TITLE: **Antimicrobial Copper Surfaces in Hospital Settings: Clinical Effectiveness**

DATE: 30 September 2016

RESEARCH QUESTION

What is the evidence for the clinical effectiveness of antimicrobial copper surfaces in hospital settings to reduce health care-associated infections?

KEY FINDINGS

Two systematic reviews, one randomized controlled trial, and one non-randomized study were identified regarding the clinical effectiveness of antimicrobial copper surfaces in hospital settings to reduce health care-associated infections.

METHODS

A limited literature search was conducted on key resources including Embase, Medline, PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2011 and September 26, 2016. Internet links were provided, where available.

SELECTION CRITERIA

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

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Table 1: Selection Criteria	
Population	Hospitalized patients of all ages
Intervention	Use of antimicrobial copper surfaces
Comparator	Any
Outcomes	Decreased health care-associated infection (HCAI) rates; improved patient outcomes
Study Designs	Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies

RESULTS

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, and non-randomized studies.

Two systematic reviews, one randomized controlled trial, and one non-randomized study were identified regarding the clinical effectiveness of antimicrobial copper surfaces in hospital settings to reduce health care-associated infections. No relevant health technology assessments were identified.

Additional references of potential interest are provided in the appendix.

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

1. Muller MP, MacDougall C, Lim M, Ontario Agency for Health Protection and Promotion Public Health Ontario, Provincial Infectious Diseases Advisory Committee on Infection Prevention and Control, Provincial Infectious Diseases Advisory Committee on Infection Prevention and Control. Antimicrobial surfaces to prevent healthcare-associated infections: a systematic review. J Hosp Infect. 2016 Jan;92(1):7-13. PubMed: PM26601608

2. Leas BF, Sullivan N, Han JH, Pegues DA, Kaczmarek JL, Umscheid CA. Environmental cleaning for the prevention of healthcare-associated infections. [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Aug. (Effective healthcare technical brief; no. 22). [2016 Sep 29]. Available from: https://effectivehealthcare.ahrq.gov/ehc/products/592/2103/healthcare-infections-report-150810.pdf
See: Self-Disinfecting Surfaces, page 11

Randomized Controlled Trials

3. Salgado CD, Sepkowitz KA, John JF, Cantey JR, Attaway HH, Freeman KD, et al. Copper surfaces reduce the rate of healthcare-acquired infections in the intensive care unit. Infect Control Hosp Epidemiol. 2013 May;34(5):479-86. PubMed: PM23571364

Non-Randomized Studies

4. von Dessauer B, Navarrete MS, Benadof D, Benavente C, Schmidt MG. Potential effectiveness of copper surfaces in reducing health care-associated infection rates in a pediatric intensive and intermediate care unit: a non-randomized controlled trial. Am J Infect Control [Internet]. 2016 Aug 1 [cited 2016 Sep 29];44(8):e133-e139. Available from: http://ac.els-cdn.com/S0196655316303388/1-s2.0-S0196655316303388-main.pdf?_tid=42a79224-8650-11e6-8c11-00000aab0f6c&acdnat=1475159175_d427a9a04d83435b378d02508bddf902 PubMed: PM27318524

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APPENDIX – FURTHER INFORMATION:

Previous CADTH Reports

5. Antimicrobial copper surfaces for the reduction of health care-associated infections in intensive care settings [Internet]. Ottawa: CADTH; 2015 Mar 31. [cited 2016 Sep 29]. (Issues in emerging health technologies; no. 133). Available from: https://www.cadth.ca/antimicrobial-copper-surfaces-reduction-health-care-associated-infections-intensive-care-settings

6. Non-manual room disinfection techniques for infection prevention in healthcare facilities: a review of the clinical effectiveness, cost-effectiveness, and guidelines [Internet]. Ottawa: CADTH; 2015 May 27. [cited 2016 Sep 29]. (Rapid response report: summary with critical appraisal). Available from: https://www.cadth.ca/non-manual-room-disinfection-techniques-infection-prevention-healthcare-facilities

Non-Randomized Studies

Alternate Intervention

7. Lazary A, Weinberg I, Vatine JJ, Jefidoff A, Bardenstein R, Borkow G, et al. Reduction of healthcare-associated infections in a long-term care brain injury ward by replacing regular linens with biocidal copper oxide impregnated linens. Int J Infect Dis [Internet]. 2014 Jul [cited 2016 Sep 29];24:23-9. Available from: http://ac.els-cdn.com/S1201971214000599/1-s2.0-S1201971214000599-main.pdf?_tid=15310f88-8654-11e6-aa1a-00000aacb362&acdnat=1475160817_1127b7d5027fd6dc14004b2c5c565acc
PubMed: PM24614137

8. Casey AL, Karpanen TJ, Adams D, Lambert PA, Nightingale P, Miruszenko L, et al. A comparative study to evaluate surface microbial contamination associated with copper-containing and stainless steel pens used by nurses in the critical care unit. Am J Infect Control. 2011 Oct;39(8):e52-e54.
PubMed: PM22173515

No Patient-Related Outcomes Reported

9. Schmidt MG, von Dessauer B, Benavente C, Benadof D, Cifuentes P, Elgueta A, et al. Copper surfaces are associated with significantly lower concentrations of bacteria on selected surfaces within a pediatric intensive care unit. Am J Infect Control [Internet]. 2016 Feb [cited 2016 Sep 29];44(2):203-9. Available from: http://ac.els-cdn.com/S0196655315009815/1-s2.0-S0196655315009815-main.pdf?_tid=980b0fb2-8654-11e6-8679-00000aacb361&acdnat=1475161036_4cda0e340da52bcd3bddc085d35327b9
PubMed: PM26553403

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http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3426407
PubMed: PM22950011

12. Schmidt MG, Attaway HH, Sharpe PA, John J, Sepkowitz KA, Morgan A, et al. Sustained reduction of microbial burden on common hospital surfaces through introduction of copper. J Clin Microbiol [Internet]. 2012 Jul [cited 2016 Sep 29];50(7):2217-23. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3405627
PubMed: PM22553242

13. Espirito Santo C, Lam EW, Elowsky CG, Quaranta D, Domaille DW, Chang CJ, et al. Bacterial killing by dry metallic copper surfaces. Appl Environ Microbiol [Internet]. 2011 Feb [cited 2016 Sep 29];77(3):794-802. Available from:
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3028699
PubMed: PM21148701

Laboratory Studies

14. Ballo MK, Rtimi S, Mancini S, Kiwi J, Pulgarin C, Entenza JM, et al. Bactericidal activity and mechanism of action of copper-sputtered flexible surfaces against multidrug-resistant pathogens. Appl Microbiol Biotechnol. 2016 Jul;100(13):5945-53.
PubMed: PM27020284

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PubMed: PM27600172

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PubMed: PM26044991

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19. San K, Long J, Michels CA, Gadura N. Antimicrobial copper alloy surfaces are effective against vegetative but not sporulated cells of gram-positive Bacillus subtilis. Microbiologyopen [Internet]. 2015 Oct [cited 2016 Sep 29];4(5):753-63. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4618608
PubMed: PM26185055

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PubMed: PM21742916

Review Articles

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