



## **Transmission of Pathogens Throughout Healthcare Facilities**

Hospital-acquired infections (HCAs) are one of the leading causes of death in the United States. With strict infection control implementation and environmental decontamination, the numbers of HCAs should be decreasing. However, infection rates continue to increase. Evidence shows that pathogens and infectious bacteria contaminate surfaces in healthcare facilities and contribute to the transition from contamination to infection of an individual. Through education, understanding how pathogens are transmitted can improve infection control practices and the reduction of contamination.

Pathogens can spread and affect a variety of different individual environments, with the possibility of infecting all people on the health spectrum. Conventional pathogens, which include *Staphylococcus aureus* and *Salmonella*, cause disease in healthy individuals. Conditional pathogens can cause disease in people by direct implementation to the tissue or in individuals with reduced resistance to infection such as those who have an increased use of antibiotics, the elderly, and newborn infants. Conditional pathogens include *Escherichia coli* and *Streptococcus agalactiae*. Lastly, opportunistic pathogens, such as *Pneumocystis*, cause generalized diseases but only in patients with a very low resistance to infection<sup>1</sup>.

HCAs, also known as nosocomial infections, are transmitted by a variety of means. The World Healthcare Organization (WHO) recently presented potential sources for transmission of infection to an individual (see figure 1)<sup>1</sup>. In a health care facility setting, multiple pathways of infection may come through personnel,



patients or the inanimate environment. Direct contact transmissions include: person-to-person, injection or insertion of medical devices, airborne contact of open wounds, and respiration of airborne particles<sup>2</sup>. Direct contact between two patients occurs very infrequently, however an infected healthcare worker can directly transmit pathogens or bacteria directly to another patient. The most frequent route of transmission is through indirect contact, which occurs when an infected patient or individual touches – and contaminates—an object or surface and subsequent contact between that item and another patient or individual occurs<sup>1</sup>.

During general care and medical treatment, the hands of healthcare workers come into contact with patients. Therefore the hands of healthcare workers are the most common transmission of pathogens, with the potential to also spread infection to instruments, containers, linens, computers and many more surfaces. The most important basic measure for maintenance of infection control and hygiene in a hospital environment is cleaning. Many healthcare establishments use a microbiological effort to clean by using soaps and detergents. However, the efficacy of cleaning solely depends on the mechanical practice of cleaning by a healthcare worker. Careless and superficial cleaning is much less effective at removing infection and bacteria, and there is the possibility of spreading contaminants to other surfaces if not adequately cleaned<sup>1</sup>.

In the study “Evidence That contaminated Surfaces Contribute to the Transmission of Hospital Pathogens and an Overview of Strategies to Address Contaminated Surfaces in Hospital Settings” presented in the American Journal of Infection Control, shows recent data that contaminated surfaces play a primary role in transmission of pathogens causing HCAs. Certain HCAI causing bacteria,



see Table 1<sup>3</sup>, continue to survive on dry surfaces for extended periods of time. These bacteria are difficult to eradicate by cleaning and disinfection and many healthcare establishments are unable to achieve adequate levels of disinfection. With the bacteria surviving for long periods of time, transfer of pathogens from surfaces to the hands of healthcare personnel have high percentages of being transferred to the patient (see Table 2)<sup>3</sup>. The study states, “if environmental surfaces are an important factor in transmission because of inadequate disinfection after discharge of an infected or colonized patient, there will be an increased risk of acquisition of the same pathogen in the subsequent room occupant”<sup>3</sup>.

With a greater understanding of the transmission of pathogens and updated technology, strategies to address environmental contamination can be greatly improved. Various tools including no-touch technologies can help reduce and prevent indirect transmission of pathogens throughout healthcare facilities.

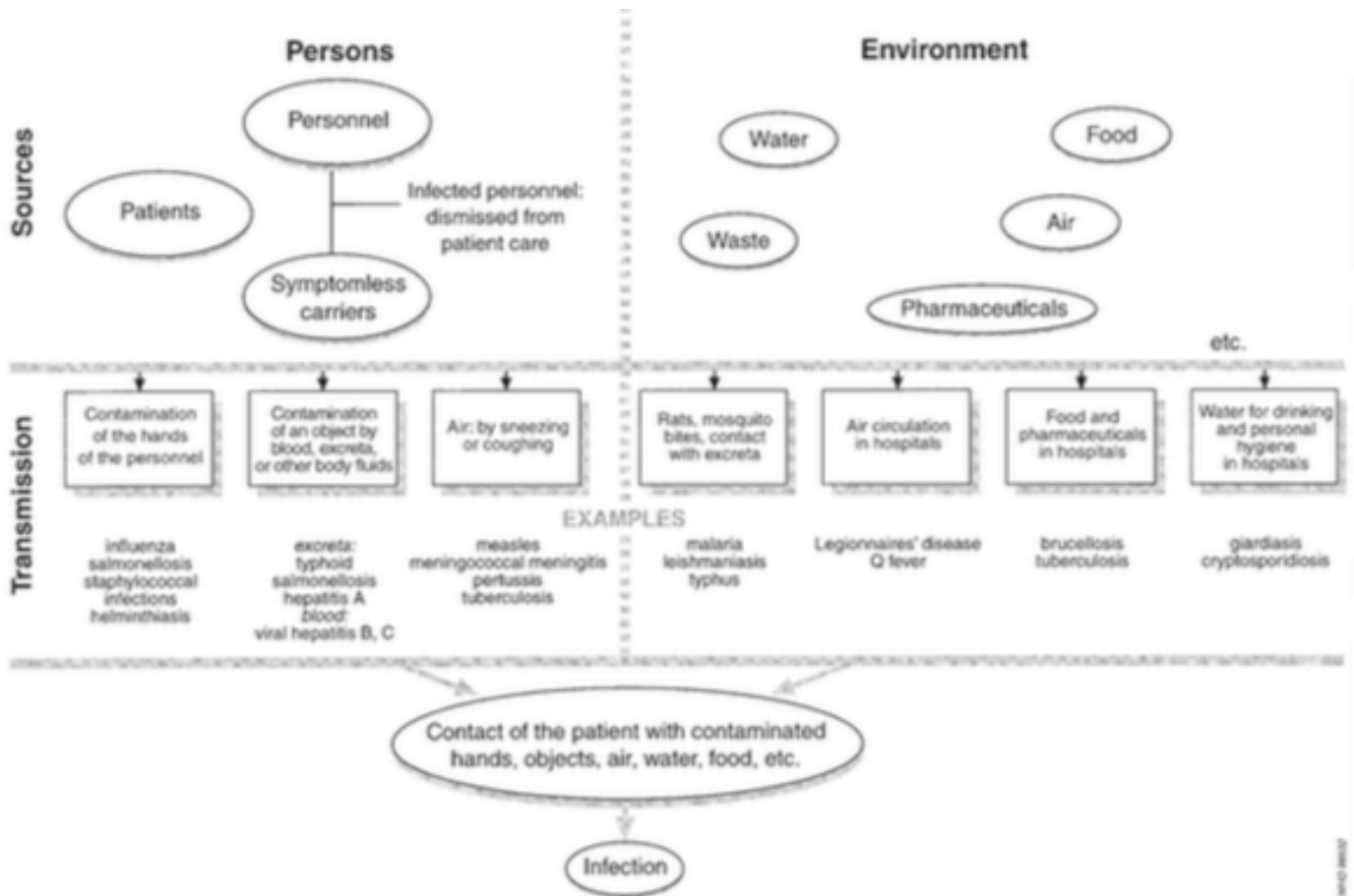


Figure 1: Potential direct and indirect sources causing transmission of infection<sup>1</sup>.



**Table 1**

Survival of hospital pathogens on dry hospital surfaces

Organism	Survival time
<i>Clostridium difficile</i> (spores)	>5 Months
<i>Acinetobacter</i> spp	3 Days to 11 months <sup>79</sup>
<i>Enterococcus</i> spp including VRE	5 Days to >46 months <sup>32</sup>
<i>Pseudomonas aeruginosa</i>	6 Hours to 16 months
<i>Klebsiella</i> spp	2 Hours to >30 months
<i>Staphylococcus aureus</i> , including MRSA	7 Days to >12 months <sup>80</sup>
Norovirus (and feline calicivirus)	8 Hours to >2 weeks <sup>81</sup>

Table 1: Length of time hospital pathogens survive on dry hospital surfaces<sup>3</sup>.

**Table 2**

Transfer of pathogens from surfaces to the hands of health care personnel

Direct patient contact	Contact with environmental surfaces only
	52% of 44 HCP acquired VRE on their hands or gloves <sup>10</sup>
45% of 50 HCP acquired MRSA on their gloved hands <sup>39</sup>	40% of 50 HCP acquired MRSA on their gloved hands <sup>39</sup>
50% of 30 HCP acquired <i>Clostridium difficile</i> on their gloved hands <sup>40</sup>	50% of 30 HCP acquired <i>C difficile</i> on their gloved hands <sup>40</sup>
Compliance with hand hygiene: 80% <sup>41</sup>	Compliance with hand hygiene: 50% <sup>41</sup>

HCP, Health care personnel.

Table 2: Transfer of pathogens from surfaces to the hands of health care personnel<sup>3</sup>.



1. Hospital Hygiene and Infection Control. Safe Management of Wastes from Health-care Activities, 148-158. World Health Organization. Retrieved from [http://www.who.int/water\\_sanitation\\_health/medicalwaste/148to158.pdf](http://www.who.int/water_sanitation_health/medicalwaste/148to158.pdf)
2. Hospital infection control: Reducing airborne pathogens - Maintenance and Operations. (n.d.). Retrieved May 03, 2016, from <http://www.healthcarefacilitiestoday.com/posts/Hospital-infection-controlreducing-airborne-pathogens--5523>
3. Otter, J. A., PhD, Yezli, S., PhD, Salkeld, J. A., BSc, & French, G. L., MD. (2013). Evidence that contaminated surfaces contribute to the transmission of hospital pathogens and an overview of strategies to address contaminated surfaces in hospital settings. American Journal of Infection Control, 41(5), S6-S11. Retrieved May 3, 2016, from [http://www.ajicjournal.org/article/S0196-6553\(13\)00004-7/fulltext](http://www.ajicjournal.org/article/S0196-6553(13)00004-7/fulltext)