

## Best Evidence Topic Report 14

### Titel:

Wat is het nut van een stethoscoop ontsmetten ter preventie van overdracht virale infecties (in het bijzonder SARS-CoV-2)?

### Auteurs:

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### Antwoord op klinische vraag:

De contaminatie van stethoscopen door micro-organismen werd aangetoond in observationeel onderzoek als ook in systematic reviews. Slechts in één case report werd mogelijke transmissie van een infectieziekte via de stethoscoop beschreven. We kunnen dus concluderen dat stethoscopen virussen en bacteriën kunnen bevatten, doch overdracht van virale infecties via deze vector is tot op heden niet aangetoond.

### Disclaimer:

Deze rapporten zijn ontwikkeld volgens de methode van de Best Evidence Topics, kortweg bestBETs. Een bestBET beoogt een antwoord te geven op een specifieke klinische vraag, geformuleerd op basis van het op dit ogenblik best beschikbare bewijs. Omwille van de beperkte beschikbaarheid van wetenschappelijk bewijs voor COVID-19 topics, worden ook studies van lagere kwaliteit gebruikt. BestBETs bevatten geen aanbevelingen. Studenten 3e Master geneeskunde van de KU Leuven werkten deze topics uit onder begeleiding van twee docenten, waarna ze volgens een vast stramien een eindrapport opstellen. Voor de validatie van deze rapporten, konden we beroep doen op de expertise van CEBAM, die de rapporten rigoreus toetste aan vooropgestelde kwaliteitscriteria.

## Best Evidence Topic Report

Title	Nut van desinfectie stethoscoop ter preventie van overdracht virale infecties (in het bijzonder SARS-CoV-2)
Report by	Lisa Ceulemans (student geneeskunde) en Olivia Claes (student geneeskunde)
Search checked by	Lisa Ceulemans (student geneeskunde) en Olivia Claes (student geneeskunde)
Supervisor	Prof. Dr. Patrick Van Krunkelsven
Clinical scenario	Volwassen patiënt die in huisartsenpraktijk onderzocht wordt met stethoscoop
Answerable question (PICO/PIRT/PEO/...)	Voor [patiënt die onderzocht wordt met stethoscoop] is [ontsmetten beter dan niet ontsmetten] op vlak van [overdracht van het SARS-CoV-2 virus]?
Search terms	<p>("Infection Control"[Mesh]) AND "SARS Virus"[Mesh]  ("Coronavirus"[Mesh]) AND "Infection Control"[Mesh]  ("COVID-19" [Supplementary Concept]) AND "Infection Control"[Mesh]  ("COVID-19" [Supplementary Concept]) AND "Equipment Contamination"[Mesh]  ("Coronavirus"[Mesh]) AND "Equipment Contamination"[Mesh]  ("Coronavirus"[Mesh]) AND "Diagnostic Equipment"[Mesh]  ("Severe acute respiratory syndrome coronavirus 2" [Supplementary Concept]) AND "Diagnostic Equipment"[Mesh]  ("Stethoscopes"[Mesh]) AND "SARS Virus"[Mesh]  ("Virus Diseases"[Mesh]) AND "Stethoscopes"[Mesh]  ("Stethoscopes"[Mesh]) AND "Equipment Contamination"[Mesh]  ("Disease Transmission, Infectious"[Mesh]) AND "Stethoscopes"[Mesh]  ("Stethoscopes"[Mesh]) AND "Coronavirus"[Mesh]  ("Stethoscopes"[Mesh]) AND "Viruses"[Mesh]  ("Stethoscopes"[Mesh]) AND "Infections"[Mesh]</p>
Search date	17/03/2020 – 20/03/2020 en 01/04/2020 op Pubmed, Embase en Cochrane Library
Search outcome (number of hits)	<p>551 resultaten:  ("Infection Control"[Mesh]) AND "SARS Virus"[Mesh] → 111 resultaten  ("Coronavirus"[Mesh]) AND "Infection Control"[Mesh] → 193 resultaten  ("Coronavirus"[Mesh]) AND "Equipment Contamination"[Mesh] → 8 resultaten  ("Virus Diseases"[Mesh]) AND "Stethoscopes"[Mesh] → 1 resultaat  ("Stethoscopes"[Mesh]) AND "Infection control"[Mesh] → 64 resultaten  ("Stethoscopes"[Mesh]) AND "Equipment Contamination"[Mesh] → 75 resultaten  ("Disease Transmission, Infectious"[Mesh]) AND "Stethoscopes"[Mesh] → 6 resultaten  ("Stethoscopes"[Mesh]) AND "Viruses"[Mesh] → 1 resultaat  ("Stethoscopes"[Mesh]) AND "Infections"[Mesh] → 92 resultaten</p>
Relevant papers	9 resultaten
Flow chart	<p>("Infection Control"[Mesh]) AND "SARS Virus"[Mesh] → 111 resultaten  Weerhouden:  - Transmission of SARS and MERS coronaviruses and influenza virus in healthcare settings: the possible role of dry surface contamination.  ("Coronavirus"[Mesh]) AND "Infection Control"[Mesh] → 193 resultaten, niet relevant  ("COVID-19" [Supplementary Concept]) AND "Infection Control"[Mesh] → 0 resultaten  ("COVID-19" [Supplementary Concept]) AND "Equipment Contamination"[Mesh] → 0 resultaten  ("Coronavirus"[Mesh]) AND "Equipment Contamination"[Mesh] → 8 resultaten, niet relevant  ("Coronavirus"[Mesh]) AND "Diagnostic Equipment"[Mesh] → 0 resultaten  ("Severe acute respiratory syndrome coronavirus 2" [Supplementary Concept]) AND "Diagnostic Equipment"[Mesh] → 0 resultaten  ("Stethoscopes"[Mesh]) AND "SARS Virus"[Mesh] → 0 resultaten  ("Virus Diseases"[Mesh]) AND "Stethoscopes"[Mesh] → 1 resultaat, niet relevant  ("Stethoscopes"[Mesh]) AND "Infection control"[Mesh] → 64 resultaten</p>

	<p>Weerhouden:</p> <ul style="list-style-type: none"> <li>- Stethoscope as a Vector for Infectious Disease.</li> </ul> <p>("Stethoscopes"[Mesh]) AND "Equipment Contamination"[Mesh] → 75 resultaten</p> <p>Weerhouden:</p> <ul style="list-style-type: none"> <li>- What's growing on a General Practitioner's stethoscope?</li> </ul> <p>("Disease Transmission, Infectious"[Mesh]) AND "Stethoscopes"[Mesh] → 6 resultaten</p> <p>Weerhouden:</p> <ul style="list-style-type: none"> <li>- Nosocomial Neonatal <i>Listeria monocytogenes</i> Transmission by Stethoscope.</li> <li>- Healthcare equipment as a source of nosocomial infection: a systematic review.</li> </ul> <p>("Stethoscopes"[Mesh]) AND "Coronavirus"[Mesh] → 0 resultaten</p> <p>("Stethoscopes"[Mesh]) AND "Viruses"[Mesh] → 1 resultaat</p> <p>Weerhouden:</p> <ul style="list-style-type: none"> <li>- Recovery of respiratory syncytial virus from stethoscopes by conventional viral culture and polymerase chain reaction.</li> </ul> <p>("Stethoscopes"[Mesh]) AND "Infections"[Mesh] → 92 resultaten</p> <p>Weerhouden:</p> <ul style="list-style-type: none"> <li>- Healthcare Personnel Attire and Devices as Fomites: A Systematic Review</li> <li>- The stethoscope and healthcare-associated infection: a snake in the grass or innocent bystander?</li> </ul>
Inclusion and exclusion criteria	<p>Inclusion criteria:</p> <ul style="list-style-type: none"> <li>- Populatie: Volwassenen en kinderen.</li> <li>- Interventie: We zochten naar artikels die de overleving van micro-organismen op de stethoscoop nagaan, alsook artikels over effect van desinfectie en over overdracht van infectieziekten via de stethoscoop.</li> <li>- Studietype: We zochten eerst naar systematische reviews. Gezien de beperkte evidence hebben we nadien echter ook enkele observationele studies en case reports geïnccludeerd.</li> <li>- Taal: Engels.</li> </ul> <p>Exclusion criteria:</p> <ul style="list-style-type: none"> <li>- Irrelevante artikels (op basis van titel en abstract).</li> <li>- Artikels die niet voldoen aan de inclusiecriteria.</li> <li>- Artikels waarbij de volledige tekst niet beschikbaar was.</li> </ul>

### Evidence table

Author, date and country	Study type	Patient characteristics	Intervention / Index test/ Exposure	Comparator	Outcome	Key results: RR, AR, NNT Sens/Spec, LR+/LR-HR, OR Other	Main risks of bias
N Haun, 2016, UK	Systematic review	/	Collection of studies that assessed prevalence of pathogenic bacterial contamination of apparel and devices carried by healthcare	/	- 72 included studies - Examine bacterial contamination of healthcare personnel attire and commonly used devices	- Stethoscopes are commonly contaminated with bacterial pathogens - There is no evidence to date directly linking healthcare personnel attire with patient infection	- Variability of methods in the individual studies

			personnel. Data included study location, population, item studied, and prevalence of contamination				
N O'Flaherty, 2015, Ireland	Systematic review	/	Collection of studies that investigated stethoscopes as vector of micro-organisms, the level of bacterial contamination and the identification of micro-organisms. Combined with articles about healthcare workers' cleaning practices and interventions to reduce the level of contamination	/	<ul style="list-style-type: none"> <li>- 43 included studies</li> <li>- Assess the role of the stethoscope in the development of healthcare-associated infection</li> </ul>	<ul style="list-style-type: none"> <li>- The mean rate of stethoscope contamination across 28 studies was 85%</li> <li>- The majority of bacteria isolated were nonpathogenic</li> <li>- There was evidence that bacteria can transfer from the skin of the patient to the stethoscope and from the stethoscope to the skin</li> <li>- Studies were not designed to detect a correlation between stethoscope contamination and subsequent infection</li> <li>- An investigation of a cluster of Klebsiella pneumoniae bloodstream infections in a neonatal intensive care unit identified the outbreak strain from 3 stethoscopes</li> <li>- Alcohol-based disinfectants are effective in reducing bacterial contamination</li> </ul>	<ul style="list-style-type: none"> <li>- Inclusion and exclusion criteria were not specified</li> <li>- Little information on the quality of the included studies</li> </ul>
S Schabrun, 2006	Systematic review	/	Collection of studies examining the degree of bacterial contamination	/	<ul style="list-style-type: none"> <li>- 23 included studies</li> <li>- Determine levels of contamination on healthcare equipment</li> </ul>	<ul style="list-style-type: none"> <li>- Nearly all healthcare equipment harbours micro-organisms in sufficient numbers to result in nosocomial infection</li> </ul>	<ul style="list-style-type: none"> <li>- Most included studies were conducted in tertiary care: lower levels of contamination might exist in smaller facilities</li> </ul>

			healthcare equipment and the effect of various cleaning agents in reducing these levels of contamination		<ul style="list-style-type: none"> <li>- Identify viable cleaning protocols</li> <li>- Establish the methodological quality of current evidence</li> </ul>	<ul style="list-style-type: none"> <li>- Seventy percent alcohol was found to be a highly effective means of reducing contamination</li> </ul>	<ul style="list-style-type: none"> <li>- Most studies had small sample sizes and were not randomized</li> </ul>
Y Horiuchi, 2018	Narrative review	/	Collection of studies that reported the degree of contamination of stethoscopes, the infection hazard and the effect of disinfection	/	<ul style="list-style-type: none"> <li>- Discuss current status of the stethoscope as a vector for infection</li> <li>- Interventions to promote stethoscope disinfection</li> </ul>	<ul style="list-style-type: none"> <li>- Disinfection with alcohol can reduce the pathogens and risk of transmission</li> <li>- Only 0–24% of healthcare providers disinfect their stethoscope after patient contact</li> </ul>	<ul style="list-style-type: none"> <li>- Search and selection of articles was not explained</li> <li>- Inclusion and exclusion criteria were not specified</li> <li>- Assessment of methodological quality was not specified</li> </ul>
JA Otter, 2016, UK	Narrative review	/	Collection of studies evaluating contamination of any surface and transmission of viruses (in particular coronavirus, SARS and influenza)	/	<ul style="list-style-type: none"> <li>- Survival on dry surfaces and in aerosols</li> <li>- Environmental contamination in field settings</li> <li>- Importance of contaminated surfaces in transmission</li> <li>- Implications for infection prevention and control</li> </ul>	<ul style="list-style-type: none"> <li>- Surface survival of SARS/MERS-CoV is greater than that of influenza virus</li> <li>- The importance of indirect contact transmission in the spread of SARS-CoV compared with other transmission routes is uncertain</li> <li>- Infection control and prevention implications of these findings are the need to wear appropriate personal protection equipment</li> </ul>	<ul style="list-style-type: none"> <li>- Inclusion and exclusion criteria were not specified</li> <li>- Assessment of methodological quality was not specified</li> </ul>
A Carducci, 2016, Italy	Observational cross-over study	58 general practitioners (GP) and 9 pediatricians	Structured questionnaire about the knowledge and habits of cleaning medical instruments. Microbiological samples	/	<ul style="list-style-type: none"> <li>- Assess doctors' knowledge about cleaning standards for stethoscopes</li> <li>- Determine microbiological agents growing on a GPs' stethoscope</li> </ul>	<ul style="list-style-type: none"> <li>- Relevant bacterial growth was identified on the majority of the stethoscope's membranes</li> <li>- Stethoscopes may feature a risk of transmission for</li> </ul>	<ul style="list-style-type: none"> <li>- Low number of health providers that work in the health district of the study</li> <li>- Presence of an interviewer may have influenced the answers of the participants although the anonymity of the</li> </ul>

			collected from stethoscopes onto Columbia Agar. Bacterial colonies were identified by laser mass spectrometry			microbiological pathogens	survey was ensured by numbering the questionnaires from 1 to 57 and randomly distributing them.
V Knecht, 2019, USA	Cross-sectional study	10 single-use clean stethoscopes, 20 single-use stethoscopes in-use in inpatient rooms, 20 stethoscopes carried by physicians	10 stethoscopes cleaned with standardized method (hydrogen peroxide wipe for 60 seconds). 20 stethoscopes cleaned with preferred method of practitioner (hydrogen peroxide swabs or alcohol 70% swabs or bleach wipes. Duration of cleaning by practitioner preference)	20 background controls cleaned with sterile saline and dry clean swabs (collected in parallel with the stethoscope sampling)	<ul style="list-style-type: none"> <li>- Total bacterial contamination of the different stethoscopes</li> <li>- Species analysis</li> <li>- Analysis of the effect of cleaning (standardized cleaning method or the method practitioners usually use)</li> </ul>	<ul style="list-style-type: none"> <li>- Practitioner stethoscopes had the highest concentration and richness in species (but only nosocomial pathogens if used on multiple patients)</li> <li>- Both cleaning methods significantly reduced bacterial biomass but failed to bring contamination to the level of clean stethoscopes</li> </ul>	<ul style="list-style-type: none"> <li>- The study was not able to identify drug-resistant species</li> <li>- The study used a DNA-based approach, so it cannot distinguish between bacteria that are dead or alive</li> <li>- No analysis of fungal or viral sequences</li> </ul>
T Blydt-Hansen, 1999, Canada	Case series	9 children infected with RSV	Fresh nasopharyngeal secretions from RSV patients used to inoculate the diaphragms of nine stethoscopes - Cultures were examined 3	One stethoscope served as a control.	<ul style="list-style-type: none"> <li>- Assess the ability of RSV to survive in dried secretions on stethoscopes after deliberate contamination</li> <li>- Determine whether a wipe with an alcohol swab is effective in eliminating infectious virus</li> </ul>	<ul style="list-style-type: none"> <li>- RSV is able to survive 6 hours in dried secretions on the diaphragms of stethoscopes</li> <li>- Wiping the diaphragm with alcohol was an effective way of disinfecting the contaminated surface</li> </ul>	<ul style="list-style-type: none"> <li>- RSV can survive as long as 6h in dried secretions on the diaphragms. Detection by PCR was more sensitive, but whether this represents viable infectious virus at 8h is unknown.</li> <li>- After alcohol swiping, viral DNA was detected by PCR in 1 of the 3</li> </ul>

			<p>times a week for 16 days. RSV was confirmed by immunofluorescent staining and PCR.</p> <ul style="list-style-type: none"> <li>- Three stethoscopes were wiped with a single prepackaged alcohol swab. After drying, the diaphragms were again sampled for viral culture and PCR.</li> </ul>				<p>stethoscopes. But negative tissue culture tests suggest it was not a large amount of infectious virus.</p>
<p>L Fullerton, 2015, UK</p>	<p>Case Report</p>	<p>2 newborns</p>	<p>Birth of a term baby followed by the birth of a premature baby nine hours later. The premature baby had early-onset sepsis with Listeria Monocytogenes. The term baby was readmitted to hospital 10 days later with a Listeria Monocytogenes meningitis.</p>	<p>/</p>	<ul style="list-style-type: none"> <li>- Report of nosocomial transmission of Listeria monocytogenes, from a premature baby with early onset sepsis to a term baby with late onset meningitis</li> </ul>	<ul style="list-style-type: none"> <li>- Root cause analysis revealed the only common factor between the 2 babies was SHO1 (Senior House Officer)</li> <li>- The most likely mode of transmission was SHO1's stethoscope</li> </ul>	<ul style="list-style-type: none"> <li>- Very small study population and just one doctor as observer, what makes it difficult to generalize the results.</li> </ul>

## Conclusions:

### Outcomes:

- SARS-CoV kan overleven op oppervlakten en kan zo theoretisch indirect overgedragen worden tussen mensen. In experimentele omstandigheden was de stabiliteit van SARS-CoV-2 op oppervlakten vergelijkbaar met die van SARS-CoV.
- Overleving van bacteriën en virussen op stethoscopen is aangetoond.
- Alcoholische oplossingen zijn geschikt om de contaminatie te verminderen, maar ze kunnen deze niet volledig verwijderen. Weinig zorgverleners ontsmetten hun stethoscoop na patiëntencontact.
- Voorlopig kan slechts één case report weerhouden worden waarbij de stethoscoop de meest waarschijnlijke oorzaak was van transmissie van een infectieziekte. Het betrof hier overdracht van *Listeria* in een neonatale setting.

### Risks of bias:

- Het belangrijkste probleem wat betreft de systematic reviews is dat de geïncludeerde studies verschillende onderzoeksmethoden gebruiken, dat ze een beperkte steekproefgrootte hebben en niet gerandomiseerd zijn.
- In de narratieve reviews wordt de zoekstrategie, de inclusie- en exclusiecriteria van artikels en de kwaliteit van de geïncludeerde studies niet besproken.
- Case reports en case series hebben een beperkte bewijskracht, dus de resultaten van deze artikels kunnen mogelijk niet gegeneraliseerd worden.

## Clinical bottom line:

De contaminatie van stethoscopen door micro-organismen werd aangetoond in observationeel onderzoek alsook in systematic reviews. Slechts in één case report werd mogelijke transmissie van een infectieziekte via de stethoscoop beschreven. We kunnen dus concluderen dat stethoscopen virussen en bacteriën kunnen bevatten, doch overdracht van virale infecties via deze vector is tot op heden niet aangetoond.

## References:

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8. Blydt-Hansen T, Subbarao K, Quennec P. **Recovery of respiratory syncytial virus from stethoscopes by conventional viral culture and polymerase chain reaction.** *Pediatric Infectious Disease Journal.* 1999; 18(2): 164-165.
9. Fullerton L, Norrish G, Wedderburn CJ. **Nosocomial Neonatal *Listeria monocytogenes* Transmission by Stethoscope.** *Pediatric Infectious Disease Journal.* 2015; 34(9): 1042-1043.