

Mitigating the contamination risks of using mobile devices in healthcare settings

Mobile devices have become indispensable healthcare tools. But what about the risks of contamination? Dr. Udo Jendrysiak examines the issue, and explains how best to keep them free of microbes.

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The danger is greater than one might think. 45% of the mobile communication devices used by hospital staff in developed countries are contaminated with microbes. With 98% of hospital employees using such devices in their daily work, that equates to a truly serious challenge with potentially far-reaching implications for patient and staff safety.

Healthcare professionals are increasingly aware of the contamination risks posed by using smartphones in the workplace. The reason is literally in our hands: smartphones are our constant, indispensable companions. Day in, day out, we use them for browsing, calls and messaging. We unconsciously hold and handle them, even when they are not in use. Due to the range of healthcare apps and functions now available for smartphones, it is hard to imagine not using them.

These factors have made disinfection—of clinical devices and everyday objects—a hot topic among clinicians, researchers and the wider healthcare community. But despite intensive coverage and discussion, many healthcare workers remain uncertain which guidelines to follow. And many clinical managers are unsure which guidelines they should give to their staff.

This white paper provides a clear way forward, showing how all of us can continue to safely reap the benefits of mobile devices and smartphones in clinical environments.

The topic of hospital hygiene long pre-dates the COVID-19 pandemic. Globally, considerable efforts have been made to improve hand disinfection, aimed especially at curbing the proliferation of antibiotic-resistant germs.

As is well known, we transmit germs primarily via our hands. Microbes attach to mobile devices from our hands, and also from surfaces that come into contact with the devices. A short period of contact is all it takes for the device to be contaminated. Bacteria and viruses can now stay on the device for hours or even days.

99.2% of smartphones were found to be contaminated with pathogens.¹

A research group from the University of South Wales recently examined the smartphones of 250 hospital employees and 191 other study participants. A staggering 99.2% of smartphones were found to be contaminated with pathogens.¹

A meta study from early 2020 describes how long different corona strains can stay active on various surfaces. The study also compared the degree to which different disinfectants reduce the pathogen count after 30 seconds or longer.²

The study found that disinfectants based on ethanol, hydrogen peroxide or sodium hypochlorite are effective against corona viruses. The authors assume that these results can be transferred to the new virus responsible for the COVID-19 disease, as examination of various corona virus strains has to date produced very similar results.

Corona viruses only last for hours or a few days on dry surfaces. Unfortunately this is far too long for in the context of permanent use of smartphones in hospitals.³

From the studies by Nicas and Best (2008), and Kwok, et al (2014), we know how often people touch their faces, eyes, nose and mouth.^{4,5}

Body area	Average number of touches	Average duration of touches
Eyes	3	1-53 sec
Nose	3	1-10 sec
Mouth	4	1-12 sec
Ear	1	1-20 sec
Cheek	4	1-12 sec
Neck	1	1-23 sec
Chin	4	1-10 sec

The results of the study by Kwok, et al (2015).⁵



On March 21, 2020, the German TV station ARD broadcast an episode of its 'Quarks' science program. In it, Professor Ortwin Adams, a virologist at the University of Düsseldorf, used fluorescent liquid to show how quickly and thoroughly hands can spread viruses.

Even a previously informed test person, who was instructed to deliberately avoid hand contact, did not succeed. Touching the face is obviously not so easy to suppress.⁶

Contact contamination indirectly contributes to the spread of pathogens from person to person via surfaces. And that has an impact on the kind of support we can give doctors and nurses.

Disinfection of mobile devices

Why are mobile phones disinfected so rarely? Often it is not just a lack of habit or availability of cleaning products, but also justified concern that the phone will be damaged. Plastics can become matt and brittle and the contacts for the charging cable can corrode.⁷

Cleaning: how and how often?

Mobile phones should be cleaned and disinfected every time their users clean and disinfect their hands. But users can hardly be expected to hold a mobile device directly under a disinfectant dispenser. The obvious solution is to ensure that ready-to-use disinfecting products for mobile devices are available wherever staff may wash their hands.

An alternative could be disinfection systems that work with UV light. A research group from the Fraunhofer Institute in Germany recently presented a prototype of this kind.⁸ However, UV disinfection systems cannot replace the manual removal of dirt and grease from smartphones. Also, UV systems would have to drop considerably in price to become competitive against conventional disinfecting methods. Another obstacle for UV disinfecting systems is the negative impact on plastics. UV radiation can not only destroy DNA, it also destroys the polymer chains in plastic, leaving it brittle and prone to failure.



Ready-to-use disinfection wipes in a secure storage container in St. Martinus Hospital, Olpe, Germany.



Consumer smartphones

Apart from expensive high-end devices, plastics are widely used on smartphones. However, some shiny metallic surfaces are only applied externally and are not resistant to abrasion with effective (i.e. aggressive) disinfectants. If disinfectant gets inside and damages the device, this usually invalidates the product guarantee.

Stiftung Warentest (an independent consumer rights and product-testing foundation in Germany) wrote in 2012: "Smartphones fling out bacteria like centrifuges, your touchscreen is a breeding ground for many pathogens", referring to a study by the Wall Street Journal.⁹ The foundation recommended cleaning smartphones with high-content alcohol disinfecting agents. However, Stiftung Warentest found that many smartphone manufacturers advised against using aggressive (i.e. effective) disinfecting agents on their devices.

Not much has changed since 2012. Apparently, chic design and aggressive disinfectants do not go well together. A look at the data sheets and cleaning recommendations supplied by manufacturers reveals language such as: "We recommend cleaning with a mild soap solution," or "Wipe gently with a slightly damp cloth or pad," or "Use a microfiber cloth to gently clean the screen." Hygiene experts have rather more stern recommendations: Thoroughly clean devices with high-proof disinfectant solution for a minimum of 30 seconds in order to reduce the active virus count from a few million to less than 1000.²

When it comes to consumer-grade smartphones, it is almost impossible to find manufacturer-issued guidelines on the suitability of device surfaces for cleaning with disinfectants containing alcohol, peroxide or chlorhexidine.

Smartphone protective cases

Many people protect their smartphone with a protective cover against damage, especially to the touchscreen. For cleaning, they must be removed and cleaned and disinfected separately. Unfortunately, soft plastic often becomes discolored and unsightly. Cleaning is difficult and time-consuming, especially at the openings for cameras, sensors and connections.

Are ultra-rugged smartphones a solution?

Rugged outdoor smartphones, also known as 'construction site' smartphones, should be able to be gripped and operated safely with gloves, as well as being fall- and water-resistant. Manufacturers often use a robust outer shell for such devices. These shells are easy to grip, but difficult to clean properly. Some manufacturers offer cleaning and disinfection services, but only at selected service points—hardly an ideal solution for smartphones requiring multiple cleanings every day.

Enterprise and personal devices

Enterprise devices (pagers, DECT and VoWiFi mobile phones and smartphones) are issued to employees depending on which tasks need to be completed, and which technology is available. Personal devices—almost exclusively consumer-grade smartphones—are also widely used in workplaces. It is not uncommon for an employee to use a combination of enterprise and personal mobile devices in a single shift. Such usage patterns make device cleaning and disinfection problematic and unnecessarily time consuming. Some workplaces, including many hospitals, explicitly prohibit staff from using personal smartphones while on duty. Not only do personal devices increase the risk of infections, they also contribute to work interruptions arising from incoming private calls.

How to reduce the risks and improve infection control

Many hospitals have created hygiene protocols for mobile devices which stipulate how mobile devices should be wiped with alcohol-based disinfection solution after use. Special device storage containers or lockers may be placed in changing rooms and nurse stations.



Recommendations – how to disinfect mobile devices and smartphones

- Use only enterprise-grade devices
- Carefully follow manufacturers' instructions—failure to do so may invalidate guarantees and warranties
- Wash your hands before and after disinfecting a device
- Clean devices thoroughly before disinfecting
- Do not spray disinfectant onto devices, or into charging ports, etc. Instead, wipe the device with disposable disinfecting wipes
- Do not forget to disinfect any retaining clips
- Use a cotton swab to gently clean charging ports and other openings. Be sure to remove any lint.

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About the author

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More information about cleaning and disinfecting Ascom mobile devices and smartphones is available at: ascom.com

USER GUIDE

How to clean and disinfect Ascom mobile devices

Unlike consumer-grade mobile handsets, Ascom mobile devices are purpose-built for healthcare, manufacturing, enterprise, retail and other high-performance work environments. Our handsets are tested with different cleaning and disinfection products and, below, is a list of approved solutions that will not harm the devices, while adhering to stringent cleaning protocols.

Cleaning instructions

1. Before cleaning the device, your hands should be cleaned.
2. You may use liquid disinfection solutions or cleaning wipes. Avoid cleaning and disinfection solutions containing skin moisturizing or cosmetic components.
3. Before disinfection, pre-clean the device to remove dirt with a cloth moistened with a mild soap solution.

See next pages for cleaning instructions

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References

- 1) 2016 Pillet S1, Berthelot P2, Gagneux-Brunon A3, Mory O4, Gay C5, Viallon A6, Lucht F3, Pozzetto B1, Botelho-Nevers E7. Contamination of healthcare workers' mobile phones by epidemic viruses. Clin Microbiol Infect. 2016 May; 22 (5): 456.e 1-6. doi: 10.1016 / j.cmi. 2015.12.008. Epub 2015 Dec 20.
- 2) Günter Kampf, Daniel Todt, Stephanie Pfaender, Eike Steinmann: Persistence of coronaviruses on inanimate surfaces and its inactivation with biocidal agents, in: Journal of Hospital Infection 2020, DOI: 10.1016 / j.jhin.2019.09.010. Epub 2019 Oct 1
- 3) Simmonds R., Lee D., Hayhurst E. Mobile phones as forms for potential pathogens in hospitals: microbiome analysis reveals hidden contaminants. Journal of Hosp Infection. 2020 Feb; 104 (2): 207-213. doi: 10.1016 / j.jhin.2019.09.010. Epub 2019 Oct 1
- 4) Mark Nicas & Daniel Best (2008) A Study Quantifying the Hand-to-Face Contact Rate and its Potential Application to Predicting Respiratory Tract Infection, Journal of Occupational and Environmental Hygiene, 5: 6, 347-352, DOI: 10.1080 / 15459620802003896
- 5) Kwok YL1, Galton J1, McLaws ML2. Face touching: a frequent habit that has implications for hand hygiene. On the J Infect Control. 2015 Feb; 43 (2): 112-4. doi: 10.1016 / j.ajic.2014.10.015.
- 6) Video: The Power of Viruses. ARD quarks. Broadcast from 21.03.20 | 28:29 min. | Available until 03/21/2021. ARD, and Prof. Ortwin Adams, University Hospital Düsseldorf. <https://www.daserste.de/information/wissen-kultur/quarks-caspers/videos/die-macht-der-viren-video-100.html>
- 7) List of disinfectants from the Robert Koch Institute, 2017, https://www.rki.de/DE/Content/Infekt/Krankenhaushygiene/Desinfektionsmittel/Desinfektionsmittelliste/Desinfektionsmittelliste_node.html
- 8) Fraunhofer Society press release. "Disinfect smartphones quickly and safely with light. April 6th 2020. <https://www.fraunhofer.de/de/presse/pressinformationen/2020/april/smartphones-schnell-und-sicher-mit-licht-desinfizieren.html>
- 9) Disgusting germs on display. Stiftung Warentest. 2012 <https://www.test.de/Smartphone-Ekelkeime-auf-Display-4483104-0/>

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