Touchscreens: The Mosquito of the Digital Age

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Abstract

The widespread and rapidly growing automation and digitization of our world has led to the installation of billions of touchscreens, both in our personal possession and in public use, such as at hospitals, airports, schools, restaurants, public transit, banks and government offices.

Warm touchscreens contacted by many people, or by individuals who themselves are in contact with potentially infected surfaces, are ideal hosts and transmitters of infectious disease. The touchscreen could be considered the mosquito of the digital age. In addition to being vectors of infectious disease, these tools are expensive devices and vulnerable to damage from cleaning protocols, vandalism and impact.

The use of an antimicrobial protective screen could be the simple, inexpensive solution to the problems faced by touchscreen users.

Main Article

Touchscreens are everywhere: on your phone, tablet and car dashboard; and at the bank, the movie theatre, the airport and your hospital room. The pervasive use of smartphones, tablets and other touchscreen devices, both in healthcare settings and the general public, presents at least three issues:

1. **Disease transmission**

Touchscreens are ideal media for pathogens of all kinds to flourish on, due to their regular contamination by unclean human hands and body fluids and their warm operating temperature. Bacteria thrive at 35?C. Touchscreens in hospitals are well-known potential sources of infection (Shakir, 2015).

A significant infectious disease problem in healthcare today is nosocomial infection, an infection that originates in hospitals. An increasingly prevalent infectious disease problem is arising in schools, restaurants and elsewhere, due to the increasingly diverse sources of pathogens outside of healthcare settings and the increasing public use of touchscreens.

The infectious disease problem is better documented in the healthcare sector than in public areas. Scientific reports have found that patients admitted to rooms that were previously occupied by patients infected with common multidrug resistant organisms (MDROs) have been found to be at a 1.5 to 2.5 times increased risk for developing the same infection (Stibich, 2016). Since there is no direct contact between the two patients, this risk of infection is almost exclusively associated with the environment. If not properly disinfected, these MDROs can linger on high touch surfaces for weeks to months, serving as a continued transmission risk for many future patients (Otter, 2013).

Studies conducted to determine contamination levels on smartphones have concluded that a smartphone is highly contaminated with the same microbes that are found on the hands of the user (Beckstrom, 2013).

Cell Phones Are Excellent Transmitters Of Infectious Disease

Several studies have concluded that cell phones are excellent transmitters of infectious disease between individuals commuting between hospital wards, and the community at large (Tatem, 2011). Evidence from the healthcare environment suggests that all touchscreens in public use should be considered potential hotspots for the transmission of infectious diseases. A 2013 project at the University of Surrey tested a large sampling of smartphones and found fecal coliforms, *Streptococcus, Staphylococcus aureus* and much more (Ulgar, 2009).

2.

Challenges of cleaning

Healthcare environments have implemented aggressive cleaning protocols for high-touch surfaces

(Weber, 2005), with the unfortunate side effect of damage to screens from the harsh chemicals. Alcohol, ammonia and bleach can ‘etch’ the surface of a screen and make it appear cloudy. Residue from cleaning products can crystallize and, when touched or rubbed, scratch the touchscreen surface. In non-healthcare settings, fear of damaging the screens means they are rarely cleaned with the vigor needed to remove pathogens.

3.

Implications of impact

Hospital environments are unusually rough on equipment and operating room monitors due to the frequent movement of equipment and the nature of an emergency environment. As a result, many touchscreen devices are physically damaged or destroyed unnecessarily because they have minimal impact resistance. Likewise, touchscreens in public spaces are subject to vandalism and abuse that could damage the screen.

Replacing or repairing touchscreens from damage is expensive, ranging from $100 for a smartphone to thousands of dollars for specialized equipment found in hospitals, airports, schools, restaurants, public transit, banks and government.

Although some newer smartphone screens incorporate an improved level of impact resistance, the bane of smartphone owners has been broken touchscreens. This has driven a massive business for aftermarket screen protectors, which to some degree protect the owner’s significant investment in their smartphone.

Protective Films Provide a Solution

Today, hospitals are facing several threats that are driving their search for touchscreen protectors, which incorporate high quality, long lasting antimicrobial properties, impact resistance, privacy features and resistance to strong chemical sanitization protocols. (University of Surrey, 2013)

The ideal feature-set for such a multi-layered product would be:

- broadly acceptable antimicrobial technology
- maintenance of near 100% capacitance for continued functioning of touchscreens
- proven impact resistance
- availability of a privacy layer, and
- resistance to chemical damage

Spyder Digital Research Inc. (SDR) offers a patented antimicrobial screen protector that meets all of these criteria and is FDA listed, EPA registered and REACH compliant. Available in any size, from smartphones to 60" display screens, the protectors have a multi-year guarantee.

The active ingredient of the antimicrobial additives in the SDR solution is silver, a metal known to have antimicrobial properties (Fong, 2006). Chemists are able to create glass with a low chemical inertness while still retaining antimicrobial metal ions, such as silver. With the presence of water or moisture, the glass will release these metal ions gradually to function as antimicrobial material.

Silver ions are able to bond strongly to the cellular enzymes of microbes and inhibit enzyme activity of the cell wall, membrane, and nucleic acids. Silver, with its positive charge attracts the negatively-charged microbes, thus disturbing their electric balance. The result is that the microbes burst their cell walls and are extinguished. Otherwise, silver ions are taken into the microbes, where they react and bond to the cellular enzyme microbes, thus inhibiting enzyme activity and multiplication of microbes. (Borrelli, 2015).

Conclusion

Regulators, health care professionals and corporate leaders are just beginning to recognize the increased threat of infectious disease epidemics facilitated by touchscreens, both from a liability perspective and from a social responsibility perspective. An opportunity exists now to prevent widespread illness and death from infectious disease contracted in public places.

Hospitals currently employ increasingly aggressive sanitizing protocols because of well-defined threats and substantial liabilities (Weber, 2005). In addition to touchscreens being an ideal environment for the spread of infectious diseases, they are also expensive devices that would benefit from protection from damage due to cleaning protocols or impact.

Promoting prophylactic measures for both healthcare and public use touchscreens is a simple, yet effective solution for a problem that promises to grow as touchscreens become used more and more extensively in our everyday lives.

References

1. Beckstrom, A. C., Cleman, P. E., Cassis-Ghavami, F. L., & Kamitsuka, M. D. (2013). Surveillance study of bacterial contamination of the parent's cell phone in the NICU and the effectiveness of an anti-microbial gel in reducing transmission to the hands. J Perinatol Journal of Perinatology, 33(12), 960-963. doi:10.1038/jp.2013.108

2. Borrelli, N. F., Senaratne, W., Wei, Y., & Petzold, O. (2015). Physics and Chemistry of Antimicrobial Behavior of Ion-Exchanged Silver in Glass.ACS Appl. Mater. Interfaces ACS Applied Materials & Interfaces, 7(4), 2195-2201. doi:10.1021/am508159z

3. Cell Phones and Acinetobacter Transmission. (n.d.). Retrieved July 21, 2016, from http://wwwnc.cdc.gov/eid/article/11/7/pdfs/05-0221.pdf

4. Fletcher, P. (n.d.). Conjunctivitis (Pink Eye) Outbreak Traced Back to School's Public Keyboards. Retrieved July 21, 2016, from https://system.netsuite.com/

5. Fong, J., & Wood, F. (2006). Nanocrystalline silver dressings in wound management: A review. International Journal of Nanomedicine, 1(4), 441-449. doi:10.2147/nano.2006.1.4.441

6. Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008. (2009). Retrieved July 21, 2016, from https://www.cdc.gov/hicpac/Disinfection_Sterilization/3_4surfaceDisinfection.html

7. Halpin, H. A., Milstein, A., Shortell, S. M., Vanneman, M., & Rosenberg, J. (2011). Mandatory Public Reporting Of Hospital-Acquired Infection Rates: A Report From California. Health Affairs, 30(4), 723-729. doi:10.1377/hlthaff.2009.0990

8. Harrison, P. (2014, April 10). Virtually All Touchscreens Are Contaminated With Pathogens. Retrieved July 21, 2016, from http://www.safmed.co.za/News-Articles/ArticleID/8/Virtually-All-Touchscreens-Are-Contaminated-With-Pathogens

9. Hospital-Acquired Conditions. Retrieved July 21, 2016, from https://www.cms.gov/medicare/medicare-fee-for-service-payment/hospitalacqcond/hospital-acquired_conditions.html

10. How dirty is your smartphone? Retrieved July 21, 2016, from http://www.surrey.ac.uk/features/how-dirty-your-smartphone

11. Hu, H., Johani, K., Gosbell, I., Jacombs, A., Almatroudi, A., Whiteley, G., . . . Vickery, K. (2015). Intensive care unit environmental surfaces are contaminated by multidrug-resistant bacteria in biofilms: Combined results of conventional culture, pyrosequencing, scanning electron microscopy, and confocal laser microscopy. Journal of Hospital Infection, 91(1), 35-44. doi:10.1016/j.jhin.2015.05.016

12. Infection public places - sanitisation public places - disinfection public places - cleaning public places. Retrieved July 21, 2016, from http://www.sanisystempolti.com/en/public_places.php

13. Julian, T., Leckie, J., & Boehm, A. (2010). Virus transfer between fingerpads and fomites. Journal of Applied Microbiology, 109(6), 1868-1874. doi:10.1111/j.1365-2672.2010.04814.x

14. Otter, J. A., Yezli, S., Salkeld, J. A., & French, G. L. (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). doi:10.1016/j.ajic.2012.12.004

15. Peasah, S. K., McKay, N. L., Harman, J. S., Al-Amin, M., & Cook, R. L. (n.d.). Medicare Non-Payment of Hospital-Acquired Infections ... Retrieved July 21, 2016, from http://www.cms.gov/mmrr/Downloads/MMRR2013_003_03_a08.pdf

16. Routes for Spread of Infections. (n.d.). Retrieved July 21, 2016, from http://www.med.uottawa.ca/sim/data/Infection_spread_e.htm

17. Scott, R. D., III. (2009, March). The Direct Medical costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention. Retrieved July 21, 2016, from http://www.cdc.gov/hai/

18. Shakir, I. A., Patel, N. H., Chamberland, R. R., & Kaar, S. G. (2015). Investigation of Cell Phones as a Potential Source of Bacterial Contamination in the Operating Room. The Journal of Bone & Joint Surgery, 97(3), 225-231. doi:10.2106/jbjs.n.00523

19. Shen, V. (2010, October 21). Technology goes viral, literally. Retrieved July 21, 2016, from http://www.stanforddaily.com/2010/10/21/technology-goes-viral-literally/

20. Stibich, M. (2016, May 13). Reduction of HAIs through the use of Pulsed Xenon UV Disinfection. Retrieved July 21, 2016, from http://infectioncontrol.tips/2016/05/13/reduction-hai-pulsed-xenon/

21. Tatem, A., Rogers, D., & Hay, S. (2006). Global Transport Networks and Infectious Disease Spread. Advances in Parasitology Global Mapping of Infectious Diseases: Methods, Examples and Emerging Applications, 293-343. doi:10.1016/s0065-308x(05)62009-x

22. The hidden life on your phone – the bacteria that lurk on your mobile. (n.d.). Retrieved July 21, 2016, from http://www.surrey.ac.uk/mediacentre/press/2013/98476_the_hidden_life_on_your_phone_the_bacteria_that_lurk_on_your_mobile.htm

23. Touch Solutions for Medical and Healthcare Applications. (n.d.). Retrieved July 21, 2016, from http://www.elotouch.com/Solutions/Medical/default.asp?mtcCampaign=18157

24. Weber, J., Nell, M., Fortna, S., Neely, A., Lighter, D., & Group, I. C. (2005). Computer equipment used in patient care within a multihospital system: Recommendations for cleaning and disinfection.American Journal of Infection Control,33(5). doi:10.1016/j.ajic.2005.04.031

25. Why your clinical display should have a fully cleanable design. Retrieved July 21, 2016,

from https://www.barco.com/~/media/Downloads/White papers/D-F/BARCO whitepaper eonis-medical_LR pdf.pdf

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