could be extended to cover the other key elements of SICPs including glove use as recommended in RCN Tools of the Trade guidance (RCN, 2021).
5. The updated guidelines should be evaluated in terms of acceptability, practicality and effectiveness within an agreed period following implementation and thereafter.

6. Recommendations for updated IPC guidelines should be developed using GRADE. Information and recommendations should be stated succinctly and be designed to be as acceptable to health workers and as practical as possible. The Australian guidance, although not complete in the version presented on the website, is an example where GRADE is used very clearly. demonstrating clear links between the evidence and recommendations.
7. Although there is a plethora of guidance, much is either relatively old, or uses outdated methods, particularly for the translation of evidence into recommendations. It is important for practitioners and patients that decision making, and recommendations are transparent; and we would suggest that clearer guidance where this is explicit is produced for the UK, along the lines of those from Australia.

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