Best Evidence Statement (BESt)

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Infection Control in Cystic Fibrosis (CF)

Clinical Question

P (population/problem): In children with cystic fibrosis
I (intervention): does use of the following infection control methods:
- annual flu shot
- multidrug-resistant bacteria transmission prevention techniques in outpatient clinic and pulmonary function testing (PFT) lab
- handwashing by patient / family
- minimizing contact with other CF patients
- antiseptic care of reusable therapy equipment

C (comparison): compared to no specific infection control methods
O (outcome): improve forced expiratory volume in one second (FEV_1)?

Target Population: Children with cystic fibrosis

Recommendations:

1. It is recommended that an annual influenza immunization be administered to
   - CF patients 6 months of age or older (IA[a]) , and
   - close contacts of all CF patients (IA[a])

   according to Advisory Committee on Immunization Practices (ACIP) recommendations (see Table) *(Saiman 2003 [5])*.

   Note: The immunization dose(s) is ideally administered before the onset of community influenza activity. The annual timing of onset, peak, and duration of this activity varies unpredictably. Annual administration of influenza vaccine early in the season will decrease risk of illness, although mid- or late-season administration is appropriate for cases of unavoidable delay *(Fiore 2007 [5])*.

Table: ACIP recommendations for influenza immunization for children with CF and their close contacts

Age	Influenza vaccination history (by season)	Number of Doses	Timing of Doses (see Note 2 above)	Vaccine	Other
≥ 6 months through 8 years	Initial season for vaccination	2	▪ 1st dose as soon after vaccine becomes available as is feasible. ▪ 2nd dose at least 4 weeks later, as soon as feasible thereafter	Trivalent inactivated influenza vaccine (TIV)	No contraindications at time of administration
	Not initial season for vaccination*	1	early in season		
≥ 9 years	Not applicable	1	early in season		

*Exception: if this is the 2nd season for administration, and the child only received one dose in the initial season, 2 doses are recommended. *(Fiore 2007 [5])*

[a] Below is the system for categorizing recommendations in the Cystic Fibrosis Foundation Consensus Conference paper upon which the recommendations in this BESt are based:
- ***Category IA***. Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.
- ***Category IB***. Strongly recommended for implementation and supported by some experimental, clinical, or epidemiologic studies and a strong theoretical rationale.
- ***Category II.*** Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.

(Saiman 2003 [5])

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2. It is recommended that transmission prevention techniques be used when caring for the CF patient who is infected with multidrug-resistant bacteria in the ambulatory care setting. Specifically:
   - observe contact plus standard precautions in the CF ambulatory care setting (IA[a]) (see box)
   - alert other diagnostic areas (e.g. radiology or PFT laboratory) of patients' transmission precautions (IB[a]) (see box, item 7).
   - segregate from other CF patients, in different spaces and/or at different times, including placing in examining room immediately (IB[a]).

   (Saiman 2003 [5]).

   Note: There is no published evidence studying the direct impact of prevention of infection with multidrug-resistant bacteria on lung function or other clinical outcomes in CF patients. Only low quality study designs have been used to evaluate the connection between infection with MRSA and clinical outcomes, and their results have been inconsistent *(Frederiksen 1999 [3a], Ren 2007 [4a], Miall 2001 [4a], Solis 2003 [4b])*.

Summary of Contact Plus Standard Precautions

1. WASH YOUR HANDS before and after all patient care and before leaving the exam room.
2. WEAR A MASK when exposure to respiratory secretions is likely
3. PROTECT YOUR EYES if procedure or activity is likely to generate splash or aerosol.
4. WEAR GLOVES when entering room; change when contaminated.
5. WEAR A GOWN when entering room unless it is unlikely that health care worker's clothing will contact the patient or environmental surfaces in the patient room.
6. REMOVE PERSONAL PROTECTIVE EQUIPMENT (PPE) before leaving room.
7. LIMIT ACTIVITIES AND TRANSPORT to essential purposes only. Advance notification of destination is required.
8. USE CAUTION when handling and disposing of needles and other sharp instruments.

(CCHMC 2007 [5], CCHMC 2005b [5])

3. It is recommended that CF patients and family members be instructed on proper hand hygiene and containment of respiratory secretions, especially
   - when arriving and leaving the clinic (IB[a]);
   - when other CF patients are present in non-healthcare settings (II[a]); and
   - while in school (II[a]).

   (Saiman 2003 [5]).

   Note 1: Dispensers of waterless antiseptic (e.g. alcohol-based hand rub) in the clinic waiting area facilitates hand hygiene (IA[a]) *(Saiman 2003 [5])*.

   Note 2: Containment of respiratory secretions is defined as using a tissue (e.g. when coughing), and immediately discarding tissue into a covered no-touch receptacle, followed by hand hygiene (II[a]) *(Saiman 2003 [5])*.

4. It is recommended, that contact between CF patients be minimized *(Saiman 2003 [5])*. Specific examples include:
   - *clinic*
     - minimize time in common waiting areas (II[a])

       Note: Strategies include: managing the clinic schedule, immediate placement in examining room upon arrival, use of a pager system to summon patient when ready, keeping the patient in one exam room *(Saiman 2003 [5])*.
     - discourage handshaking and physical contact between CF patients (IA[a])
     - maintain a minimal distance of three feet between patients in the waiting area (IA[a])
     - discourage use of common items in waiting area (IA[a])
   - *inpatient*
     - follow infection control precautions specific for CF patients *(CCHMC 2005a [5])* (II[a])
     - avoid direct contact between CF patients in the hospital (II[a])

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- *home*
  - do not share personal care items between CF patients (IB[a])
  - perform physiotherapy in different rooms and times, with only one patient in the room during treatment (II[a])
- *extended family gatherings*
  - avoid handshaking with, and maintain distance greater than three feet between, CF patients who do not live together (II[a])
- *camps, overnights, and sports*
  - avoid CF-specific activities (IB[a])
- *school*
  - do not place more than one CF patient in same classroom, whenever possible (II[a])
  - always separate CF patients by greater than three feet and/or by scheduling common activities (e.g. lunch or gym) at different times (II[a])

(Saiman 2003 [5]).

5. It is recommended that antiseptic care of reusable nebulizers and other therapy equipment in the home be performed, including three steps:
   - clean, by washing with soap and water as soon as possible, and prior to disinfecting (II[a])
   - disinfect according to manufacturer's recommendations, which may include
     - boil in water for 5 minutes (IB[a])
     - immerse in disinfecting solution (follow safety instructions) (II[a])
     - use standard cycle dishwasher with water temperature at least 70° C for at least 30 minutes (IB[a])
     - microwave for 5 minutes (IB[a])
   - air dry

   (Saiman 2003 [5]).

   Note 1: Clean noncritical items (e.g. therapy vest) with a detergent (II[a]) *(Saiman 2003 [5])*.

   Note 2: Refer to CCHMC Respiratory Care Policy II 205 Hand Held Nebulizer Treatments for inpatient policy for cleaning and changing of hand held nebulizers *(CCHMC 2006 [5])*.

Health Benefits, Side Effects and Risks

Health Benefits

- In children immunized with influenza vaccination, 13 diagnoses, including otitis media and upper respiratory infections, were significantly less common than in unimmunized children *(Fiore 2007 [5])*.
- Isolation of cohorts of patients infected with a specific organism decreases prevalence and incidence of infection in the clinic population *(Frederiksen 1999 [3a])*.

Side Effects or other Risks

- Children immunized with influenza vaccination may have mild local (i.e. soreness, swelling) or systemic (i.e. fever, irritability, insomnia, malaise, myalgia) reactions *(Fiore 2007 [5])*.
- Isolation precautions, including segregation from other persons with CF, may have negative psychosocial effects. These effects may be ameliorated with attention to appropriate contact with non-CF persons and by managing the physical environment during isolation *(Saiman 2003 [5])*.

References (evidence grade in *[ ]; see Table of Evidence Levels following references*)

Note: When using the electronic version of this document, ☜ indicates a hyperlink to the PubMed abstract. A hyperlink following this symbol goes to the article PDF when the user is within the CCHMC network.

1. **CCHMC:** Cincinnati Children's Hospital Medical Center. Respiratory Care Policy II 205 Hand Held Nebulizer Treatments 2006. Accessed 12-11-2007 from *[5]* ☜ _____.

2. **CCHMC:** Cincinnati Children's Hospital Medical Center. Infection Control Policies and Resources. ICRM - 731 Standard Precautions. 1-3, 2007, *[5]* ☜ _____.

3. **CCHMC:** Cincinnati Children's Hospital Medical Center. Infection Control Policies and Resources. ICRM - 735 Respiratory-Contact Precautions. 1-5, 2005a, *[5]* ☜ _____.

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4. **CCHMC:** Cincinnati Children's Hospital Medical Center. Infection Control Policies and Resources. ICRM - 736 Contact Precautions. 1-3, 2005b, *[5]* ☜ _____.

5. **Fiore, A. E.; Shay, D. K.; Haber, P.; Iskander, J. K.; Uyeki, T. M.; Mootrey, G.; Bresee, J. S.; and Cox, N. J.:** Prevention and control of influenza. Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2007. *MMWR Recomm Rep,* 56(RR-6): 1-54, 2007, *[5]* _____ ☜ _____.

6. **Frederiksen, B.; Koch, C.; and Hoiby, N.:** Changing epidemiology of Pseudomonas aeruginosa infection in Danish cystic fibrosis patients (1974-1995). *Pediatric Pulmonology,* 28(3): 159-66, 1999, *[3a]* _____ ☜ _____.

7. **Miall, L. S.; McGinley, N. T.; Brownlee, K. G.; and Conway, S. P.:** Methicillin resistant Staphylococcus aureus (MRSA) infection in cystic fibrosis. *Archives of Disease in Childhood,* 84(2): 160-2, 2001, *[4a]* _____ ☜ _____.

8. **Ren, C. L.; Morgan, W. J.; Konstan, M. W.; Schechter, M. S.; Wagener, J. S.; Fisher, K. A.; Regelmann, W. E.; and The Investigators and Coordinators of the Epidemiologic Study of Cystic, F.:** Presence of methicillin resistant Staphylococcus aureus in respiratory cultures from cystic fibrosis patients is associated with lower lung function. *Pediatric Pulmonology,* 42(6): 513-8, 2007, *[4a]* _____ ☜ _____.

9. **Saiman, L.; Siegel, J.; and Cystic Fibrosis Foundation:** Infection control recommendations for patients with cystic fibrosis: microbiology, important pathogens, and infection control practices to prevent patient-to-patient transmission. *Infection Control & Hospital Epidemiology,* 24(5 Suppl): S6-52, 2003, *[5]* _____ ☜ _____.

10. **Solis, A.; Brown, D.; Hughes, J.; Van Saene, H. K. F.; and Heaf, D. P.:** Methicillin-resistant Staphylococcus aureus in children with cystic fibrosis: An eradication protocol.[see comment]. *Pediatric Pulmonology,* 36(3): 189-95, 2003, *[4b]* _____ ☜ _____.

Table of Evidence Levels*

Quality level	*Definition*
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5	Other: General review, expert opinion, case report, consensus report, or guideline

†a = good quality study; b = lesser quality study
*full Table of Evidence Levels of Individual Studies by Domain, Study Design, & Quality available in separate document

Supporting information

Group/team members

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Search strategy

OVID Databases
Medline, CINAHL, and the Cochrane Database for Systematic Reviews (CDSR)

OVID Filters

Publication Date	1996 to present
Limits	Humans and English Language

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Search Terms and MeSH Terms

Patients/Population	exp Cystic Fibrosis/ or cystic fibrosis.mp. limit to ("all child (0 to 18 years)" or all child <0 to 18 years>) (pediatr$ or child$).mp.
Intervention/Exposure	exp Influenza Vaccines/ (exp Staphylococcus aureus/ and exp Methicillin Resistance/) or MRSA.mp. exp Handwashing/ or handwashing.mp. exp Patient Isolation/ or contact isolation.mp.
Outcomes	exp Forced Expiratory Volume/ or (FEV or FEV_1).mp.

Applicability issues

Outcomes that are planned to be measured include:

1. Optimized Lung Function (CF-1): The average (mean) FEV_1 % predicted of our population, as measured using each patient's best forced expiratory volume (FEV_1) percent predicted, per quarter.
2. Flu Vaccine (CF-7): Percent of cystic fibrosis patients who received or actively declined a flu vaccine in the most recent flu season.
3. New Pseudomonas Infection (CF-9): Number of patients who develop a new/first time pseudomonas infection each month.
4. Days Between Multidrug-Resistant Infections (CF-10): Number of days between patients acquiring a new infection with a multidrug-resistant organism confirmed by lower respiratory tract culture.

Complete operational definitions are on file.

Note

This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

Reviewed by Clinical Effectiveness

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