MEDICAL UNIVERSITY OF SOUTH CAROLINA
VALUE INSTITUTE
Evidence-Based Practice Brief
Implementing Isolation Precautions in the ED

Author(s): Amanda Davis, MPH, RD, CHES; Emily Brennan, MLIS

ASK THE QUESTION

Question: What are the best practices for implementing isolation precautions (i.e., contact, droplet, airborne, neutropenic, etc.) in the emergency department?

SEARCH FOR EVIDENCE

Databases: PubMed, Scopus, CINAHL


Scopus search strategy: (TITLE-ABS-KEY((“universal precautions” OR “patient isolation” OR “isolation precautions” OR “contact precautions” OR “droplet precautions” OR “airborne precautions” OR “transmission precautions”)) AND TITLE-ABS-KEY(emergency)) AND NOT DBCOLL(medl*)

CINAHL search strategy: (MH “Universal Precautions” OR MH “Patient Isolation” OR isolation precautions OR contact precautions OR droplet precautions OR airborne precautions OR transmission precautions) AND (MH “Emergency Service+” OR emergency)

Filters: English, Published last 10 years

CRITICALLY ANALYZE THE EVIDENCE

There were 8 primary research articles found addressing the implementation of best practices for isolation precautions in the emergency department. Five studies (Fusco et al. 2012; Garner et al. 2016; Martel et al. 2013; Pallin et al. 2014; Turnberg et al. 2008) addressed measured the use of isolation precautions as compared to established guidelines. All five evaluated the use of infection control procedures that are consistent with the Center for Disease Control and Prevention (2007) guidelines referenced below. Two studies (Magill et al. 2009; May et al. 2012) focused on the effect of process improvement and educational interventions on use of isolation precautions. And, one study (McLemore et al., 2011) evaluated ED length of stay for patients with and without contact precautions.

Use of isolation precaution measures:
Fusco et al. (2012) evaluated the use of isolation precautions in 41 EDs and 14 medical admission departments in Europe via direct observation during the H1N1 pandemic of 2009. They found that while most units had specific infection control procedures, only 34% had a general waiting area large enough for safe
distancing (at least 3 feet), just over half (54%) had separate waiting areas for patients with highly infectious diseases and only 51% had triage personnel with specific training in early recognition of highly infectious diseases. Garner et al. (2016) surveyed 26 children’s hospitals in the US regarding their airborne isolation management and capacity in the ED. They found that while 96% reported having at least one (median: 5) isolation room with negative pressure capabilities, only 39% had ante-rooms connected. Additionally, only 35% of respondents reported having a separate waiting area for patients with suspected respiratory infections. Pallin et al. (2014) surveyed 412 EDs in the US National Emergency Department Inventory database in 2009 (n=301; 73% response rate) regarding their contact precautions (gown and gloves) for MRSA and C. diff. While 79% of EDs required contact precautions with suspected MRSA, only 49% required them for patients with purulent skin infection (predominantly caused by MRSA). Additionally, only 84% of EDs required contact precautions for suspected C. diff. Turnberg et al. (2008) administered questionnaires to ED and primary care health care workers regarding adherence to the CDC-recommended respiratory infection control practices at five medical centers in Seattle, WA. While the majority of health care workers reported that disposable masks were offered, reports of isolating patients to private exam rooms and asking patients to maintain a safe distance (3 feet apart) were much lower. While the rates were significantly higher in the ED than primary care (p<0.001), only 66% of ED workers reported that patients were placed in private exam rooms. Use of personal protective equipment (PPE) was also quite low for wearing eye protection (20-22%) and wearing a mask (22-34%) while treating a sneezing or coughing patient.

Martel et al. (2013) performed direct observations of triage nurses and administered questionnaires to ED staff at 2 university hospitals in Quebec, Canada. Their observations showed that while 82% of triage documented presence of fever or cough if a patient presented with those symptoms, compliance with respiratory hygiene was extremely low. Only 18% informed patients that they needed to wear a mask, 9% informed patient of proper mask technique and 0% asked patients to wash their hands after contact with respiratory secretions. The questionnaire results showed that mask comfort and “tendency to forget” significantly impacted mask wearing, and that residents were significantly less likely than nurses to request that patients wear a mask (14% vs 83%, p <0.05).

Effect of process improvement and educational interventions:
Magill et al. (2009) reports on a process improvement project to increase use of infection control measures for patients with known infectious disease status in an ED in Australia. The updated process included placing a blue sticker on the patient tracking board and similar blue sign on the curtains of the bed, reminding staff to don the PPE included in a strategically stored blue bin before interacting with the patient. May et al. (2012) evaluates compliance with patient assignment and transport precautions for influenza in an urban ED in Washington, DC before and after implementation of reminders in the EMR. A reminder for droplet precautions was added next to the checkbox for the influenza naso-pharyngeal swab order, and was viewable by both the MD and RN. As a result, both compliance with transmission precautions (29 to 45%, p=0.015) and precautions for patients moved to the hallways or radiology (7% to 24%, p=0.001) significantly increased.

Effect of isolation precautions on LOS:
McLemore et al. (2011) performed a retrospective review of 825 pediatric hospital admissions to assess for differences in ED length of stay based on contact precautions for multi-drug resistant organisms. After excluding patients admitted to the ICU, telemetry or stepdown units the mean wait time was still significantly higher for patients on contact precautions (mean difference 54 minutes, p=0.045).

<table>
<thead>
<tr>
<th>Existing External Guidelines</th>
<th>Organization and Author</th>
<th>Last Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection control in the management of highly pathogenic infectious diseases</td>
<td>European Network of Infectious Disease (Brouqui et al.)</td>
<td>2009</td>
</tr>
<tr>
<td>Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings</td>
<td>Centers for Disease Control and Prevention (Siegel et al.)</td>
<td>2007</td>
</tr>
</tbody>
</table>
The 2 published clinical guidelines have been evaluated for this review using the **University of Pennsylvania’s Center for Evidence-Based Practice Trustworthy Guideline rating scale.** The scale is based on the Institute of Medicine’s “Standards for Developing Trustworthy Clinical Practice Guidelines” (IOM), as well as a review of the AGREE Enterprise and Guidelines International Network domains.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Transparency</td>
<td>B</td>
</tr>
<tr>
<td>2.</td>
<td>Conflict of interest</td>
<td>A</td>
</tr>
<tr>
<td>3.</td>
<td>Development group</td>
<td>A</td>
</tr>
<tr>
<td>4.</td>
<td>Systematic Review</td>
<td>B</td>
</tr>
<tr>
<td>5.</td>
<td>Supporting evidence</td>
<td>C</td>
</tr>
<tr>
<td>6.</td>
<td>Recommendations</td>
<td>B</td>
</tr>
<tr>
<td>7.</td>
<td>External Review</td>
<td>NR</td>
</tr>
<tr>
<td>8.</td>
<td>Currency and updates</td>
<td>B</td>
</tr>
</tbody>
</table>

See Appendix B for full description of the Trustworthy Guideline grading system.

### Guideline Comparison

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Evidence Evaluation</td>
<td>No level of Evidence available (consensus statement)</td>
<td>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 IC Required for implementation, as mandated by federal and/or state regulation or standard. Category II Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale. No recommendation unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists</td>
</tr>
</tbody>
</table>

European Network of Infectious Disease (2009) guideline for infection control in the management of highly pathogenic infectious diseases states that at admission of patients with highly infectious diseases to an emergency department:

- Systematically apply standard precautions and cough and respiratory etiquette
- Set up at least one single room with a dedicated route and direct access, or an isolation room
- Offer special training to the emergency department team
- Retain close relationships with the medical team of the referral hospital (if applicable)

Center for Disease Control and Prevention (2007) guideline for preventing transmission of infectious agents in healthcare settings recommends the following: **Respiratory Hygiene/Cough Etiquette**
• Educate healthcare personnel on the importance of source control measures to contain respiratory secretions to prevent droplet and fomite transmission of respiratory pathogens, especially during seasonal outbreaks of viral respiratory tract infections (e.g., influenza, RSV, adenovirus, parainfluenza virus) in communities. Category IB

• Implement the following measures to contain respiratory secretions in patients and accompanying individuals who have signs and symptoms of a respiratory infection, beginning at the point of initial encounter in a healthcare setting (e.g., triage, reception and waiting areas in emergency departments, outpatient clinics and physician offices).
  o Post signs at entrances and in strategic places (e.g., elevators, cafeterias) within ambulatory and inpatient settings with instructions to patients and other persons with symptoms of a respiratory infection to cover their mouths/noses when coughing or sneezing, use and dispose of tissues, and perform hand hygiene after hands have been in contact with respiratory secretions. Category
  o Provide tissues and no-touch receptacles (e.g., foot-pedal operated lid or open, plastic-lined waste basket) for disposal of tissues Category II
  o Provide resources and instructions for performing hand hygiene in or near waiting areas in ambulatory and inpatient settings; provide conveniently-located dispensers of alcohol-based hand rubs and, where sinks are available, supplies for handwashing. Category IB
  o During periods of increased prevalence of respiratory infections in the community (e.g., as indicated by increased school absenteeism, increased number of patients seeking care for a 81 respiratory infection), offer masks to coughing patients and other symptomatic persons (e.g., persons who accompany ill patients) upon entry into the facility and encourage them to maintain special separation, ideally a distance of at least 3 feet, from others in common waiting areas. Category IB
  o Some facilities may find it logistically easier to institute this recommendation year-round as a standard of practice. Category II

Patient placement
• In acute care hospitals, place patients who require Contact/Droplet Precautions in a single-patient room when available. Category IB When single-patient rooms are in short supply, apply the following principles for making decisions on patient placement: 1) Prioritize patients with conditions that may facilitate transmission for single-patient room placement. Category II; 2) Place together in the same room (cohort) patients who are infected or colonized with the same pathogen and are suitable roommates. Category IB
• In acute care hospitals and long-term care settings, place patients who require Airborne Precautions in an AIIR that has been constructed in accordance with current guidelines as follows: Provide at least six (existing facility) or 12 (new construction/renovation) air changes per hour; Direct exhaust of air to the outside. If it is not possible to exhaust air from an AIIR directly to the outside, the air may be returned to the air-handling system or adjacent spaces if all air is directed through HEPA filters; Whenever an AIIR is in use for a patient on Airborne Precautions, monitor air pressure daily with visual indicators (e.g., smoke tubes, flutter strips), regardless of the presence of differential pressure sensing devices (e.g., manometers); Keep the AIIR door closed when not required for entry and exit. Category IA/IC

Use of personal protective equipment
• Wear gloves whenever touching the patient’s intact skin or surfaces and articles in close proximity to the patient (e.g., medical equipment, bed rails). Don gloves upon entry into the room or cubicle. Category IB
• Wear a gown whenever anticipating that clothing will have direct contact with the patient or potentially contaminated environmental surfaces or equipment in close proximity to the patient. Don gown upon entry into the room or cubicle. Remove gown and observe hand hygiene before leaving the patient-care environment. Category IB After gown removal, ensure that clothing and skin do not contact potentially contaminated environmental surfaces that could result in possible transfer of microorganism to other patients or environmental surfaces. Category II
• Don a mask upon entry into the patient room or cubicle. Category IB
• No recommendation for routinely wearing eye protection (e.g., goggle or face shield), in addition to a mask, for close contact with patients who require Droplet Precautions. Unresolved issue
**Patient transport**

- In acute care hospitals and long-term care and other residential settings, limit transport and movement of patients outside of the room to medically-necessary purposes. Category II
- When transport or movement in any healthcare setting is necessary, ensure that infected or colonized areas of the patient’s body are contained and covered. Category II
- Remove and dispose of contaminated PPE and perform hand hygiene prior to transporting patients. Category II
- Don clean PPE to handle the patient at the transport destination. Category II

A narrative review by Harding et al. (2011) also presents a succinct reference for considerations of transmission-based precautions as shown below.

### Transmission-based precautions quick reference guidelines

<table>
<thead>
<tr>
<th>Type of isolation</th>
<th>Personal protective equipment required and room required</th>
<th>Hand hygiene</th>
<th>Cleaning of equipment</th>
<th>Examples of diseases requiring isolation</th>
<th>Criteria for discontinuing isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contact</strong></td>
<td>Gown and gloves when entering patient's room</td>
<td>Hand hygiene upon entering and leaving patient's room — if hands are visibly soiled, use soap and water</td>
<td>Hospital-approved disinfectant to clean equipment between patients (e.g., stethoscopes, noncritical equipment)</td>
<td>MRSA, VRE, extended-spectrum β-lactamase, carbapenem-resistant Entrobacteriaceae</td>
<td>MRSA and VRE: varies according to hospital policy. Extended-spectrum β-lactamase and carbapenem-resistant Entrobacteriaceae: most hospitals do not have criteria for discontinuing these respiratory syncytial viruses. Duration of illness: Scolices: until 24 h after start of effective therapy. TB pulmonary and laryngeal: discontinue only when patient is receiving effective therapy and improving clinically and has a consecutive sputum smears negative for acid-fast bacilli collected on separate days. Zoster, disseminated: until lesions are dry and crusted. Varicella: until lesions are dry and crusted. Influenza: 5 d except for duration of illness in immunocompromised patients. Group A streptococcus: until 24 h after initiation of effective therapy. Meningococcal disease: until 24 h after initiation of effective therapy. Pertussis: until 5 d after start of effective therapy. C difficile: CDC guidelines. Discontinue isolation if patient has been treated and has had no diarrhea for 24 h; some hospitals continue isolation (check hospital policy). Norovirus: isolation may be discontinued after no diarrhea for 72 h (this will vary per hospital policy).</td>
</tr>
<tr>
<td><strong>Airborne</strong></td>
<td>Particulate respirator mask</td>
<td>Hand hygiene upon entering and leaving patient’s room</td>
<td>Hospital-approved disinfectant to clean equipment between patients</td>
<td>TB pulmonary and laryngeal</td>
<td>Zoster, disseminated— requires airborne and contact precautions. Varicella—requires airborne and contact precautions.</td>
</tr>
<tr>
<td><strong>Droplet</strong></td>
<td>Surgical mask within 3 ft of patient</td>
<td>Hand hygiene upon entering and leaving patient’s room</td>
<td>Hospital-approved disinfectant to clean equipment between patients</td>
<td>Influenza</td>
<td>Group A streptococcus major wound/skin infections— requires contact precautions in addition. Meningococcal disease</td>
</tr>
<tr>
<td><strong>Enteric</strong></td>
<td>Gown and gloves when entering patient's room</td>
<td>Soap and water (not alcohol hand gel) when entering and leaving patient's room</td>
<td>Equipment wiped with 1:10 bleach disinfectant to water before removing from room</td>
<td>C difficile Norovirus</td>
<td>Discontinue isolation if patient has been treated and has had no diarrhea for 24 h; some hospitals continue isolation (check hospital policy). Norovirus: isolation may be discontinued after no diarrhea for 72 h (this will vary per hospital policy).</td>
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</tbody>
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### PICO Question: What are the best practices for implementing isolation precautions (i.e., contact, droplet, airborne, neutropenic, etc.) in the emergency department?

<table>
<thead>
<tr>
<th>Author/Date/ Journal</th>
<th>Purpose of Study</th>
<th>Study Design</th>
<th>Sample &amp; Setting</th>
<th>Outcomes</th>
<th>Design Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fusco et al., 2012, BMC Infectious Diseases</td>
<td>To present data about logistic and infrastructure, infection control procedures, and availability of staff for the appropriate management of highly infectious diseases in European hospitals</td>
<td>Cross-sectional (direct observation)</td>
<td>Direct observations in European EDs (n=41) and Medical Admission Departments (n=14) by staff from the European Network for Highly Infectious Diseases project -1 representative from each facility also performed direct observations -Feb through Nov 2009 (surge of H1N1 pandemic) -3 checklists (16 main issues, 148 specific questions)</td>
<td>General infection control: -34.1% had a general waiting area large enough for safe distancing (at least 3 feet) -53.6% had separate waiting areas for patients with suspected highly infectious diseases (fever and cough) Specific infection control for highly infectious diseases: -92.7% had specific PPE available -85.4% had specific protocols for management of suspected highly infectious diseases, including basic infection control measures -61% had a dedicated route from the ED to isolation wards, but only 51.2% had routes that bypassed common areas Strategies for early recognition of highly infectious diseases: -Only 51.2% had triage personnel with specific training</td>
<td>Study Limitations = None Non-Experimental/Observational Studies (case-control, cohort, cross-sectional, descriptive, epidemiologic, case study/series, survey) Insufficient sample size Sample not representative of patients in the population as a whole Variables (confounders, exposures, predictors) were not described Outcome criteria not objective or were not applied in blind fashion Insufficient follow-up, if applicable For prognostic study, sample not defined at common point in course of disease/condition For diagnostic study, gold standard not applied to all patients For diagnostic study, no independent, blind comparison between index test and gold standard</td>
</tr>
<tr>
<td>Garner et al., 2016, American Journal of Infection Control</td>
<td>To conduct a survey of free-standing US children’s hospitals to ascertain their existing capability for airborne isolation in the ED</td>
<td>Cross-sectional (survey)</td>
<td>Survey results from 26 members (60% response rate) of the Children’s Hospital Association in 2012-13 -10 question survey: specific airborne isolation capacity and perceptions of adequacy during routine management</td>
<td>Only 35% of hospitals reported having separate ED waiting areas for patients with suspected respiratory infections All hospitals reported having at least 1 airborne isolation room (median: 5) in the ED -96% reported having at least 1 isolation room with negative pressure capabilities (median: 4) -61% reported that ante-rooms were not connected to these isolation rooms -68% reported isolations rooms vented directly outdoors or used high efficiency particulate filters -61% reported confidence that the number of isolation beds was adequate for their needs</td>
<td>Study Limitations = None Non-Experimental/Observational Studies (case-control, cohort, cross-sectional, longitudinal, descriptive, epidemiologic, case study/series, survey) Insufficient sample size Sample not representative of patients in the population as a whole Variables (confounders, exposures, predictors) were not described Outcome criteria not objective or were not applied in blind fashion Insufficient follow-up, if applicable For prognostic study, sample not defined at common point in course of disease/condition For diagnostic study, gold standard not applied to all patients For diagnostic study, no independent, blind comparison between index test and gold standard</td>
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</tbody>
</table>

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**GRADE CRITERIA**

(See Appendix A)

**Lower Quality Rating if:**
- High risk of bias (When design limitations for one or more criteria impact the quality of studies sufficiently enough to lower confidence in the estimate of effect)
- Studies inconsistent (When there are differences in the direction of the effect, populations, interventions or outcomes between studies)
- Studies are indirect (Your PICO question is quite different from the available evidence in regard to population, intervention, comparison, or outcome)
- Studies are imprecise (When studies include few patients and few events and thus have wide confidence intervals and the results are uncertain)
- Publication Bias (e.g. pharmaceutical company sponsors study on effectiveness of drug)

**Increase Quality Rating if:**
- Large effect (When the relative risk of association between two factors is large or very
| Magill et al., 2009, Australasian Emergency Nursing Journal | To implement a cost effective, flexible, easily identifiable, color coded infection control patient management system, to highlight the appropriate Personal Protective Equipment (PPE) requirements when dealing with specific patient populations | Descriptive (process improvement) | "Overwhelming" increase in patients with infectious presentations to the ED requiring isolation prompted new systems innovation -single hospital in Australia -August 2008 |
|-------------------------------------------------------------|--------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------
| Identified previous records of infection -placed Blue stickers on file generated before triage -stickers placed on patient tracking board to easily identify isolation status -bin system implemented that used colored coded cards relevant to PPE requirements -color code placed on sign for curtains of bed |

**Study Limitations =**

- None

**Quality Improvement (pre-post, controlled pre-post, historical comparison, time series)**

- Intervention not evidence-based
- Improvement method was not clearly identified or the need for improvement was not described
- Stakeholders, organizational culture, patients, or interventions were not clearly described or appropriate
- Interventions were not described in enough detail to be replicated by others
- Baseline and outcome data were not collected and reported appropriately or in the same manner
- Data collection tools were not validated to measure intended outcomes
- Any modifications made to the intervention were not based on pilot studies

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| Martel et al., 2013, American Journal of Infection Control | To determine the compliance with respiratory hygiene of triage nurses at 2 university hospital centers and to identify factors influencing compliance to the | Descriptive 2-part study: -direct observations and cross-sectional survey | 115 anonymous observations of compliance with respiratory hygiene by triage ED nurses -Quebec, Canada -5 student observers -convenience sampling (all shifts) Questionnaire to assess knowledge, attitudes and beliefs about respiratory hygiene and subjective compliance |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------
| **Overall compliance:**
  - presence of fever or cough (82%)
  - wash hands after patient contact (53%)
  - wash hands before patient contact (43%)
  - inform patient of need to wear mask (18%)
  - appropriate isolation of patient (12%)
  - inform patient of proper mask technique (face and nose; 9%)
  - inform patient to change mask when wet (2%)
  - ask patient to wash hands (0%)
  - inform patient to wash hands after contact with respiratory secretions (0%) |

**Study Limitations =**

- None

**Non-Experimental/Observational Studies (case-control, cohort, cross sectional, longitudinal, descriptive, epidemiologic, case study/series, survey)**

- Insufficient sample size
- Sample not representative of patients in the population as a whole
- Variables (confounders, exposures, predictors) were not described
- Outcome criteria not objective or were not applied in blind fashion
- Insufficient follow-up, if
respiratory hygiene principles of emergency health care workers

(n=75; 61% response rate)
-all ED staff included
-voluntary responses

Despite clearly visible hygiene posters, necessary materials (masks, tissues) were missing in almost 10% of cases

Questionnaire:
-Mask comfort played more of a compliance role in subjects with less than 10 years of experience as compared with those with greater than 10 years (46.7% vs 17.25%, respectively; p < 0.010, Pearson x²)
-“Tendency to forget” was a reason cited as obstacle toward mask wearing reported lower perceived compliance to recommendations than the other respondents (p <0.001, Pearson x²) as did those where comfort was considered an obstacle to wearing a mask (p=0.03, Pearson x²)
-Residents reported requesting patients to wear a mask much less frequently than nurses (14.3% vs 83.3%, respectively; p < 0.05, Fisher exact)

-concern about contracting infections:

Authors recommend:
-ED-specific visual tools encouraging disinfection of hands and wearing of mask by patients with fever and cough
-modification of ED visual tools in waiting rooms to mention real indications of mask wearing (coughing, sneezing, running nose in addition to fever and cough)

applicable
☐ For prognostic study, sample not defined at common point in course of disease/condition
☐ For diagnostic study, gold standard not applied to all patients
☐ For diagnostic study, no independent, blind comparison between index test and gold standard
### May et al., 2012. The Journal of Emergency Medicine

<table>
<thead>
<tr>
<th>Patients with diagnosis of laboratory-confirmed influenza before (2007-08) and after (2008-09) implementation of electronic reminders in the EMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>-pre: n=129</td>
</tr>
<tr>
<td>-post: n=112</td>
</tr>
</tbody>
</table>

- **EMR Data collected:**
  - ED location: room, hallway, chair
  - use of droplet precautions
  - radiology transport

- **Appropriate precautions defined as:**
  - patient assigned to private room or cohorted
  - if patient moved, transported, or placed in hallway a surgical mask was worn

- **Email intervention through the EMR system regarding appropriate precautions (2008-09: repeated monthly Oct–April)**

- **Reminder for droplet precautions added next to checkbox for influenza nasopharyngeal swab order (visible to MD and RN)**

**Before EMR implementation:**

<table>
<thead>
<tr>
<th>2007-2008 Flu Season (Oct 1 to May 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.9 Confirmed Influenza</td>
</tr>
<tr>
<td>129 Private Room</td>
</tr>
</tbody>
</table>

**After EMR implementation:**

<table>
<thead>
<tr>
<th>2008-2009 Flu Season (Oct 1 to April 24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>112 Confirmed Influenza</td>
</tr>
<tr>
<td>112 Private Room</td>
</tr>
</tbody>
</table>

- **Compliance with transmission precautions significantly increased (29% to 45%, p=0.015)**
- **Compliance with precautions for patients moved to the hallways or radiology significantly increased (7% to 24%, p=0.001)**

However, despite the intervention, infection control precautions remained below desired levels.

### McLemore et al., 2011

<table>
<thead>
<tr>
<th>To analyze ED</th>
</tr>
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</table>

- **825 randomly-selected pediatric service**

- **Mean wait time to admission was 298 minutes for the patients requiring**

**Study Limitations =**
- None

**Non-Experimental/Observational Studies (case-control, cohort, cross sectional, longitudinal, descriptive, epidemiologic, case study/series, survey)**

- Insufficient sample size
- Sample not representative of patients in the population as a whole
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- For diagnostic study, no independent, blind comparison between index test and gold standard
<table>
<thead>
<tr>
<th>Study Title</th>
<th>Study Design</th>
<th>Study Details</th>
<th>Findings</th>
</tr>
</thead>
</table>
| **Infection Control & Hospital Epidemiology** | To assess the adoption of institutional policies reflecting national guidelines on contact precautions (gown and gloves) in EDs in the United States | Cross-sectional (survey) | Sampled 412 randomly selected EDs from the 2009 National Emergency Department Inventory USA database -80 large-volume, teaching -65 large-volume, non-teaching -37 small-volume, teaching -230 small-volume, non-teaching Used purposeful oversampling of hospitals with >50,000 annual ED visits (large volume) and teaching hospitals (higher hospital acquired-infection burden) Questionnaire not Policy – MRSA: -79% of EDs require contact precautions with MRSA suspected - Only 49% require contact precautions for patients with purulent skin infection (predominantly caused by MRSA) - Large-volume EDs were 1.4 times more likely than small-volume EDs to have participated in a project relating to MRSA (RR 1.4, 95% CI 1.1-1.9; p=0.01) Policy – C. diff: -84% of EDs require contact precautions with C. diff suspected - Only 45% require contact precautions with stool incontinence or diarrhea |}

**Non-Experimental/Observational Studies (case-control, cohort, cross sectional, longitudinal, descriptive, epidemiologic, case study/series, survey)**
- Insufficient sample size
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**Study Limitations**
- None

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<table>
<thead>
<tr>
<th>Study</th>
<th>Authors, Year, Source</th>
<th>Study Design</th>
<th>Population</th>
<th>Validated</th>
<th>Results</th>
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</thead>
</table>
| Turnberg et al., 2008, American Journal of Infection Control | Cross-sectional (survey) | 630 health care workers (53% response rate; range: 39 to 76%) at 5 medical centers in King County, Washington -July to Dec 2005 | $3 coffee incentive at 4 of 5 hospitals -medical practitioners (n=187; 54 in ED), nurses (n=180; 143 in ED), nurse aides (n=97; 21 in ED), allied health professionals (n=82; 33 in ED) and reception/administration (n=84; 19 in ED) -questionnaire not validated and responses to each question not required | Patient masking & separation: -86% of doctors and 94% of nurses reported that disposable masks are offered to coughing patients -43% of doctors, 28% of nurses and 23% of reception/administration staff reported that patients with influenza-like illness were asked to sit 3 feet from others -65% of doctors and 64% of nurses reported that patients with influenza-like illness are placed in private exam rooms Hand hygiene and PPE: -96% of doctors, 97% of nurses and 90% of nurse aides reported hand hygiene after working with a coughing patient -28% of doctors, 76% of nurses and 52% of nurse aides reported wearing disposable gloves when with a patient with influenza-like illness -20% of doctors, 22% of nurses and 20% of nurse aides reported wearing eye protection when with a sneezing patient -22% of doctors, 33% of nurses and 34% of nurse aides reported wearing a mask when examining a coughing patient with influenza-like illness 70% of ED workers reported wearing disposable gloves when working with coughing patients with influenza-like illness (p< .001) compared with primary care (38%) 66% of ED workers reported that ILI patients are placed in a private | Study Limitations =  
- None  
- Non-Experimental/Observational Studies (case-control, cohort, cross sectional, longitudinal, descriptive, epidemiologic, case study/series, survey)  
- Insufficient sample size  
- Sample not representative of patients in the population as a whole  
- Variables (confounders, exposures, predictors) were not described  
- Outcome criteria not objective or were not applied in blind fashion  
- Insufficient follow-up, if applicable  
- For prognostic study, sample not defined at common point in course of disease/condition  
- For diagnostic study, gold standard not applied to all patients  
- For diagnostic study, no independent, blind comparison between index test and gold standard
examination room (p<0.001) compared with primary care (48%)

69% of ED workers reported that patients are given personal instructions about respiratory precautions (p<0.001) compared with primary care (46%)

REFERENCES


Appendix A: GRADE criteria for rating a body of evidence on an intervention
Developed by the GRADE Working Group

**Grades and interpretations:**

- **High:** Further research is very unlikely to change our confidence in the estimate of effect.
- **Moderate:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
- **Low:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
- **Very low:** Any estimate of effect is very uncertain.

<table>
<thead>
<tr>
<th>Type of evidence and starting level</th>
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</thead>
<tbody>
<tr>
<td>Randomized trial–high</td>
</tr>
<tr>
<td>Observational study–low</td>
</tr>
<tr>
<td>Any other evidence–very low</td>
</tr>
</tbody>
</table>

**Criteria for increasing or decreasing level**

**Reductions**
- Study quality has serious (−1) or very serious (−2) problems
- Important inconsistency in evidence (−1)
- Directness is somewhat (−1) or seriously (−2) uncertain
- Sparse or imprecise data (−1)
- Reporting bias highly probable (−1)

**Increases**
- Evidence of association† strong (+1) or very strong (+2)
- Dose-response gradient evident (+1)
- All plausible confounders would reduce the effect (+1)

†Strong association defined as significant relative risk (RR 2-5 or 0.5-0.2) based on consistent evidence from two or more studies with no plausible confounders;
- Very strong association defined as significant relative risk (RR >5 or <0.2) based on direct evidence with no threats to validity
Appendix B. Trustworthy Guideline rating scale

The University of Pennsylvania’s Center for Evidence-Based Practice Trustworthy Guideline rating scale is based on the Institute of Medicine’s “Standards for Developing Trustworthy Clinical Practice Guidelines” (IOM), as well as a review of the AGREE Enterprise and Guidelines International Network domains.

The purpose of this scale is to focus on the weaknesses of a guideline that may reduce the trust a clinical user can have in the guideline, and distinguish weaknesses in documentation (e.g. guideline does not have a documented updating process) from weaknesses in the guidance itself (e.g. recommendations are outdated). Current quality scales like AGREE emphasize documentation. They are important checklists for developers of new guidelines, but are less useful for grading existing guidelines. These scales also are harder for clinicians and other persons who are not methodology experts to apply, and their length discourages their use outside formal technology assessment reports. This new scale is brief, balanced, and easy and consistent to apply.

We do not attempt to convert the results of this assessment into a numeric score. Instead we present a table listing the guidelines and how they are rated on each standard. This facilitates qualitative understanding by the reader, who can see for what areas the guideline base as a whole is weak or strong as well as which guidelines are weaker or stronger.

1. Transparency

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>A</td>
<td>Guideline development methods are fully disclosed.</td>
</tr>
<tr>
<td>B</td>
<td>Guideline development methods are partially disclosed.</td>
</tr>
<tr>
<td>C</td>
<td>Guideline development methods are not disclosed.</td>
</tr>
</tbody>
</table>

The grader must refer to any cited methods supplements or other supporting material when evaluating the guideline. Methods should include:
- Who wrote the initial draft
- How the committee voted on or otherwise approved recommendations

Evidence review, external review and methods used for updating are not addressed in this standard.

2. Conflict of interest

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Funding of the guideline project is disclosed, disclosures are made for each individual panelist, and financial or other conflicts do not apply to key authors of the guideline or to more than 1 in 10 panel members.</td>
</tr>
<tr>
<td>B</td>
<td>Guideline states that there were no conflicts (or fewer than 1 in 10 panel members), but does not disclose funding source.</td>
</tr>
<tr>
<td>C</td>
<td>Lead author, senior author, or guideline panel members (at least 1 in 10) have conflict of interest, or guideline project was funded by industry sponsor with no assurance of independence.</td>
</tr>
<tr>
<td>NR</td>
<td>Guideline does not report on potential conflict of interests.</td>
</tr>
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</table>

For purposes of this checklist, conflicts of interest include employment by, consulting for, or holding stock in companies doing business in fields affected by the guideline, as well as related financial conflicts. This definition should not be considered exclusive. As much as anything, this is a surrogate marker for thorough reporting, since it may be assumed that guideline projects are funded by the sponsoring organization and many authors think it unnecessary to report a non-conflict.

3. Guideline development group

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>A</td>
<td>Guideline development group includes 1) methodological experts and clinicians and 2) representatives of multiple specialties.</td>
</tr>
<tr>
<td>B</td>
<td>Guideline development group includes one of the above, but not both.</td>
</tr>
</tbody>
</table>
Guideline developers all from one specialty or organization, and no methodologists.
Affiliations of guideline developers not reported

The purpose of this standard is to ensure that supporters of competing procedures, or clinicians with no vested interest in utilization of one procedure or another, are involved in development of the guideline. Both AGREE II and IOM call for patient or public involvement; very few guideline panels have done so to date, so this is not necessary for guidelines to be rated A. Involvement of methodologists or HTA specialists in the systematic review is sufficient involvement in the guideline development group for our purposes. In the absence of any description of the guideline group, assume the named authors are the guideline group.

4. Systematic review

A Guideline includes a systematic review of the evidence or links to a current review.
B Guideline is based on a review which may or may not meet systematic review criteria.
C Guideline is not based on a review of the evidence.

In order to qualify as a systematic review, the review must do all of the following:
- Describe itself as systematic or report search strategies using multiple databases
- Define the scope of the review (including key questions and the applicable population)
- Either include quantitative or qualitative synthesis of the data or explain why it is not indicated

Note: this element does not address the quality of the systematic review: simply whether or not it exists. Concerns about quality or bias of the review will be discussed in text, where the analyst will explain whether the weaknesses of the review weaken the validity or reliability of the guideline.

Note: a guideline may be rated B on this domain even if the review on which it is based is not available to us. This potential weakness of the guideline should be discussed in text of the report.

5. Grading the supporting evidence

A Specific supporting evidence (or lack thereof) for each recommendation is cited and graded
B Specific supporting evidence (or lack thereof) for each recommendation is cited but the recommendation is not graded.
C Recommendations are not supported by specific evidence.

To score a B on this domain there should be specific citations to evidence tables or individual references for each relevant recommendation in the guideline, or an indication that no evidence was available. Any standardized grading system is acceptable for purposes of this rating. If a guideline reports that there is no evidence available despite a thorough literature search, it may be scored B on this domain, or even A if evidence for other recommendations is cited and graded.

6. Recommendations

A Considerations for each recommendation are documented (i.e. benefits and harms of a particular action, and/or strength of the evidence); and recommendations are presented in an actionable form.
B Either one or the other of the above criteria is met.
C Neither of the above criteria are met

In order to be actionable, the guideline should specify the specific population to which the guideline applies, the specific intervention in question, and the circumstances under which it should be carried out (or not carried out). The language used in the recommendations should also be consistent with the strength of the recommendation (e.g. directive and active language like “should” or “should not” for strong recommendations, and passive language like “consider” for weak recommendations). A figure or algorithm is considered actionable as long as it is complete enough to incorporate all the applicable patients and interventions. Please see the forthcoming NICE manual (24) for a good discussion of actionability in guidelines.

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7. External review

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<tbody>
<tr>
<td>A</td>
<td>Guideline was made available to external groups for review.</td>
</tr>
<tr>
<td>B</td>
<td>Guideline was reviewed by members of the sponsoring body only.</td>
</tr>
<tr>
<td>C</td>
<td>Guideline was not externally reviewed.</td>
</tr>
<tr>
<td>NR</td>
<td>No external review process is described.</td>
</tr>
</tbody>
</table>

8. Updating and currency of guideline

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<tbody>
<tr>
<td>A</td>
<td>Guideline is current and an expiration date or update process is specified.</td>
</tr>
<tr>
<td>B</td>
<td>Guideline is current but no expiration date or update process is specified.</td>
</tr>
<tr>
<td>C</td>
<td>Guideline is outdated.</td>
</tr>
</tbody>
</table>

A guideline is considered current if it is within the developers’ stated validity period, or if no period or expiration data is stated, the guideline was published in the past three years (NOTE: the specific period may be changed at the analyst’s discretion, based on whether the technology is mature and whether there is a significant amount of recent evidence). A guideline must address new evidence when it is updated. A guideline which is simply re-endorsed by the panel without searching for new evidence must be considered outdated.