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## Less Contact Isolation Is More in the ICU: Not Sure

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## 2 Less Contact Isolation is more in the ICU: not Sure.

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1 The debate between the use of standard (SP) or contact precautions (CP) for stopping the  
2 spread of multidrug-resistant organism (MDRO) has been controversial for years (1-5) and  
3 still persists despite recent high quality cluster-randomized studies (6-9). SP are based on a  
4 universal (also called “horizontal”) approach for all patients, whatever they are known as  
5 MDRO carriers or not; SP include compliance with hand hygiene and cleaning the  
6 environment. CP with a so-called “vertical” approach still include compliance with SP for all  
7 patients, , additional control barriers for colonized patients, i.e. gloves and gown, and  
8 placement in single room if possible. Identification of MDRO carriage through screening is  
9 frequently associated with CP.

10

11 The introduction of alcoholic handrub (AHR) in the early 2000’s has been a major step for  
12 improving compliance with hand hygiene in healthcare setting. Many studies demonstrated  
13 that including AHR in a multifaceted strategy, based on education, observation and feedback  
14 and other bundled measures are necessary for effective AHR implementation. Since CP and  
15 SP both aim at interrupting transmission, SP now including AHR (as compared to  
16 handwashing) has higher efficacy, likely closer to that of CP, thus fueling the debate between  
17 CP and SP.

18

19 The epidemiology of MDRO is rapidly changing. MDRO comprise Methicillin-resistant  
20 *Staphylococcus aureus* (MRSA), extended-spectrum betalactamase-producing  
21 enterobacteriaceae (ESBL-PE), vancomycin-resistant enterococci (VRE), carbapenemase-  
22 producing enterobacteriaceae (CPE), and carbapenemase-producing Gram negative bacilli,  
23 *Pseudomonas aeruginosa* and *Acinetobacter baumannii* (CRAB). The latter, i.e. CPE,  
24 carbapenemase-producing Gram negative bacilli, and VRE in some countries, are classified  
25 as extensively-resistant in the late 2010’s.

26 In ICUs facing multiple endemic MDROs, placing a large proportion of patients into CP may  
27 result in lower compliance for interrupting cross-transmission from each of these patients  
28 (10). Priorities must be defined for selecting the most threatening MDRO, in terms of the  
29 individual consequence of infection and the collective risk of dissemination, so relevant  
30 infection control practices can be selected.

31

32 This complexification of epidemiology and control measures, together with legal mandates  
33 issued in several countries may darken the central question for controlling MDRO spread:  
34 what is the most effective method to interrupt MDRO cross-transmission? Hospital  
35 epidemiologists are often facing difficult choices with CP having some benefit for many  
36 preventing MDRO transmission and subsequent infection but also having negatives of cost,  
37 environmental waste and healthcare worker dissatisfaction.

38

39 Many factors contribute to the dynamic of MDRO dissemination in the ICU, which should be  
40 taken into consideration when designing a policy (Table). Some are of key importance:

- 41 - The MDRO under consideration and its local/regional and national epidemiology.  
42 Several MDROs can be more easily transmitted suggesting that CP might be more  
43 relevant for these bacteria: for example non-*E. coli* ESBL as compared to ESBL *E. coli*  
44 (4, 11), or ESBL-PE (taken globally) as compared to MRSA (8). Other may have rapid  
45 spread, i.e. VRE and CRAB, partially owed to their environmental reservoir; therefore  
46 requiring enhanced environmental cleaning;
- 47 - Several success stories in controlling MDRO derived from a national policy, strictly  
48 enforced by all healthcare facilities, such as CPE in Israel (12) or MRSA in the  
49 Northern European countries and recently in the United Kingdom and France (13).  
50 Statistical modelling and regional surveillance of VRE and CPE showed that some  
51 HCFs may be hotspots for acquisition with subsequent dissemination in many other  
52 facilities, thus demonstrating the role of a policy enforced in all healthcare structures  
53 (14); Many of these national policies involved the use of active surveillance and CP in  
54 their control measures;

- 1 - This is especially true at the beginning of an epidemic, where extended active  
2 surveillance cultures and strict control measures including CP have the highest chance  
3 to be effective. By contrast, an endemic situation with high prevalence at ICU  
4 admission can only be curtailed, and SP may be preferred in this situation. Importantly,  
5 any strategy ideally should be evaluated, by performing admission and discharge  
6 screening;
- 7 - Compliance with hand hygiene for SP and CP actually is lower than that measured  
8 through auditing, due to a Hawthorne effect (15). The first objective in low  
9 compliance/low AHR consumption ICUs should be to improve hand hygiene practice,  
10 before implementing CP;
- 11 - Resources are critical for effective implementation of any precaution, including the  
12 availability of single room for CP. In ICU from developing countries, it may be decided  
13 first to improve compliance with hand hygiene, while limiting CP to the most aggressive  
14 MDROs.

15  
16 Looking at the parameters to consider from the Table before deciding a control strategy, we  
17 suggest that each ICU could implement its own policy, tailored to local epidemiology and  
18 resources. Leadership and effective implementation of recommended measures are key for  
19 success. For example, two multicenter ICU studies aiming at controlling MRSA were  
20 published simultaneously in 2011 (6, 7). They used essentially the same control measures,  
21 but resulted in different impact in controlling MDRO. Although both have methodological  
22 concerns, the successful intervention was conducted using a behavioral approach, with  
23 performance feedback and resolution of local challenges, in addition to technical measures  
24 of screening and CP. This illustrates the importance of leadership and HCWs involvement in  
25 conducting such intervention, possibly as important as the recommended precautions  
26 themselves.

27  
28 CP and SP do not include measures for cleaning the environment. There is growing  
29 evidence that dry surfaces and humid areas may be reservoirs of MDRO. This has been  
30 evidenced for a long time for VRE and CRAB, and in a lesser extent MRSA. Recent  
31 publications showed that MDR-GNB, including CPE, may persist in humid reservoirs,  
32 responsible for outbreak (16). Any strategy, SP or CP, to control MDRO spread should  
33 include thorough environmental cleaning.

34  
35 Although the MDRO epidemiology varies across ICUs, it is of critical importance to adhere to  
36 a regional and national strategy. Local situation however, may help to select targeted MDRO  
37 where CP has the highest chance to be effective, and other MDROs being tackled with SP,  
38 taken into account a maximum number of patients to be placed into CP for higher efficacy.

39  
40 In this very complex field, there are good arguments from both sides, SP or CP, for  
41 controlling MDRO spread (1, 17). There is however some solid evidence. CP should be  
42 enforced only if compliance with HH is high enough, e.g. > 40-50%, otherwise the first  
43 objective should be to improve it. In case of already intermediate or high compliance,  
44 implementing CP may be futile with very high compliance with hand hygiene. Moreover,  
45 given its potential drawback, CP is probably less relevant for endemic situation. Local  
46 resources should be devoted to the most cost-effective measures based on local  
47 epidemiology, whilst respecting national guidelines

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49  
50 Conflict of interest

51 JCL and BG have no COI.

52 AH is editor for "up-to-date"

53

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1 **References list:**

- 2 1. Kirkland KB. Taking off the gloves: toward a less dogmatic approach to the use of contact  
3 isolation. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of*  
4 *America.* 2009;48(6):766-71.
- 5 2. Morgan DJ, Wenzel RP, Bearman G. Contact Precautions for Endemic MRSA and VRE: Time to  
6 Retire Legal Mandates. *Jama.* 2017;318(4):329-30.
- 7 3. Rubin MA, Samore MH, Harris AD. The Importance of Contact Precautions for Endemic  
8 Methicillin-Resistant *Staphylococcus aureus* and Vancomycin-Resistant Enterococci. *Jama.*  
9 2018;319(9):863-4.
- 10 4. Tschudin-Sutter S, Lucet JC, Mutters NT, Tacconelli E, Zahar JR, Harbarth S. Contact  
11 Precautions for Preventing Nosocomial Transmission of Extended-Spectrum beta Lactamase-  
12 Producing *Escherichia coli*: A Point/Counterpoint Review. *Clinical infectious diseases : an official*  
13 *publication of the Infectious Diseases Society of America.* 2017;65(2):342-7.
- 14 5. Marra AR, Edmond MB, Schweizer ML, Ryan GW, Diekema DJ. Discontinuing contact  
15 precautions for multidrug-resistant organisms: A systematic literature review and meta-analysis.  
16 *American journal of infection control.* 2018;46(3):333-40.
- 17 6. Jain R, Kralovic SM, Evans ME, Ambrose M, Simbartl LA, Obrosky DS, et al. Veterans Affairs  
18 initiative to prevent methicillin-resistant *Staphylococcus aureus* infections. *N Engl J Med.*  
19 2011;364(15):1419-30.
- 20 7. Huskins WC, Huckabee CM, O'Grady NP, Murray P, Kopetskie H, Zimmer L, et al. Intervention  
21 to reduce transmission of resistant bacteria in intensive care. *N Engl J Med.* 2011;364(15):1407-18.
- 22 8. Derde LP, Dautzenberg MJ, Bonten MJ. Chlorhexidine body washing to control antimicrobial-  
23 resistant bacteria in intensive care units: a systematic review. *Intensive care medicine.* 2012.
- 24 9. Harris AD, Pineles L, Belton B, Johnson JK, Shardell M, Loeb M, et al. Universal glove and  
25 gown use and acquisition of antibiotic-resistant bacteria in the ICU: a randomized trial. *Jama.*  
26 2013;310(15):1571-80.
- 27 10. Dhar S, Marchaim D, Tansek R, Chopra T, Yousuf A, Bhargava A, et al. Contact precautions:  
28 more is not necessarily better. *Infection control and hospital epidemiology.* 2014;35(3):213-21.
- 29 11. Gurieva T, Dautzenberg MJD, Gniadkowski M, Derde LPG, Bonten MJM, Bootsma MCJ. The  
30 Transmissibility of Antibiotic-Resistant Enterobacteriaceae in Intensive Care Units. *Clinical infectious*  
31 *diseases : an official publication of the Infectious Diseases Society of America.* 2018;66(4):489-93.
- 32 12. Schwaber MJ, Carmeli Y. An ongoing national intervention to contain the spread of  
33 carbapenem-resistant enterobacteriaceae. *Clinical infectious diseases : an official publication of the*  
34 *Infectious Diseases Society of America.* 2014;58(5):697-703.
- 35 13. Stone SP, Fuller C, Savage J, Cookson B, Hayward A, Cooper B, et al. Evaluation of the national  
36 Cleanyourhands campaign to reduce *Staphylococcus aureus* bacteraemia and *Clostridium difficile*  
37 infection in hospitals in England and Wales by improved hand hygiene: four year, prospective,  
38 ecological, interrupted time series study. *BMJ.* 2012;344:e3005.
- 39 14. Slayton RB, Toth D, Lee BY, Tanner W, Bartsch SM, Khader K, et al. Vital Signs: Estimated  
40 Effects of a Coordinated Approach for Action to Reduce Antibiotic-Resistant Infections in Health Care  
41 Facilities - United States. *MMWR Morb Mortal Wkly Rep.* 2015;64(30):826-31.
- 42 15. Srigley JA, Furness CD, Baker GR, Gardam M. Quantification of the Hawthorne effect in hand  
43 hygiene compliance monitoring using an electronic monitoring system: a retrospective cohort study.  
44 *BMJ quality & safety.* 2014;23(12):974-80.
- 45 16. Kizny Gordon AE, Mathers AJ, Cheong EYL, Gottlieb T, Kotay S, Walker AS, et al. The Hospital  
46 Water Environment as a Reservoir for Carbapenem-Resistant Organisms Causing Hospital-Acquired  
47 Infections-A Systematic Review of the Literature. *Clinical infectious diseases : an official publication of*  
48 *the Infectious Diseases Society of America.* 2017;64(10):1435-44.
- 49 17. Septimus E, Weinstein RA, Perl TM, Goldmann DA, Yokoe DS. Approaches for preventing  
50 healthcare-associated infections: go long or go wide? *Infection control and hospital epidemiology.*  
51 2014;35 Suppl 2:S10-4.

2 **Table: Circumstances with likelihood of effective standard or contact precautions**

|   | In favor of standard precautions                   | In favor of contact precautions             | Rationale  |
|---|--|---|--|
| <b>Patient</b>                            |  |   |  |
| Bacterial burden in the source patient    | Asymptomatic                                       | Diarrhea, UTI, wounds                       | The risk of cross-transmission and environmental contamination increases with the bacterial burden of the source patient, making CP and single room potentially more effective than SP   |
| Care dependency, workload                 | Low  | High  | Higher workload and care dependency increase the number of contacts with the source patient, and the risk of cross-transmission  |
| Patient's risk for infection              | Healthy  | Vulnerable                                  | In an ICU with patients at high risk for infection, e.g. transplant ICU or burn ICU, placing colonized patients into CP has a higher chance be effective and reduce the risk for (severe) infection  |
| <b>MDRO Epidemiology</b>                  |  |   |  |
| Local epidemiology                        | Endemic  | Sporadic, outbreaks                         | It is shown that the higher the number of patients placed into CP, the lower the adherence to control measures   |
| Type of MDRO                              | Multiply-resistant                                 | Extensively-resistant                       | CP has higher chance to be effective for some extensively-resistant MDRO in patients with difficult-to-treat infections than for patients at risk for infection with less resistant MO. In addition, adherence to a national policy, usually targeting more resistant MDRO, is key for success at the national level |
| Ease of transmission ("transmissibility") | Lower (ex, ESBL <i>E. coli</i> )                   | Higher (ex, ESBL non <i>E. coli</i> ; CRAB) | The frequency of transmission depends on the type of MDRO  |
| Route of dissemination                    | Participation of the antibiotic selective pressure | Mostly by cross-transmission                | Emergence of several MDRO variably depends on selective antibiotic pressure, e.g. ampC producing <i>Enterobacteriaceae</i> and exposure to 3GC or several resistance mechanisms in <i>P. aeruginosa</i> being induced due to antibiotics. CP may be less useful for patients with these MDRO                         |
| <b>HCW practices</b>                      |  |   |  |
| Compliance with hand                      | High (> 70%) or low (<                             | Intermediate (40-70%)                       | High compliance with hand hygiene forms the basis for  |

|                            |                       |                     |   |
|----------------------------|-----------------------|---------------------|---|
| hygiene                    | 40%)                  |                     | efficacy of SP. But in a situation with a low compliance with hand hygiene, most efforts must target improving compliance before instituting CP. The benefit of CP may be higher in intermediate compliance |
| AHR consumption of the ICU | High (> 150 mL/Pt.d)  | Low (< 100 mL/Pt.d) | AHR consumption is a useful surrogate of hand hygiene in an ICU, additionally to compliance with hand hygiene   |
| <b>Resources</b>           |                       |                     |   |
| Environment                | Clean, spacious rooms | Crowded             | Architectural, human and financial resources are critical to improve compliance with CP   |
| Single room                | Limited number        | Available           | Using single room for all patients in the ICU improves compliance with hand hygiene at room entry and exit, therefore increasing compliance with CP   |
| Screening of patients      | Limited               | Available           | To be effective, active surveillance cultures are required for identifying the whole reservoir of MDRO in patients to be placed into CP   |
| Human workforce            | Limited               | Available           | CP require time for healthcare workers to comply with donning and doffing protective equipment  |
| Financial resources        | Limited               | Large               | CP require financial resources to purchase protective equipment   |

1 Adapted from Kirkland K [1]

2

3 Abbreviations: UTI, urinary tract infection; CP, contact precautions; SP, standard precautions; ICU, intensive care unit, MDRO, multidrug-  
 4 resistant organism; ESBL, extended-spectrum betalactamase; CRAB, carbapenem-resistant *Acinetobacter baumannii*;

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