

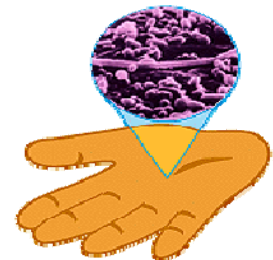
Barrier Precautions for Multidrug-Resistant Organisms: Current Recommendations and Actual Practice

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Antimicrobial Resistance in the Hospital

Hospital-Associated Infections

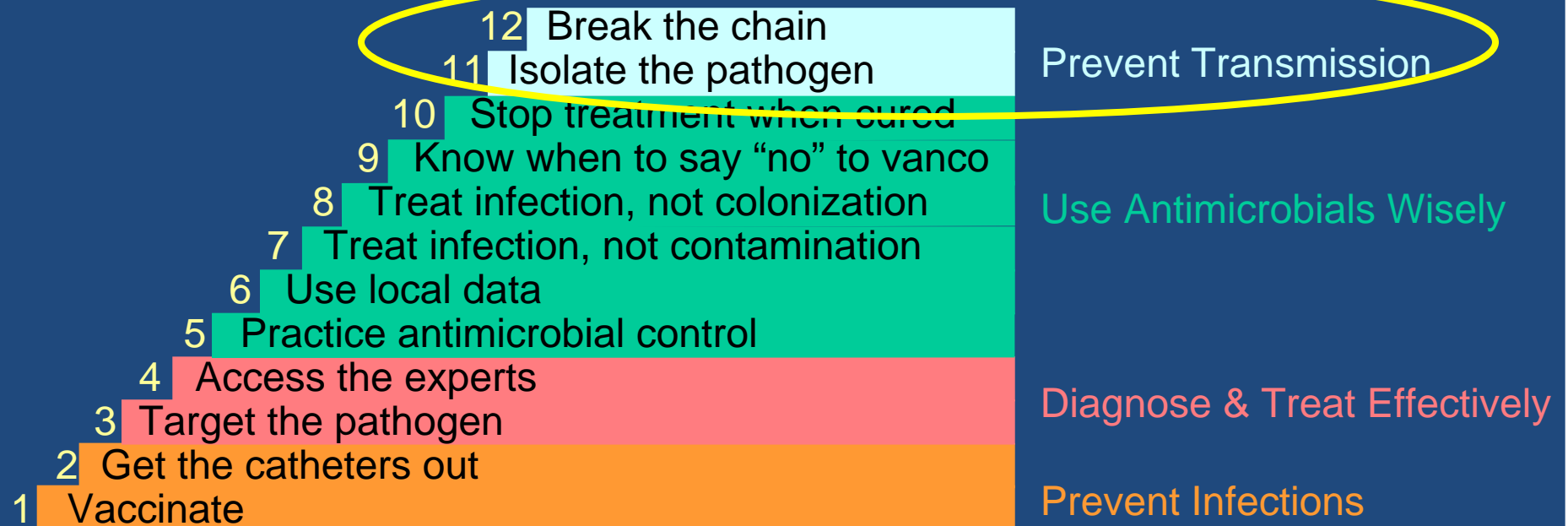
- Approximately 1.7 million HAIs per year
- Associated with increased mortality, length of stay, and cost
- CMS changes – two leading HAIs, urinary-tract and surgical site infections, will no longer be reimbursed

Antimicrobial Resistance

- More than 70% of bacterial HAIs are resistant to a first-line drug
- Infections are more difficult and costly to treat
- Risk factors include transmission of infection
- Reservoirs: hospital environment, colonized patients, healthcare workers, long-term care facilities, community



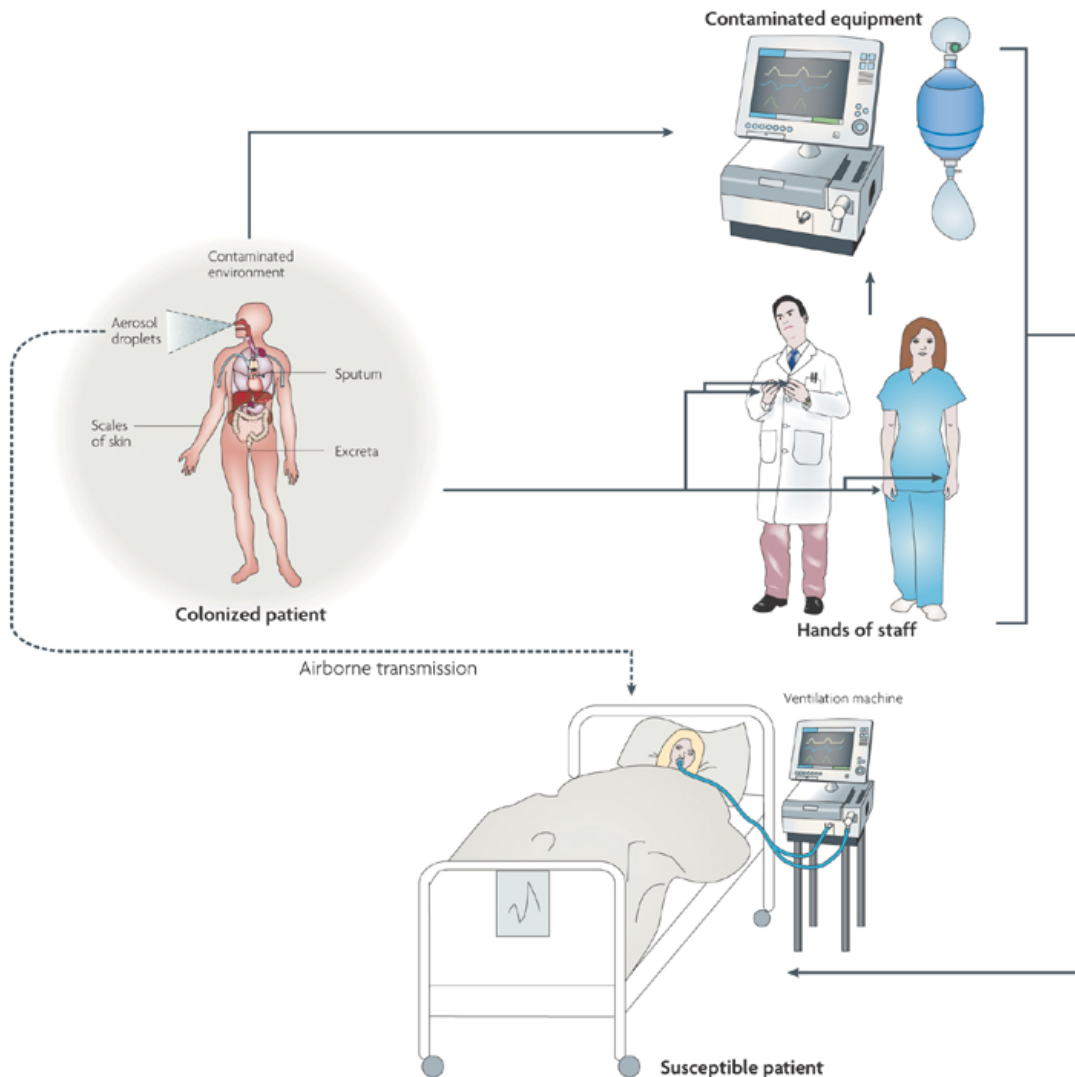
“12 Steps” to Reduce Resistance



Use standard infection control precautions; Contain infectious body fluids (**Follow** airborne, droplet, and **contact precautions**.); When in doubt, consult infection control experts

Stay home when you are sick; **Keep your hands clean**; Set an example

Routes of Transmission



Nature Reviews | Microbiology

Direct or Indirect

- Patient to patient/staff/visitor/environment
- Staff to patient/staff/visitor/environment
- Visitor to patient/staff/visitor/environment
- Patient/staff/visitor from Environment

Contact Precautions Protocol

Equipment

- Sign outside patient's room, indicating that the patient is on contact isolation
- Isolation cart (or dedicated supply cupboards) outside room
- Gowns and three sizes of gloves (small, medium, large) on or in the isolation cart (or in proximity, outside room)

Behavior

Room Entry: Perform hand hygiene, apply fresh gloves, and put on new gown before entering patient's room

Room Exit: Remove and dispose of gloves and gown inside patient's room, immediately prior to leaving exit, then perform hand hygiene

Contact Isolation

Visitors / Visitantes

- Report to Nurses' Station for instructions before entering room.

Antes de entrar a la habitación deben reportarse a la estación de enfermeras para recibir instrucciones.



Gloves & Gown



Hand Hygiene upon entering & leaving room

Contact Precautions Burden

HOSPITAL TYPE	SITE CHARACTERISTICS		
	Beds	Hospital Patient-Days ^a	Contact Precautions Patient-Days ^a
Community	221	33,139	6,361
Children's	283	46,697	5,762
Academic Tertiary Care	692	106,476	31,501
Total	1,196	186,312	43,624

Based on positive and screening cultures during the first six months of 2008, the three study sites had 23,486 Contact Precautions days per 100,000 patient-days, over 23% of total patient days.

Nearly 30% of patient days at the Academic Tertiary Care hospital were indicated for Contact Precautions during this time period.

While the burden of indicated Contact Precautions appears to be high, the actual implementation and practice of Contact Precautions is unknown.

^a Patient-days were calculated over six months: January through June 2008.

Observation of Contact Precautions

Research Questions

- What percentage of patients indicated for Contact Precautions display a Contact Precautions sign and have Contact Precautions equipment available?
- What percentage of staff and visitors adhere to the Contact Precautions protocol?
- Do these percentages differ significantly between hospitals, units, or types of people (i.e., patient-care staff, visitor, food service/cleaning staff)?

Approach

Observational study at three sites of hospital patients with positive or screening cultures for epidemiologically-significant organisms and patients with Contact Precautions signs for undetermined reasons or due to unit policy.

Data Collection

Date			Time In					Time Out					Hospital						Observer
Unit	Room	List	Sign	Cart	Glvs	Gwn	Garb	Prsn	I Hyg	I Glv	I Gwn	O Hyg	O Glv	O Gwn	V+	V-	Cont	Comments	
M6HN	234-01	y	n	n	n	n		s	m	n	n	y	na	na				confirmed patient in listed location	
M6GN	434-01	y	y	na	m	y		f	n	n	n	n	n	n				isolation room; size L gloves not visible	
M5CT	226-01	y	y	y	y	y	y	v	n	y	y					2			
↓	↓							c				n	n	n			1	touched linen cart with gloves on	
M5GS	348-01	n	y	y	y	y									1				

Surveillance List and Methods

- An automated surveillance system was used to determine patients indicated for Contact Precautions by positive or screening cultures and to calculate reasons for Contact Precautions.
- At each room, we observed the availability of a Contact Precautions sign and isolation cart, with three sizes of gloves and gowns, as well as adherence to hand hygiene and barrier precautions protocols by staff and visitors.
- Data were collected in four 5-day increments at each site April-June 2008.

Collected Observations

DISTRIBUTION OF OBSERVATIONS

HOSPITAL TYPE	Patient Rooms	% (no.) Within ICUs	Staff Adherence to Contact Precautions	Visitor Adherence to Contact Precautions	Mean Patient Rooms per Day
Community	542	13.7 (74)	114	22	27.1
Children's	564	37.6 (212)	160	25 ^c	28.2
Academic Tertiary Care	2,501 ^b	27.3 (684) ^b	746 ^b	130 ^b	104.2 ^b
Total	3,607^b	26.9 (970)^b	1,020^b	177^b	

Over 3,600 observations were collected at the three sites, including over 1,197 observations of adherence to the Contact Precautions protocol by hospital staff and visitors.

About 27% of the patient room observations were made in intensive care units; three of these units in the Academic Tertiary Care hospital operated under a policy of universal Contact Precautions.

^b Observations include patient rooms in ICUs practicing universal contact precautions.

^c Visitors in the Children's hospital were not required comply with barrier precautions.

Reason for Contact Precautions

CULTURE TYPE	DAYS ^a	PATIENTS ^b
VRE	28.8 (1,174)	22.5 (184)
MRSA	21.0 (856)	20.0 (164)
Screening ^c	9.5 (389)	26.7 (218)
<i>Klebsiella pneumoniae</i>	9.5 (388)	6.5 (53)
<i>Clostridium difficile</i>	9.1 (370)	7.8 (64)
Other Gram-negatives	7.7 (314)	5.0 (41)
<i>Pseudomonas aeruginosa</i>	6.1 (248)	4.6 (38)
<i>Escherichia coli</i>	4.8 (195)	4.4 (36)
<i>Acinetobacter baumannii</i>	3.2 (132)	2.1 (17)
Other	0.3 (12)	0.4 (3)
Total	100 (4,078)	100 (818)

NOTE: Data are % (no.) of cultures.

Culture data were analyzed for the 577 unique patients on the surveillance list for whom room observations were collected.

VRE and MRSA positive cultures were the predominant contributing reasons for Contact Precautions days (28.8%, 21%).

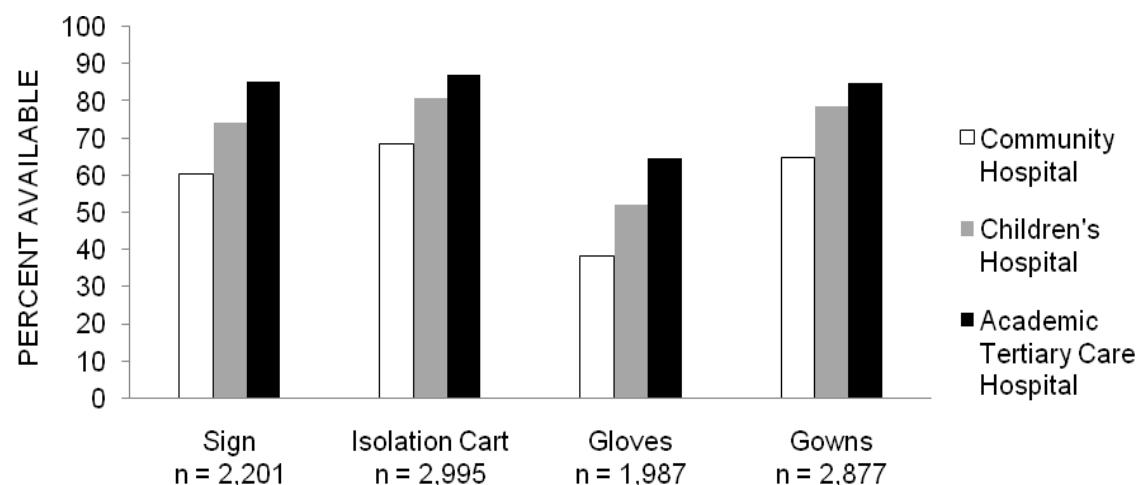
The largest percentage of patients was indicated for Contact Precautions based on screening cultures (26.7%).

^a Data for days represent more than the unique patient-days observed: some patients had positive cultures for more than one organism.

^b Data for unique patients represent more than the unique patients observed: some patients had positive cultures for more than one organism.

^c Screening cultures include MRSA, VRE, and ESBL-producing gram-negatives.

Availability of Contact Precautions Equipment



CONTACT PRECAUTIONS EQUIPMENT

NOTE: n = no. observations of available equipment for all three sites.

A total of 2,201 rooms displayed Contact Precautions sign outside the patient room. However, over 20% (n = 556) of rooms indicated for Contact Precautions on the surveillance list did not have a sign.

Isolation carts and gowns were available outside rooms indicated for Contact Precautions or displaying a sign for some other reason 70% of the time or greater. Availability of three sizes of gloves was less, ranging from only 38% to 65% across the sites.

Contact Precautions Behaviors Adherence

	TYPE OF HOSPITAL				P
	OVERALL	Community	Children's	Academic Tertiary Care	
Room Entry:					
Hand Hygiene n = 621	18.4 (114)	15.5 (11)	22.7 (20)	18.0 (83)	0.459
Gloves n = 741	63.0 (467)	53.3 (49)	57.4 (54)	65.6 (364)	0.037
Gown n = 733	61.1 (448)	39.5 (34)	53.2 (50)	65.8 (364)	<0.001
Room Exit:					
Hand Hygiene n = 635	46.8 (297)	36.6 (26)	45.6 (47)	48.6 (224)	0.165
Gloves n = 553	42.1 (233)	26.2 (17)	37.6 (32)	45.7 (184)	0.013
Gown n = 557	44.5 (248)	20.0 (12)	38.8 (31)	49.2 (205)	<0.001

NOTE: n = no. observations per Contact Precautions behavior. Data are % (no.) adherence to contact precautions. Comparison of the difference in adherence to Contact Precautions behaviors by type of hospital, unit, or person was performed using Pearson's χ^2 analysis.

Overall rates of hand hygiene were lower than expected on entry and exit.

Rates of gloving and gowning adherence upon entry were greater than proper disposal of barriers upon exit.

Although there was no significant difference in hand hygiene among sites, barrier precautions adherence upon entry and exit adherence were greatest at the Academic Tertiary Care facility, lowest at the Community hospital.

Higher Behaviors Adherence in ICUs

	OVERALL	TYPE OF UNIT		P
		ICU	Non-ICU	
Room Entry:				
Hand Hygiene n = 621	18.4 (114)	22.1 (61)	15.4 (53)	0.031
Gloves n = 741	63.0 (467)	70.6 (238)	56.7 (229)	<0.001
Gown n = 733	61.1 (448)	77.2 (264)	47.1 (184)	<0.001
Room Exit:				
Hand Hygiene n = 635	46.8 (297)	54.7 (150)	40.7 (147)	<0.001
Gloves n = 553	42.1 (233)	53.2 (125)	34.0 (108)	<0.001
Gown n = 557	44.5 (248)	60.8 (152)	31.1 (96)	<0.001

NOTE: n = no. observations per Contact Precautions behavior. Data are % (no.) adherence to contact precautions. Comparison of the difference in adherence to Contact Precautions behaviors by type of hospital, unit, or person was performed using Pearson's χ^2 analysis.

Stratification by unit type revealed that adherence to each Contact Precautions behavior was better among rooms in intensive care units than in other types of units.

Glove and gown donning upon entry were the categories with the highest rates of adherence observed.

Even in ICUs, hand hygiene upon entry was the behavior with the lowest rate of adherence.

Patient-Care Staff were Most Adherent

	OVERALL	TYPE OF PERSON			P
		Patient-Care Staff	Other Staff	Visitors ^a	
Room Entry:					
Hand Hygiene n = 621	18.4 (114)	21.8 (99)	8.5 (6)	9.4 (9)	0.001
Gloves n = 741	63.0 (467)	67.4 (383)	56.8 (46)	41.3 (38)	<0.001
Gown n = 733	61.1 (448)	64.5 (376)	36.2 (21)	55.4 (51)	<0.001
Room Exit:					
Hand Hygiene n = 635	46.8 (297)	57.6 (270)	21.4 (18)	11.0 (9)	<0.001
Gloves n = 553	42.1 (233)	49.5 (203)	22.6 (19)	18.6 (11)	<0.001
Gown n = 557	44.5 (248)	49.4 (214)	21.8 (12)	31.9 (22)	<0.001

NOTE: n = no. observations per Contact Precautions behavior. Data are % (no.) adherence to contact precautions. Comparison of the difference in adherence to Contact Precautions behaviors by type of hospital, unit, or person was performed using Pearson's χ^2 analysis.

^a Visitors in the Children's hospital were not required to wear barrier precautions.

Patient-care staff were significantly more adherent to all Contact Precautions behaviors than food and cleaning staff or visitors.

In particular, barrier precautions upon entry and hand hygiene upon exit were behaviors for which we observed high rates of patient-care staff adherence.

Gloving and Hand Hygiene Go Hand in Hand

	OVERALL	WEARING GLOVES		P
		Yes	No	
Room Entry: Hand Hygiene n = 448	21.7 (97)	28.7 (79)	10.4 (18)	<0.001
Room Exit: Hand Hygiene n = 390	54.9 (214)	62.1 (169)	38.1 (45)	<0.001

NOTE: n = no. observations per Contact Precautions behavior. Data are % (no.) adherence to contact precautions. Comparison of the difference in adherence to hand hygiene by glove wearing was performed using Pearson's χ^2 analysis.

Among patient-care staff, glove-wearers were more likely to adhere to hand hygiene upon entry and, especially, upon exit.

We also found that glove-wearers that properly disposed of gloves upon room exit performed hand hygiene more frequently upon exit.

This indicates that groups of Contact Precautions “Compliers” and “Non-Compliers” may exist among staff members.

Other Findings

Additional Variables

- We found that practice of a unit-wide policy of universal Contact Precautions in ICUs was not a significant predictor of behavioral adherence.
- We did not find that type of organism was a significant predictor of behavioral adherence.

Yet More Opportunities for Transmission

- We observed 168 instances environmental contamination over the study period.
- About 20% of rooms observed had a barrier disposal container improperly located outside of the room.

Recommendations

Preventing Transmission of Resistant Microorganisms

- Use of a culture-based surveillance list indicating patients requiring Contact Precautions may improve rates of appropriate labeling of patient rooms for contact isolation , availability of equipment, and behavioral adherence.
- Contact Precautions supplies were not necessarily available, even when an isolation cart was observed: improved efforts are needed to provide three sizes of gloves outside contact isolation rooms.
- Adherence to the Contact Precautions protocol should be improved among staff, particularly outside of the ICUs and among non care-giving staff.
- A substantial proportion of visitors donned barriers, but this group was not as adherent to hand hygiene as were staff members. Visitors may need better education regarding the Contact Precautions protocol and rationale.

Future Direction

Examining Documentation of Contact Precautions

- Determine if provider order and nursing documentation of Contact Precautions were present when indicated by automated surveillance based on positive or screening cultures or by clinical observation.
- Determine if Contact Precautions sign and equipment were available when indicated by provider order or nursing documentation.

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