

Position Statement

Infection prevention and control in paediatric office settings

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Abstract

Transmission of infection in the paediatric office is an issue of increasing concern. This document discusses routes of transmission of infection and the principles of current infection control measures. Prevention includes appropriate office design and administrative policies, triage, routine practices for the care of all patients (e.g., hand hygiene; use of gloves, masks, eye protection, and gowns for specific procedures; adequate cleaning, disinfection, and sterilization of surfaces and equipment, including toys; and aseptic technique for invasive procedures), and additional precautions for specific infections. Personnel should be adequately immunized, and those infected should follow work-restriction policies.

Keywords: *Ambulatory; Infection control; Infection transmission; Paediatric office*

Young children readily acquire and transmit infections. They frequently harbour infectious organisms and may shed pathogens, especially respiratory and gastrointestinal viruses, even when asymptomatic. In places where young children gather, close proximity of large numbers of infectious and susceptible hosts favours transmission. Behavioural characteristics, such as incontinence or inadequate hygiene, frequent mouthing of hands and toys or other objects, drooling and direct contact among children during play, facilitate the spread of infection (1).

Preventing transmission of infection in the physician's office is an important component of patient care and is of concern to health care providers, patients and parents. There is a large body of data on infections acquired by children admitted to hospital, and there are established infection control protocols to reduce the risk of infection in hospital. However, the risk of acquiring infection in ambulatory care settings, and the efficacy and feasibility of infection control measures in these settings, are unknown. Published recommendations specific to physicians' offices are sparse, imprecise in some areas, and may be difficult to implement (1–6).

This document updates the Canadian Paediatric Society position statement published in 2008 (7). It discusses published recommendations and areas of controversy, and provides suggestions and recommendations based on professional opinion. This statement is directed to physicians who care for children in general paediatric office settings. Specialty ambulatory care settings, where invasive procedures such as dialysis, parenteral therapy, endoscopy, or outpatient surgery or dentistry are routinely performed, may require additional measures.

BALANCING PRIORITIES

Infection control programs are designed to reduce the risk of transmission to an acceptable level. The consequences of transmission in terms of infection severity and outcome must be weighed against the consequences of preventive measures taken. Practices must be tailored to the level of care being provided and the patient population served (1).

Preventing transmission of infection and maintaining a child-friendly office may be opposing goals. Physicians must decide whether the benefits of an office in which children are free to play with each other, share toys, and generally have fun and practice their social skills, outweigh the risks of infections that may be acquired there.

BACKGROUND

Transmission of infection in paediatric ambulatory care settings

Most reported infections acquired in ambulatory care have been the result of procedures performed there: abscesses after injection of contaminated vaccines or medications, viral conjunctivitis from contaminated ophthalmic equipment, transmission of blood-borne viruses from inadequately sterilized equipment, infections complicating outpatient surgery, and infections related to inadequate decontamination of endoscopes (8,9). Hepatitis B and C viruses have been transmitted by contamination of multidose vials or by using the same physical space to prepare, dismantle, and dispose of injection equipment (10).

Measles has been transmitted in paediatricians' offices. In the 1980s, a large proportion of all cases of measles in the USA were acquired in ambulatory care settings (8,9). Transmission by contaminated air alone was documented in two paediatric office outbreaks (11,12). There are reports of transmission of tuberculosis from physicians to patients in paediatricians' offices (13,14). Pertussis has been transmitted to health care workers in paediatric ambulatory settings (15).

Infections commonly seen in the community, such as viral respiratory and gastrointestinal infections, may be transmitted in physicians' offices if precautions are not taken. However, in-office spread of these infections has not been reported, possibly because it is difficult to distinguish between office and community exposures. Young children have 4 to 10 respiratory infections and up to 4 episodes of gastroenteritis per year (16,17). They can acquire infections in child care, at school, in crowded shopping malls or recreational centres, or from siblings, parents, other family contacts, friends, or caregivers. In one study, rates of respiratory and gastrointestinal infections in healthy children younger than 3 years of age who had visited the doctor's office over the preceding week were compared with infection rates in control children from the same paediatric practice who had not visited the office in the same period. No increased risk of infection was observed: 30% of those who visited the office and 32% of those who did not developed an infection (18). One study at the Montreal Children's Hospital, in Montreal, Quebec, did not find a significant difference in rates of new respiratory or gastrointestinal infections between children who had visited the emergency room over the previous week (17.3%) and those who had not (23.4%) (19). In contrast, another study reported an increased risk of influenza-like illness in a family member in the 2 weeks following a well-child visit (20).

Factors influencing risk of transmission

Young children and others who are unable to appropriately handle their respiratory secretions, children with diarrhea who are in diapers or incontinent, and those with infected open wounds or skin lesions, are likely sources of infection (21).

Organisms that can survive on patient care equipment, environmental surfaces or toys are more likely to be transmitted. Heavy environmental contamination enhances transmission potential, as does a low infective dose. Respiratory viruses and rotavirus have low infective doses and persist for prolonged periods on inanimate objects (22–27). Methicillin-resistant *Staphylococcus aureus* (MRSA) (28) and respiratory syncytial virus (RSV) (29) survive on stethoscope diaphragms. Transmission of RSV from the inanimate environment has been demonstrated (30). Contaminated electronic thermometer bases and blood pressure cuffs have been implicated in the transmission of *Clostridium difficile* and vancomycin-resistant enterococcus (VRE) (31–33). Children who lack immunity to the infecting agent and those who are ill, debilitated or immunocompromised are at increased risk for disease.

The risk of transmission among patients may be less in an office setting than on a hospital ward. In offices, the duration of contact between individuals is shorter, patients are generally in better health and fewer invasive procedures are performed. However, patients may remain in crowded common waiting areas for prolonged periods of time. Also, it may not be immediately recognized that a patient has a contagious illness, and the need for short turnaround time for examination rooms may hamper cleaning (4). Some practices have chosen to eliminate waiting rooms and place patients directly into examination rooms on arrival (34).

PRINCIPLES OF CURRENT INFECTION CONTROL GUIDELINES

Current guidelines for the prevention of transmission of infection are based on the following principles:

- Certain measures referred to as 'Routine Practices' in Canada (1) and 'Standard Precautions' in the USA (4) are required for the care of all patients, regardless of diagnoses, and are determined by the task being performed. The goal is to prevent transmission from any patient, whether symptomatic or not, assuming that blood, body fluids, excretions, and secretions from any patient could contain pathogens.
- Further measures called 'Additional Precautions' in Canada (1) and 'Transmission-based Precautions' in the USA (4) are required for patients with specific infections based on clinical presentation, and are determined by the methods of transmission of the micro-organisms expected or known to be involved. Screening for clinical manifestations of infection is essential to identify patients for whom additional precautions are warranted (Table 1).
- Concern about transmission of respiratory pathogens in ambulatory care settings came to the forefront during the 2003 severe acute respiratory syndrome (SARS) epidemic. Heightened awareness led to recommendations for a new

Table 1. Illnesses warranting 'Additional Precautions'*

Infection	Precautions	Duration of precautions
Antibiotic-resistant organisms (infection or colonization), including MRSA	Contact	If patients assessed as at risk to transmit (see text)
Avian influenza [†]	Droplet plus Contact	To 14 days from onset
Enteroviral infection (diagnosed or suspected) [†]	Contact	For duration of illness
Gastroenteritis	Contact	For duration of symptoms or until an infectious cause is ruled out
Hepatitis, viral (types A and E, diagnosed or suspected)	Contact	Until viral infection is ruled out; to 7 days after onset if hepatitis A is diagnosed
Measles (diagnosed or suspected)	Airborne	To 4 days after onset of rash (and for duration of illness if immunocompromised)
Measles contact, nonimmune, in incubation period	Airborne	From 5 days after the first day of exposure to 21 days after the last day of exposure
Meningitis (diagnosed or suspected)	Droplet plus Contact	
Bacterial	Droplet	Until 24 h of appropriate antibiotic received
Viral	Contact	For duration of illness
Mumps	Droplet	To 9 days after onset of swelling
Mumps contact, nonimmune, in incubation period	Droplet	From 10 days after the first day of exposure to 26 days after the last day of exposure
Pertussis (diagnosed or suspected)	Droplet	Until 5 days of appropriate antibiotic received or pertussis ruled out
Petechial or ecchymotic rash with fever (suspected meningococemia)	Droplet	Until 24 h of appropriate antibiotic received or meningococcus ruled out
Rubella	Droplet	To 7 days after onset of rash
Rubella contact, nonimmune, in incubation period	Droplet	From 7 days after the first day of exposure to 21 days after last day of exposure
SARS [‡] MERS-CoV [‡]	Droplet plus Contact (plus N95 masks)	To 10 days after resolution of fever
Scabies (diagnosed or suspected)	Contact	Until initial therapy applied
Skin infection (extensive lesions, abscess or infected wound if drainage or exudate not covered and contained by dressing)	Contact	For duration of drainage or until exudative lesions are healed
Streptococcus group A impetigo not covered by dressing	Contact	Until 24 h of appropriate therapy received
Streptococcus group A invasive disease, pharyngitis, pneumonia, scarlet fever	Droplet	Until 24 h of appropriate antibiotic received
Tuberculosis (diagnosed or suspected) infectious form [§]	Airborne	Until assessed as not infectious
Varicella (diagnosed or suspected)	Airborne plus Contact	Until lesions crusted and dried or varicella is ruled out
Varicella contact, nonimmune, in incubation period	Airborne	From 8 days after the first day of exposure to 21 days after the last day of exposure; to 28 days if given varicella zoster immune globulin
Viral respiratory tract infection (diagnosed or suspected bronchiolitis, common cold, croup, pneumonia or pharyngitis)	Droplet plus Contact	For duration of illness or until viral infection is ruled out
Zoster (diagnosed or suspected)—rash not covered	Airborne plus Contact	Until lesions crusted and dried or zoster is ruled out

MERS-CoV Middle East respiratory syndrome coronavirus; MRSA Methicillin-resistant *Staphylococcus aureus*; SARS Severe acute respiratory syndrome.

Data taken from references (1,4,41,58–60).

*This list is not exhaustive. For infections not listed here, see tables in references (1) and (4).

[†]These recommendations may be revised as more information becomes available. Local, provincial/territorial, or federal authorities should be consulted.

[‡]Includes hand, foot, and mouth disease.

[§]Tuberculosis should be considered contagious in individuals with untreated cavitary pulmonary disease, laryngeal disease, smear-positive sputum, extensive lung involvement or disseminated congenital infection. Young children with tuberculosis are rarely infectious, but adult family members may be and should be assessed for cough.

standard of patient behaviour, 'Respiratory Etiquette', in ambulatory care. Outpatient settings are being urged to implement source containment measures to prevent transmission of respiratory infections, beginning at the point of initial patient encounter with the health care facility (1,2,4,35,36).

ROUTES OF TRANSMISSION OF INFECTION (1,2,4,21)

Contact transmission is the most frequent route and includes both direct contact (physical contact between infected and susceptible individuals) and indirect contact (via contaminated intermediate surfaces, such as hands, equipment and toys). Appropriate routine patient care practices should prevent most transmission by this route. Additional Contact Precautions (wearing gloves and gowns, and disinfection of equipment and surfaces) are warranted for infectious agents of low infective doses (e.g., rotavirus) and for situations in which extensive contamination of the patient's immediate environment is expected (e.g., watery diarrhea which cannot be contained in a diaper, or a young child with respiratory infection and copious respiratory tract secretions).

Droplet transmission refers to transmission by large droplets expelled from the respiratory tract during coughing and sneezing, and inhaled by or deposited onto the respiratory mucous membranes of individuals near to the infected child. Special ventilation is not required because large droplets do not stay suspended in the air, but settle on surfaces close to the source patient. Wearing surgical or procedure masks was recommended for persons within 1 m of the patient until recently, when concern that large droplets may travel further than 1 m led to extending this distance to 2 m, while recognizing that 1m is probably sufficient for young children and others whose cough is not forceful (1).

Some organisms transmitted by droplet transmission (e.g., *Haemophilus influenzae* type b, *Neisseria meningitidis*, and *Bordetella pertussis*) are fragile and do not survive on surfaces in the environment or on hands.

Other organisms, such as RSV, influenza, parainfluenza, rhinovirus, adenovirus, and SARS coronavirus survive long enough on surfaces to be picked up on the hands of patients or personnel. For these infections, droplet and contact transmission occurs. Thus, respiratory viruses may be transmitted by inhalation, by depositing large droplets onto mucous membranes or by inoculating nasal mucosa or conjunctiva by contaminated hands. Surgical or procedure masks can protect personnel from acquisition via deposition of droplets on mucous membranes and may also help to keep hands away from nose and mouth. Eye shields give added protection against infection via the conjunctiva. Face shields or goggles have been shown to prevent

RSV infection in health care personnel (37,38). RSV transmission to personnel was also reduced when they wore gloves but used no masks or eye protection, probably because personnel are less likely to touch their noses or eyes with gloved hands. This finding suggests that for RSV, contact transmission may be more important than droplet transmission (39,40).

Airborne transmission occurs when infectious particles survive in aerosols of small, desiccated droplets from the respiratory tract or aerosols from skin squames, which remain suspended in the air and are dispersed over large distances by air currents. Control requires a negative-pressure room with air exhausted outside the building or passed through a high-efficiency particulate air (HEPA) filter before recirculation. Special tight-fitting masks with built-in filters that remove particles down to 1 micron in diameter at 95% efficacy (N95) are recommended for susceptible persons who must enter the room. Airborne transmission is uncommon but important because varicella, measles, tuberculosis, and smallpox are spread by this route. Although evidence suggests that infections such as SARS coronavirus, Middle Eastern Respiratory Syndrome (MERS) coronavirus, avian influenza and viral hemorrhagic fevers are transmitted by large droplet and contact spread, it is thought that small particle aerosols generated during certain procedures, such as intubation or bronchoscopy, may result in airborne transmission over short distances (1,4,41,42).

N95 masks are rarely needed in paediatricians' offices. Personnel should be immune to varicella and measles, and tuberculosis in children is rarely contagious (2). Tuberculosis should be considered contagious in individuals with untreated cavitary pulmonary disease, laryngeal disease, smear-positive sputum, extensive lung involvement, or disseminated congenital infection (43). In the event of an outbreak of a new pathogen for which route of transmission is not yet known, N95 masks may be indicated.

INANIMATE ENVIRONMENT AND INFECTION

Preventing acquisition of infection from the inanimate environment involves appropriate disinfection and sterilization of equipment and other items, cleaning surfaces, and standard maintenance of ventilation and plumbing systems.

For purposes of processing, medical equipment is classified into three groups. Items that are introduced into sterile body spaces (critical) must be sterile. Items in contact with mucous membranes or nonintact skin or through which inspired air flows (semicritical) require high-level disinfection designed to inactivate all micro-organisms except bacterial spores. Items that are only in contact with intact skin (noncritical) require low-level disinfection designed to remove most micro-organisms and bring contamination to an acceptable level (1-5,44).

Most examination equipment in an office setting is in contact with only the patient's intact skin. Some experts have suggested that cleaning with detergent and water is sufficient for noncritical equipment (6,45). A disinfectant should be used when the equipment is contaminated with blood or body fluid. Ideally, all such equipment should be cleaned between patients (1,2,6). If this is not feasible, daily cleaning may suffice, but equipment must be cleaned before reuse when it is contaminated with patient secretions or excretions or if visibly soiled (2,3). Equipment that does not have direct patient contact should be cleaned on a routine basis and when soiled.

Environmental surfaces should be cleaned on a routine basis with a low-level disinfectant or detergent (2,3,5,44). Frequently touched surfaces should be cleaned daily (2,3). Cleaning with detergent and water may suffice, unless surfaces are contaminated with blood or body fluids (2,44) (Table 2).

Toys and transmission of infection

Playing together and sharing of toys contribute to developing social skills. Toys may be considered as part of the equipment of a paediatrician's office, but sharing of toys poses a potential health risk. Microbial contamination of toys has been documented in hospitals, physician's offices, and child care centres (46–49). Fecal coliforms and rotavirus have been found on toys in hospitals (46,47).

In one study of doctors' offices, toys in waiting rooms were tested at least 1 week after the last cleaning. Coliforms were found on 90% of soft toys and 13.5% of hard toys. Hard toys

that had been cleaned regularly every 1 to 2 weeks had lower counts than those from offices with no routine cleaning, while soft toys cleaned every 1 to 2 weeks had similar counts to those not cleaned. Hard toys were effectively decontaminated by cleaning and soaking for 1 hour in a bleach solution. Soft toys washed in a washing machine remained contaminated, but soaking in bleach for 30 minutes before washing was effective. By 1 week of use, soft toys were again contaminated with coliforms, whereas hard toys were not. The authors concluded that soft toys were unsuitable for doctors' waiting rooms (49).

In their guidelines published in 2000 (45), the American Academy of Pediatrics recommended cleaning of toys in offices. In response to these recommendations, some paediatricians eliminated toys from their waiting rooms, finding the cleaning and monitoring of toy use too arduous (50). Physicians must consider the needs of children when weighing the risks and benefits of having toys in their offices.

Toy manufacturers have incorporated antiseptics into plastic toys. There is no evidence that this practice has an impact on contamination of toys with micro-organisms or on transmission of infection, nor is there any theoretical basis to support such effects (2,44).

Hand hygiene

Hand hygiene is a crucial element in infection control. Traditionally, hand hygiene has been performed with soap and water. Alcohol-based hand rinses and gels have been shown to be more effective than soap and water for

Table 2. Sterilization and disinfection requirements

Instrument	Level of disinfection	Products
Critical items – Items that enter sterile tissue (e.g., needles)	Sterilization	Steam, dry heat, chemical sterilants
Semicritical items – Items that contact mucous membranes or nonintact skin but do not enter tissue (e.g., laryngoscopes, specula)	Sterilization or high-level disinfection	Pasteurization, 2% glutaraldehyde, 0.55% ortho-phthalaldehyde, 6% to 7.5% hydrogen peroxide with or without peracetic acid*
Noncritical items** – Items that touch only intact skin (e.g., stethoscopes or blood pressure cuffs, electronic devices such as tablets, computers that are shared between patients)	Intermediate- or low-level disinfection Detergent and water considered sufficient by some authorities	70% to 90% ethyl or isopropyl alcohol (immersion >5 min), sodium hypochlorite 5.25% diluted 1:50 to 1:500 (immersion >10 min), 3% hydrogen peroxide, 0.5% accelerated hydrogen peroxide, quaternary ammonium products, iodine, iodophors, phenolics, disinfectant wipes † Transparent cleanable or disposable covers may be needed to protect devices that cannot withstand cleaning.
Environmental surfaces – Doorknobs, tabletops, carts, floors	Low-level disinfection or detergent and water	Approved hospital detergent/disinfectant or household detergent, disinfectant wipes

Data taken from references (2,3,5,6,44,45).

*Follow manufacturer's instructions for contact times.

**If visibly contaminated with blood, use sodium hypochlorite diluted 1:10 to 1:100 or 70% to 90% alcohol.

†Phenolics should not be used for items that will be in direct contact with the skin of newborns.

removing micro-organisms from hands, and they also save time (1,2,51,52). Small containers which can be carried in the pocket or clipped to clothing are readily available for use when needed.

RECOMMENDATIONS

In the absence of data from paediatric office settings, the following recommendations are based on expert opinion and extrapolations from other health care settings, with a level of evidence rating of B-III (53).

Administrative policies

- Policies and procedures for infection control and prevention should be developed and implemented (1–3). Policies should be reviewed at least every 2 years (2). A checklist of necessary materials and policies may be useful (5). For a sample checklist, see the Appendix.
- Ongoing education should be provided for all office personnel and should include how infections are transmitted, infection control measures, recognition of symptom complexes, prevention and management of potential exposures to blood-borne viruses, and cleaning and disinfection of equipment, toys, and surfaces (1,2,4,6).
- A system of communication with local public health authorities should be established and maintained to facilitate systematic reporting of notifiable diseases and exchange of information about suspected outbreaks (2).

Office design

- Infection control needs should be considered in office planning (e.g., layout, sinks and materials used) (1,3–6).
- Handwashing sinks with adjacent soap and disposable towel dispensers, as well as waterless hand hygiene products, should be available in all patient care areas (1,2,5,6,51,52).
- Plans should include specific spaces to display signs and place materials for Respiratory Etiquette.
- Carpeting should be avoided in examination and waiting rooms (2,6).
- Ventilation for new or renovated medical offices should provide a minimum of six air exchanges per hour (2,44).

Triage

Triage should be performed by telephone at the time an appointment is made or as soon as possible after arrival (1–6).

- Immunocompromised children need protection from exposure to patients with transmissible infections, especially respiratory viral infections. They should not be left in a waiting room but placed in an examination room upon arrival.
- Children with transmissible infections:
 - Parents should be advised to inform the receptionist immediately upon arrival if they suspect their child has a

contagious illness. Signs should be posted in appropriate locations reminding parents and patients to do this.

- Children with symptomatic infections should be segregated from well children as quickly as possible. Ideally, those with any contagious illness should not stay in a waiting room but be shown into an examination room immediately. At a minimum, children with suspected or diagnosed airborne infections (e.g., varicella and measles) should be quickly removed from a common waiting area.
- In the event of a travel alert concerning a respiratory pathogen, assess children with respiratory infections for possible imported infection by:
 - Asking about travel outside Canada in the 21 days before onset of symptoms (time intervals may vary depending on the presumed incubation period of the infection) (41,42).
 - Asking whether there are any persons in the same household who have a respiratory illness and travelled outside Canada in the 21 days before illness onset.

If answer to either inquiry is ‘yes’, place the patient and family in an examining room immediately.

Waiting rooms

- Patient visits should be scheduled to minimize crowding and shorten wait times (2,6).
- Information and instructions for parents and patients regarding infection control (e.g., posters, handouts, videos) should be available in the waiting room. (See references [54,55] for examples.)
- Hand hygiene equipment (e.g., waterless hand hygiene products or sinks with soap and disposable towels) should be available in the waiting room (2,4).
- Contact between children with contagious illnesses and other children should be minimized (2,5,6).
 - Visits for suspected infections should be scheduled for a different time of the day than routine appointments, or a regular, separate time period reserved for drop-in visits (1,6).
 - Infants and young children with vomiting, diarrhea, fever, cough or open skin lesions should be in the waiting room for as short a time as possible, placed in an examination room as soon as possible, and not be allowed in common play areas or to handle toys or other shared items. Signs explaining this policy should be posted.

Toys

Sharing of toys by infants and young children should be minimized (2). Options include:

- Removing toys from waiting rooms, unless their use can be supervised and appropriate cleaning is feasible.
- Asking parents to bring a couple of the child’s own toys from home, designed for individual play, and to avoid sharing these with other children.

- Providing toys for infants and young children that can be cleaned easily and frequently (2,5,6). Choose toys with smooth, solid surfaces and avoid toys with small pieces or creviced surfaces, stuffed toys and toys made of fabric or plush.
- Ask parents to supervise their child's use of office toys and to place them in a designated used toy container when finished. Used toys should be removed from circulation until cleaned.
- Providing small books, booklets or toys that are designed for individual play and can be given to the child to take home or disposed of after use.

Older children who are mature enough to practice hand hygiene and handle respiratory secretions appropriately may share toys, books, puzzles, and computer games.

'Routine Practices' for care of all patients

Hand hygiene

- All health care personnel should perform hand hygiene using alcohol-based waterless hand rinses or soap and water (1-6,51,52):
 - Immediately before and after contact with each patient.
 - Before moving to a clean-body site from a contaminated-body site during care of the same patient.
 - After contact with blood, body fluids, secretions, excretions, or objects contaminated with any of these.
 - After direct hand contact (e.g., a spill or splash) with a live vaccine, such as rotavirus or live attenuated influenza vaccine.
 - After contact with an environmental surface or item likely to be contaminated.
 - Before invasive procedures (use an antiseptic soap or antiseptic hand rinse).
 - Before preparing or handling sterile medications or other sterile products.
 - After removing gloves.
- Alcohol-based hand rinses should contain 60% to 90% isopropyl or ethyl alcohol (51,52).
- Soap and water should be used if hands are visibly soiled (2,52).
- Parents and children should be instructed about the need for hand hygiene (1,6,52).
- Alcohol-based hand rinses for patient use should be placed out of reach of children, and parents should be advised to supervise their children to avoid accidental ingestion or contact with eyes.
- Hand cleansing towelettes are an alternative to soap and water for cleaning of visibly soiled hands (51,52).

Personal protective equipment

- Gloves should be worn (1-6):
 - If anticipating direct hand contact with blood, body fluids, secretions or excretions, or with items contaminated by any of these substances.

- For direct hand contact with mucous membranes or non-intact skin.
- For direct hand contact with a patient when the health care provider has an open lesion on the hand.
- Gloves are not needed for routine child care, such as wiping a nose or changing a diaper, provided that these actions can be performed without direct hand contamination (2).
- Gloves are not routinely required for administering vaccines (2).
- A surgical mask or procedure mask and eye protection (e.g., goggles or face shield or mask with visor attached) should be worn during procedures with risk of splashing blood, body fluids, respiratory secretions, or other secretions or excretions into the face (e.g., suctioning). A mask should be used only once and changed when wet or soiled (1-6).
- A gown should be worn to protect clothing during procedures likely to generate splashes of blood, body fluids, secretions, or excretions (1-6).

Policies regarding blood-borne pathogens

- Needles and other sharp instruments should be handled with care during use and disposal. Puncture-proof, impermeable, approved sharps disposal containers should be available at the point-of-use where injections or venipunctures are performed. These containers should be kept out of the reach of young children and should not be overfilled (1-3,5,6).
- Spills of blood or bloody body fluids should be contained promptly and cleaned with detergent followed by bleach (a 1:10 to 1:100 dilution of household bleach, using the higher concentration for larger spills). Gloves should be worn for cleaning blood spills (2,6,44).
- Mouthpieces, resuscitation bags or other ventilation devices should be readily available in areas where the need to resuscitate may be required (4,6).
- Personnel with risk for exposure to body fluids should receive hepatitis B vaccine, be tested for anti-hepatitis B antibody after vaccination and be informed of their hepatitis B immune status (2,56).
- Policies and protocols for managing injuries with used needles or other sharp objects, and for other potential exposures to blood-borne viruses, should be available and implemented (1,2,6,56,57). Guidance should include procedures for injured personnel: how to obtain immediate advice, clinical assessment, and access to postexposure prophylaxis, including hepatitis B vaccine, hepatitis B immune globulin, antiretroviral medications, and laboratory testing, when indicated (1,2,57).

Disinfection and sterilization

- Written policies and protocols for disinfection and, sterilization should be in place and implemented (1,2,6,45).

- Disinfectants approved for health care should be used (Table 2).
- Level of disinfection required for medical equipment (Table 2) (2,6,44):
 - Items entering sterile body spaces (e.g., needles) should be disposable or sterilized before reuse.
 - Items in contact with mucous membranes or nonintact skin (e.g., thermometers, suture cutters, vaginal speculums) should be disposable or undergo high-level disinfection or sterilization before reuse.
 - Items in contact with intact skin only (e.g., stethoscopes, otoscopes, blood pressure cuffs, infant scales, electronic devices) should undergo low-level disinfection (1–3,5,6,44) or cleaning with detergent and water (6,45). Items contaminated with blood or body fluids should undergo low-level disinfection.
 - Optimally, these should be cleaned after each use (1,2,6). If this is not feasible, clean daily, and immediately when soiled (2,3,6).
 - Clean the bell and diaphragm of stethoscopes, the handle and body of otoscopes and ophthalmoscopes, and reusable ear cures, with alcohol or disinfectant wipes (2,6) or with soap and water (6). Disinfect when contaminated with blood.
 - Items designed for single-patient use (e.g., glucometers) should not be used for more than one patient (1,3,5,6).
- Clean equipment should be stored where it will not become contaminated (2,6).
- Measures should be taken to avoid contaminating the bases of electronic thermometers, pulse oxymetry and tympanometry equipment, and other frequently handled devices, with body fluids, excretions, or secretions. These should be cleaned daily and when soiled (2,6).
- Frequently touched office items that are difficult to clean (e.g., pens, charts, computer keyboard and mouse, personal digital assistant devices, and pagers) should always be considered contaminated. Hand hygiene should always be performed immediately before patient contact, because it is common to have contact with these items right before examining a patient. Computer mice and keyboards should be cleaned daily (2). Using transparent covers on computer keyboards may facilitate cleaning (5).

Cleaning of surfaces

- Written policies and protocols for cleaning should be in place and implemented (1,2,6,44).
- A low-level detergent-disinfectant approved for health care settings (2,5,44) or detergent (45) should be used (Table 2).
- The examining table should be covered with disposable paper or a washable cloth that is changed between patients. Clean the

table between patients, if soiled. If soiled with body fluids or stool, clean and disinfect with a 1:100 bleach solution (2,3,5,6).

- Examination tables, treatment chairs, sinks and other frequently touched surfaces (e.g., light switches, door knobs, and telephones) should be cleaned daily (2,3,6).
- Washrooms should be cleaned daily and when soiled. Provide a diaper-changing area with disposable paper covers, and a receptacle for used diapers (2,3,6).
- Surfaces such as countertops, chairs, and floors are usually not an infection risk and should be cleaned weekly or on a routine basis and when soiled (2,3,6). Other surfaces, including cupboards, walls, windows, and air vents, should be cleaned at least annually and as needed to maintain an appropriate standard of cleanliness (3).

Cleaning of toys

- Optimally, toys used by infants and young children should be cleaned between uses by different patients (2). If this is not possible, they should be cleaned at the end of every day (2,5). Toys that come in contact with body fluids (e.g., are mouthed) should be removed from the area of use until they have been cleaned (2,5,6).
- Disinfect with 1:100 bleach solution, wash with soap and water, and air dry. Alternatively, toys can be cleaned in a dishwasher designed to sanitize dishes (2).
- Toys, puzzles, and computer games that are used by older children should be cleaned or discarded when soiled. Frequently touched surfaces (e.g., knobs, buttons, handles, and joy-sticks) should be cleaned daily.
- Large toys that are built-in or considered part of the office furniture and touched frequently should be cleaned daily and if soiled.

Aseptic technique and injection safety

- Aseptic technique should be maintained for immunization, venipuncture, suturing, incision, or other invasive procedures and for accessing or manipulation of intravascular catheters (1,2).
- Skin should be prepared with an antiseptic. The preferred agent for venipuncture or immunization is 70% alcohol. For insertion of intravascular catheters and other invasive procedures, and for obtaining blood cultures, 2% chlorhexidine, chlorhexidine in 70% alcohol, 10% povidone-iodine or an alcoholic tincture of iodine should be used. Povidone-iodine should be left to dry for 2 minutes (2,6,35).
- Because antiseptics can be contaminated during use, single-use products are preferable. When multiple-use containers are used, label them with the date and discard after 28 days of use (2).
- Avoid multidose medication vials whenever possible, but if used (1,9):

- Handle and store them with care to maintain sterility of contents and comply with expiry dates.
- Restrict their use to a centralized medication area.
- Reserve separate surfaces for assembling clean equipment (e.g., syringes, needles) or preparing medications, and for handling used equipment (9).
- Equipment contaminated with blood or body fluids should be handled with care to prevent transfer of organisms to patients and surfaces (9).
- Physical barriers (e.g., disposable paper or plastic pads) should be used to protect surfaces from blood contamination during blood sampling (9).

Respiratory Etiquette

Respiratory Etiquette refers to measures designed to minimize transmission of respiratory pathogens via the droplet route in health care settings. Source containment begins at the point of entry into the health care setting (1,2,4,5). These measures include:

- Early identification of all persons (patients, parents, and others) with febrile respiratory illness in outpatient areas.
- Posting signs at facility entrances and at the reception or registration desks with instructions for patients and those accompanying them to:
 - Inform the receptionist promptly if they have symptoms of a respiratory infection.
 - Cover the mouth and nose with tissues while coughing or sneezing or, if necessary, sneeze or cough into the elbow rather than the hands.
 - Promptly dispose of used tissues in a no-touch receptacle.
 - Perform hand hygiene after contact with respiratory secretions.
 - Use a surgical or procedure mask, if tolerated and if the patient is old enough to wear one.
- Instructing family members with a febrile respiratory illness not to accompany patients to the office unless it is unavoidable, in which case they should take these same measures.
- Providing tissues, no-touch waste receptacles, masks and hand hygiene products.
- Ensuring that supplies of soap and towels are available at every sink.
- Placing patients with a cough and those accompanying them at least 1 m to 2 m away from others in common waiting areas, when space permits.

Additional precautions (Table 1)

Airborne transmission precautions

- Physicians should enquire about the number of air exchanges and airflow patterns in their office setting, especially in new

or recently renovated buildings (2,6). This information may not be available in older buildings.

- If feasible, patients with a known or suspected airborne infection should be scheduled to minimize exposure of other patients (e.g., at the end of the day) (1,2,5,6).
- Patients with known or suspected measles, varicella, disseminated zoster, or contagious tuberculosis should be placed directly into an examining room (1,2,5,6).
 - Ideally, this should be a negative-pressure room with air vented directly outside or filtered through a HEPA filter before recirculation. Because such rooms are rarely available in physician offices, a single room, situated as far away as possible from other patients, should be used (1).
 - The examination room door should be kept closed (1,2,5,6).
 - In offices where patients with contagious tuberculosis are seen frequently, a portable HEPA filtration unit can be used to create a negative-pressure room (5).
- Patients should be examined and discharged as quickly as possible (1,2).
- Patients should wear a surgical or procedure mask when not in a negative-pressure room. For younger infants, cover their nose and mouth with a tissue (1,2,5).
- Masks for personnel (1,5,6):
 - For suspected or known contagious tuberculosis, N95 masks are recommended for all personnel entering the room. In offices where patients with contagious tuberculosis are seen frequently, N95 masks should always be available, personnel should be fit-tested and should perform a fit check (forceful inspiration to determine if the seal is tight) every time a N95 mask is put on (5). Where tuberculosis is rarely seen and N95 masks are not available, patients with suspected contagious tuberculosis should be referred as quickly as possible to an appropriately equipped clinic or hospital for assessment (1,2,4). A surgical or procedure mask should be worn but may not be as effective as a N95 mask.
 - For suspected measles or varicella patients – immune personnel do not need to wear a mask. Nonimmune personnel should not enter the examination room.
- After a patient has left, sufficient time should be allowed to clear the air of aerosolized particles before using the room for any other patient (if infection is known or suspected tuberculosis) or for a nonimmune patient (when the infection is measles or varicella) (1,5). Six air exchanges per hour is usually the standard in new buildings, and if this is the case, the time required to ‘clear the air’ is approximately 70 min (44). When the air exchange rate is not known, it is prudent to avoid using the room for nonimmune patients for

the rest of the day.

- Determine whether any exposed personnel or patients require post-exposure prophylaxis (immune globulin or vaccine) or follow-up for potential tuberculosis exposures (1).

Droplet transmission precautions

- Place patients with suspected meningitis, pertussis, rubella, mumps, or meningococcal infection directly into an examining room, whenever possible (1,4,5).
 - When this is not possible, separate the infected patient from other patients by 1 m to 2 m and keep the time spent in the waiting room to an absolute minimum.
- Have the patient wear a surgical or procedure mask when outside of the examining room, if feasible. For infants, cover their nose and mouth with a tissue (1,4,5).
- Personnel coming within 1 m to 2 m of the patient should wear a surgical or procedure mask (unless, if mumps or rubella are of concern, they are immune) (1,4,6).
- Eye protection (goggles or face shield or mask with visor) should be considered for care of patients with respiratory tract infections (RTIs) who are coughing at the time of the interaction or if a procedure is performed that may result in coughing (1,5,6). When eye protection is not available, wear gloves and keep hands away from the eyes during patient care.

Contact precautions

- Contact precautions should be taken for conditions in which heavy contamination of the environment is anticipated, including (1,4):
 - Infectious diarrhea.
 - Extensive, skin lesions which are not covered (e.g., varicella, zoster), or wound drainage not contained by dressings.
 - Selected patients colonized with antibiotic-resistant organisms (AROs), such as MRSA and VRE (see below).
 - Children with a documented or suspected viral RTI who cannot control their respiratory secretions adequately.
- Patients should be placed in an examining room as soon as possible (1,5).
- Gloves should be worn before entering the room (1,4). Some recommend wearing gloves only if there will be contact with the patient's intact skin or with surfaces or items in close proximity to the patient (5,6).
- A gown should be worn when clothing will have direct contact with the patient or with potentially contaminated surfaces or items. Remove the gown before leaving the room (1,4–6).
- Perform hand hygiene using an antiseptic alcohol-based hand rinse or gel or an antiseptic soap after removing gloves

and after any direct hand contact with the patient or contaminated items (1,4).

- Equipment and surfaces in direct contact with the patient or infective material (e.g., respiratory secretions, stool or skin exudates) should be cleaned before use for another patient (1,4,5).
- If the patient is likely to cause extensive environmental contamination (e.g., has diarrhea or fecal incontinence not contained by a diaper, copious wound drainage, or copious uncontrolled respiratory secretions or sputum), all horizontal or frequently touched surfaces should be cleaned before the room is used for another patient (1,5).

Antibiotic-resistant organisms (AROs) in ambulatory care

- Systems should be developed and implemented to readily identify patients known to be colonized with AROs (4).
- Routine Practices, especially hand hygiene, suffice to manage most asymptomatic patients colonized with AROs (1,2,4,58).
- The need for Contact Precautions should be assessed on a case-by-case basis, considering the nature of the encounter (e.g., procedures to be performed) and the risk for environmental contamination (e.g., active infection versus colonization, uncontrolled respiratory secretions, stool incontinence, or colonized ostomy sites) (4,58).
- Antibiotics should be used judiciously, to prevent or delay emergence of antimicrobial resistance (2,4,58).

Precautions for novel pathogens

Newly identified pathogens, also called emerging pathogens, may have the potential to impact public health significantly.

- For SARS or MERS coronavirus, avian influenza or any new pandemic influenza strain (1,4,6,41,59,60):
 - Droplet Precautions (including eye protection) and Contact Precautions are sufficient for routine care.
 - Airborne Precautions are recommended when performing aerosol-generating procedures (e.g., endotracheal suctioning, intubation, manual ventilation, high-flow oxygen or nebulizer therapy, bronchoscopy) (1,2,6). Such procedures are unlikely to be performed in an office setting.
- For Ebola virus (42):
 - Contact public health authorities immediately.
 - Droplet Precautions (including eye protection) and Contact Precautions are sufficient for low-risk patients (those with early-stage disease or in convalescence, with no bleeding, diarrhea, or vomiting).
 - For patients with more advanced disease (bleeding, vomiting, or incontinence), more extensive protective apparel must be used to cover all exposed skin. Airborne Precautions are recommended when performing aerosol-generating

procedures. Patients with suspected Ebola virus infections should not be managed in an office setting.

- Local, provincial/territorial or federal authorities should be consulted. Recommendations may be revised as more information becomes available.

Health of personnel

- Vaccines:
 - All personnel should receive influenza vaccine annually (1,2,56).
 - All personnel should be immune to measles, rubella, mumps, varicella, hepatitis B, and polio, and should receive at least one adult dose of acellular pertussis vaccine (1,2,6,56).
 - Personnel should also receive tetanus and diphtheria vaccines and any other vaccines indicated by their health status or age.
 - Immunization records should be maintained for all personnel (2).
- Personnel should undergo pre-employment tuberculin testing and, if negative, repeat testing after any significant exposure (2,5,6,56,61). In some jurisdictions, pre-employment testing may be required only for clinics where tuberculosis patients are frequently seen.

- Policies should be developed and implemented outlining work restrictions for personnel with communicable infections and measures to be taken to prevent transmission while working with an infection (1,2,5,6,56) (Table 3).

- Colds and other minor RTIs are not criteria for exclusion from work. However, personnel should not have direct contact with high-risk patients, should contain coughs and respiratory secretions using surgical or procedure masks and tissues, and perform meticulous hand hygiene after each contact with nasal or other respiratory tract secretions and before every contact with a patient or patient care equipment (2,5,56).

- Personnel with blood-borne viral infections (e.g., hepatitis B, hepatitis C, and HIV) should not perform procedures with a high risk for transmission of blood from the health care worker to a patient (2,62). Such procedures are mainly surgical and are extremely unlikely to be performed in routine office settings.

Medical waste

Regulated medical waste should be disposed of according to local legislation. Nonanatomical medical waste includes (1–6):

- Liquid or semiliquid blood and blood products. Also, items contaminated with blood that would release liquid or semiliquid blood if compressed.
- Body fluids contaminated with blood, excluding urine and feces.

Table 3. Work restrictions for all health care providers

Infection	Restriction	Duration
Blood-borne viruses (hepatitis B and C, HIV)	From performing specific exposure-prone procedures with high risk for blood transfer (62). These are surgical procedures that are unlikely to be performed in an office setting	As per local public health policy (viremia resolved or blood viral load controlled)
Colds, other viral upper RTIs	From direct care of high-risk patients* For other patients, wear surgical or procedure mask during care and perform hand hygiene after any contact with nasal or respiratory secretions and before any patient contact	Until symptoms resolve
Conjunctivitis	From direct patient care	Until exudate resolves
Gastroenteritis [†]	From direct patient care	Until symptoms resolve or illness deemed noncontagious
Hepatitis A	From direct patient care	Until 1 week after onset of jaundice
Herpes simplex, orofacial	From direct care of newborns and nonimmune or immunocompromised patients, if lesions are not covered [‡]	Until lesions dry
Herpetic whitlow	From direct patient care	Until lesions dry
Influenza	From office	Until symptoms resolve
Measles	From office	Until 4 days after onset of rash
Mumps	From office	Until 9 days after onset of parotitis

Infection	Restriction	Duration
Pediculosis	From direct patient care	Until one treatment completed (<24 h)
Pertussis	From office	Until 5 days of appropriate antibiotic
Rubella	From office	Until 7 days after onset of rash
Scabies	From direct patient care	Until one treatment completed (<24 h)
Staphylococcal skin infection (MSSA)	From direct patient care if: Lesions on hands Lesions elsewhere with exudates or drainage that cannot be effectively contained by dressing	Until lesions on hands are healed Until lesions elsewhere can be covered by dressings
Staphylococcal skin infection (MRSA)	From direct patient care	Until lesions healed and assessed for risk of transmission
Streptococcus group A infection	From direct patient care	Until treated for 24 h
Tuberculosis, active Pulmonary	From office	Until assessed as noninfectious
Varicella	From office	Until lesions crusted
Zoster	From direct patient care if lesions not covered. If covered: From care of newborns and nonimmune immunocompromised patients and pregnant women	Until lesions crusted and dry

MRSA *Methicillin-resistant Staphylococcus aureus*; MSSA *Methicillin-susceptible S aureus*; RTIs *Respiratory tract infections*

Data taken from references (2,5,6,56,62).

*Patients with hemodynamically significant congenital heart disease or chronic lung disease, neonates and immunocompromised patients.

†Clinically significant diarrhea or vomiting.

‡If working, keep lesions covered, avoid touching face during patient care, wear surgical or procedure mask during care and wash hands after touching lesions and before touching any patient or patient care equipment.

- Sharp objects including needles, needles attached to syringes, and blades.
- Broken glass and other materials able to cause punctures or cuts, if these have been in contact with human blood or body fluids.
- Full sharps containers.

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APPENDIX

Checklist for office infection prevention and control. *Adapted from reference (5).

SUPPLIES

- Hand hygiene agents (liquid soap and water, alcohol-based hand rinses)
- Disposable gloves
- Surgical masks or procedure masks
- N95 masks (if it is anticipated that patients with contagious tuberculosis are likely to be seen routinely)
- Gowns
- Eye protection (goggles or face shields or surgical masks with visors attached)
- Tissues
- No-touch waste receptacles
- Antiseptics
- Disinfectants, cleaning agents, household bleach
- Sharps containers
- Infection control signs, posters, patient handouts

POLICIES AND PROCEDURES

Personnel

- Infection Prevention and Control (IPAC) policies and procedures are written and enforced.
- Personnel are aware of and follow the IPAC policies and procedures.
- Personnel are provided with ongoing IPAC education.
- Personnel are immunized appropriately.
- If patients with contagious pulmonary tuberculosis are routinely seen, personnel who wear N95 masks are fit-tested, N95 masks are used appropriately, and staff receive baseline TB skin testing unless exempt.
- Personnel with communicable infections are aware of work restrictions.
- Communication with local public health authorities is established.

Facility

- There are no-touch waste receptacles available in each room.
- There is a separate waiting area for patients who need to be segregated for acute infection.
- Gloves are used appropriately.
- Masks are used appropriately.
- There is a functional separation of clean storage and dirty utility areas.
- Carpeting is not used in waiting or examination rooms.
- Ventilation provides at least six air exchanges per hour in new or recently renovated premises. If less, or if information on air exchanges is unavailable, this should be noted.

Reception area

- Visual alerts are posted at each entrance and at the reception desk, informing patients to report contagious infections and instructing them about Respiratory Etiquette.
- A telephone triage screening system is available and used appropriately.
- Infection control triage begins at the reception desk.
- Infection control information is made available for parents and patients.
- Contact between children with contagious illnesses and other children is minimal.
- There are alcohol-based hand hygiene products and masks available at reception, with signage for appropriate use.
- Boxes of tissue always easily available.
- There are instructions for parents on toy use and, if toys are to be re-used, they are properly cleaned between uses.

Examination rooms

- There are designated hand-hygiene sinks with liquid soap and paper towels in each clinic area.
- Alcohol-based hand rinses or gels are available in each exam room.
- Puncture-resistant sharps containers are provided in each exam room and clinic area.
- Sharps are discarded directly into sharps containers.
- Gloves, masks and gowns are used, when necessary and appropriately.
- Supplies (other than cleaning supplies) are not stored under, or on counters adjacent to, hand-hygiene sinks.
- If patients with active pulmonary tuberculosis are routinely seen, an appropriately ventilated examination room is available.

Environmental disinfection and cleaning

- Medical equipment used on multiple patients is cleaned between patients.
- Approved and appropriate disinfectants or sterilization processes are used to reprocess equipment and instruments.
- Approved hospital-grade detergent-disinfectants are used for environmental cleaning.
- Examining tables are covered with disposable paper or a washable cloth that is changed between patients. Other surfaces and equipment in direct contact with the patient are cleaned between patients.
- Examining tables, chairs, and other frequently touched surfaces are cleaned daily and when soiled.
- Washrooms are cleaned daily and when visibly soiled (floors, sinks, countertops, diaper change stations).
- Other office areas are cleaned at least weekly.
- The procedure for cleaning up spills of body fluids is posted and practiced.
- Waste is segregated and managed according to provincial/territorial regulations and local bylaws.

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