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Major Article

Current practice of infection control in Dutch primary care: Results of an online survey

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Background: Good infection prevention is an important aspect of quality of medical care. The aim was to evaluate infection prevention and control (IPC) performance among Dutch general practitioners (GPs).
Methods: Based on the current national IPC guidelines for GPs, a self-administered anonymous online questionnaire was developed and sent to GPs in the Nijmegen region of the Netherlands. Thirty-two questions were constructed to survey characteristics of GPs' offices and assess current performance of IPC measures.
Results: One hundred questionnaires were included in our analysis. The preferred method of hand hygiene was soap and water (56%) versus alcohol-based handrub (44%). The cleaning of nondisposable, noncritical, semicritical, and critical instruments was consistent with national guideline recommendations or superior to them in 100%, 49%, and 97% of cases, respectively. An average of 57% of GPs reported environmental cleaning frequencies that were compliant with the national guidelines or superior to them. Personal protective equipment was available in 62% of GPs' practices but used in only 25% of home visits to patients.
Conclusions: Not all national IPC guidelines seem to be followed to the fullest extent. The current situation indicates there is room for potential improvement regarding implementation of IPC measures in GPs' offices. Area-specific guidelines and continuous medical education regarding IPC may help improve the situation.

Infection prevention and control (IPC) is an important aspect of quality care and is the basic requirement for counteracting the transmission of health care–associated infections (HAIs) in all settings. HAIs are a well-recognized complication of many medical procedures. Globally, HAIs (also known as nosocomial infections) are 1 of the most frequent adverse events in health care delivery. Each year, hundreds of millions of patients are affected by HAIs worldwide, leading to significant mortality and financial losses for health systems.[1] The fight against HAIs is a public health priority that has been promoted through the World Health Organization's Clean Care is Safer Care campaign.[2] The prevalence of HAIs in Europe is between 4.4% and 14.8%.[3] In the United States, the incidence of HAIs is estimated at around 5%-6%, with an attributable mortality of 3.6%.[3] The prevalence of HAIs in Dutch hospitals—as measured in PREZIES (national surveillance network)—has decreased significantly from 7.8% in 2007 to 3.2% in 2013.[4] In the long-term care setting, Eikelenboom-Boskamp et al[5,6] found a mean HAI prevalence of 6.7% between 2007 and 2011 versus 2.2% between 2012 and 2017.

A large percentage of HAIs are diagnosed only after discharge from the health care setting, yet the number of HAIs treated by general practitioners (GPs) is unknown. In Dutch national GP registers, such as the National Information Network of General Practice and the Integrated Primary Care Information database, no specific codes are available for registration of HAIs after discharge from the health care setting.[7] Further studies are needed to assess this question. At present, the increasingly rapid transfer of patients from health care settings to the community, and the rising number of procedures performed in primary and

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community care, result in an increasingly vulnerable patient population at the GP level. Owing to the fact that health care is becoming less compartmentalized, hospitals, long-term care facilities, and GPs are increasingly sharing their patients and their problems, including multidrug-resistant organisms (MDROs).[8,9] Although several studies have evaluated IPC practices and structures in hospitals and long-term care facilities, studies focusing on outpatient care are less common.[10-12] Good IPC practices are effective at reducing rates of infection in all health care settings, including primary care.[13] The medical implications of a failure to implement IPC procedures have been shown to be serious in, for example, hospitals, whereas they seem nonexistent in primary care settings.[14] Although reports on the structure and procedures of IPC in hospitals seem common practice,[15] the first—and to our knowledge last—Dutch survey to investigate compliance with the recommendations on infection prevention in general practice was carried out in 2004-2005.[16]

The primary aim of this study was to evaluate IPC structure and procedures at the GP level. The secondary aim was to identify potential motivating factors that may stimulate GPs to improve their IPC policies during health care delivery and to identify potential barriers to adequate IPC practices.

METHODS

Based on the (at the time of the survey) current national IPC guidelines for GPs, which were issued by the Dutch Working Party on Infection Control and the Dutch GP Society in 2009 (recently updated),[17] we developed a self-administered anonymous online questionnaire. The link to the online questionnaire was sent to 196 GPs in the Nijmegen region of the Netherlands. The study was carried out over a 6-month period (June 2015 to November 2015). Two reminders were sent at 2 and 4 months after the initial invitation.

A questionnaire was included in the analysis when ≥25% of questions were answered. The questionnaire consisted of 32 questions grouped by topic. The first part asked about demographic data and basic characteristics of GPs and their offices—for example, GP office forms (7 items). The second part consisted of questions about frequency of environmental cleaning; applied methods of cleaning, disinfection, and sterilization of medical instruments in the GP's office; availability (yes or no) of personal protective equipment (PPE), both in the GP's office and during home visits to patients; the preferred method of hand hygiene (soap and water or alcohol-based handrub [ABHR]) and its availability (yes or no) in different working areas; and, for example, availability of sterile gloves (7 items). In the third part of our questionnaire, we assessed whether GPs and others (eg, cleaning staff) were trained with regard to IPC procedures and whether IPC guidelines were available in the office (yes or no, 4 items). The fourth part assessed GPs' self-reported compliance with IPC measures (always, often, sometimes, rarely, never, 6 items)—for example, cleaning of stethoscopes in between patients. In the fifth part, we included 8 statements on potential interventions in which we asked GPs whether they agreed these—for example, receiving education materials about IPC—would help them improve their IPC practices (8 items). This portion was composed of closed questions and disagreement versus agreement questions using a 6-point Likert scale. The sixth part asked GPs about factors hindering their IPC practices (open questions). Collected data were entered and analyzed using SPSS Statistics 22.0 (IBM, Armonk, NY). Descriptive statistics (frequencies) were applied.

RESULTS

Study population

A total of 118 questionnaires were answered, resulting in a response rate of 61%. Of the 118 returned questionnaires, 18 (15%) were excluded from analysis, as <25% of questions were answered. The age of the GPs ranged from 30-65 years (mean, 51.2 years). Fifty-four percent of responders were men (Table 1). The mean working duration of GPs was 19.4 years (range, 2–36 years).

Table 1
Demographic and basic characteristics of GPs

Characteristics, total GPs surveyed (n)		Total, n (%)
Mean age, years (±SD), n = 100		51.15 (±8.83)
Mean working duration (±SD), n = 100		19.39 (8.93)
Sex, n = 100	Male	54 (54.0)
	Female	46 (46.0)
Working duration, y, n = 100	<11	19 (19.0)
	11-20	37 (37.0)
	≥21	44 (44.0)
GPs' office forms, n = 99	Solo	8 (8.1)
	Duo	31 (31.3)
	Group	34 (34.3)
	Primary health center	26 (26.3)
Location of GPs' offices, n = 100	Urban	49 (49.0)
	Rural	51 (51.0)
GPs trained in IPC, n = 89	Yes	51 (57.3)
	No	38 (42.7)

GPs, general practitioners; *IPC*, infection prevention and control.

Assessment of practice

The frequency of environmental cleaning within GPs' offices varied based on work area (Table 2). According to 42.4% of participating GPs, the frequency of environmental cleaning within their offices was in accordance with the national guidelines (range for various work areas, 32.3%-53.5%). According to 56.8% of GPs, the frequency of environmental cleaning within their offices was in accordance with the national guidelines or greater than recommended (range for various work areas, 32.3%-100% [for all public areas]). This was especially true for the cleaning of public areas: according to 35.2% of GPs in our sample, cleaning frequency was in accordance with the national guidelines, and according to 64.8%, it was performed more thoroughly than recommended (Table 2). According to 93.1% of participating GPs (range, 85.6%-99%), nondisposable, noncritical instruments within their offices were cleaned in accordance with the national guidelines. According to 6.9% of GPs, nondisposable, noncritical instruments within their offices were decontaminated more thoroughly than recommended. According to an average of 97% of participating GPs (range, 96%-98%), nondisposable, critical instruments within their offices were sterilized in accordance with the national guidelines. In our sample, 49.4% of GPs cleaned and disinfected semicritical instruments either in line with the national guidelines or more thoroughly than recommended (Table 3).

The availability of PPE, ABHR, and skin disinfectant is shown in Figure 1. The availability of PPE, ABHR, and skin disinfectant was consistently higher in the offices than during home patient visits. Gowns and caps were the PPEs reported to be least present in Dutch GP offices.

The preferred method of hand hygiene was soap and water (56%) versus ABHR (44%) (N = 100). Ninety-one percent of GPs reported that ABHR was present in each room intended for patient care, although 5% of responders had ABHR in only 1 room of their office and 2% had no ABHR at all. An additional 2% of GPs had pocket bottles of ABHR to be used during patient visits. As part of the guidelines, disposable towels should be used for hand drying. Ninety-two percent of GPs reported having disposable paper towels available, whereas 8% still used cotton towels.

Table 2
GPs' reported cleaning frequency (%) of working areas in relation to national guideline recommendations*

Classification of working areas according to WIP	Working areas	Frequency of cleaning according to WIP	GPs' office cleaning frequencies in relation to WIP, N (%)		
			As recommended	More frequent	Less frequent
Noncritical areas (public)	Entrance (hall)	Weekly	33 (33.3)†	66 (66.7)	0
	Waiting room		37 (37.0)†	63 (63.0)	0
Semicritical areas	Consulting room	Daily	32 (32.3)†	0	67 (67.7)
	Examination room		39 (40.2)†	0	58 (59.8)
	Toilets		47 (47.0)†	0	53 (53.0)
Critical areas	Treatment room	Daily	44 (44.4)†	0	55 (55.6)
	Kitchen		40 (40.4)†	0	59 (59.6)
	Laboratory		52 (53.1)†	0	46 (46.9)
	Areas for cleaning and disinfection of nondisposable instruments		53 (53.5)†	0	46 (46.5)

GPs, general practitioners; *WIP*, Dutch Working Party on Infection Control.
*Number of completed questionnaires varies from 97-100.
†Recommended cleaning frequency according to WIP.

Table 3
GPs' reported distribution of cleaning and disinfection or sterilization of nondisposable medical instruments in relation to national guideline recommendations*

Classification of medical instruments according to WIP	Medical instruments	GPs with cleaning form of their medical instruments in relation to WIP, N (%)		
		Cleaning	Cleaning and disinfection	Sterilization
Noncritical instruments	Ear syringe	83 (85.6)†	10 (10.3)	4 (4.1)
	Reflex hammer	89 (94.7)†	2 (2.1)	3 (3.2)
	Stethoscope	95 (99.0)†	0	1 (1.0)
Semicritical instruments	Laryngeal mirror	39 (50.6)	7 (9.1)†	31 (40.3)
Critical instruments	Instruments for minor surgery	2 (2.0)	0	96 (98.0)†
	Needle holder	1 (1.0)	2 (2.1)	94 (96.9)†
	Eye drill	2 (2.0)	2 (2.0)	95 (96.0)†
	Vaginal speculum	1 (1.0)	2 (2.0)	95 (97.0)†

GPs, general practitioners; *WIP*, Dutch Working Party on Infection Control.
*Number of completed questionnaires varies from 77-99.
†Recommended cleaning frequency according to WIP.

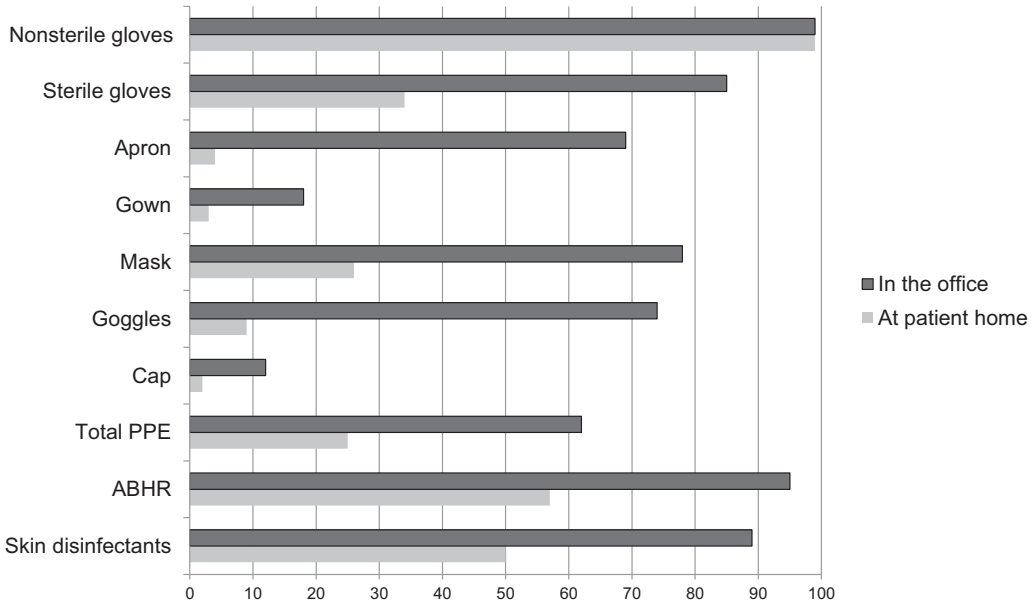

Fig 1. General practitioners' reported availability (%) of personal protective equipment, alcohol-based handrub, and skin disinfectant in offices and during patient contact. Number of completed questionnaires varies from 95-100. *ABHR*, alcohol-based handrub; *PPE*, personal protective equipment.

IPC training

Regarding IPC training, about 57% of participating GPs indicated their general practice nurses had such training, and 71% and 51%, respectively, indicated that practice assistants and cleaning staff were trained in IPC. More than 80% of GPs reported that IPC practice protocols were present in their office.

Compliance with IPC measures

The responses to questions regarding self-estimated compliance of GPs with hand hygiene showed that 38% and 95%, respectively, cleaned their hands before and after touching a patient. We saw that 8% of GPs cleaned their stethoscope in between patients. When the patient was known to carry MDROs, 69% cleaned their stethoscope after use. Regarding use of PPE, 2% of GPs still wore a white coat during patient contact and 24% wore sterile gloves during a minor surgical procedure.

Intervention to improve IPC practices

The percentage of GPs agreeing a suggested intervention would improve IPC practices varied per statement, with 89% indicating the availability of better GP population–based guidelines would improve their performance, followed in decreasing order by reduction in risk of infection for GPs and staff (88%), reduction in risk of infection for patients (87%), receipt of educational materials about IPC (71%), feedback and patient request (70%), inspection by health authorities (municipal health services) (62%), financial penalty (43%), and financial assistance (34%).

Factors hindering IPC practices

Nearly one-third of GPs made comments about barriers to applying adequate IPC practices. Of these 31 GPs, 16 had doubts about the HAI risk of their patients and 7 had doubts about the efficacy of the IPC measures stated in the guidelines. The fear of side effects, such as hand eczema after ABHR use, was a barrier for 5 GPs. Finally, 3 GPs believed that IPC measures are not applicable or of any value to nonhospitalized patients.

DISCUSSION

Over the last 30 years, a lot of effort, time, and money have been directed toward establishing adequate IPC guidelines for various settings and implementing needed IPC measures in the Dutch health care system. The focus of the implementation was initially directed at hospitals and only directed at long-term care facilities in the past few years. The aim of our online questionnaire was to establish the status quo of IPC in GPs' offices in our region to prioritize future efforts to advance IPC in that area.

The important discovery we made during this study was the identification of some shortcomings of IPC in GPs' offices. The most prominent shortcomings observed were ineffective decontamination of semicritical instruments, inefficient environmental cleaning within offices (particularly semicritical and critical areas), low availability and use of PPE during home patient visits, and the use of water and soap as the preferred method for hand hygiene.

Although ABHR is long established as the preferred method of hand hygiene in our hospitals, the so-called system switch seems to have not found its way into GPs' offices, with more than half (56%) still using water and soap as the preferred method of hand hygiene. Although hands certainly are an important route of infection transmission (including in GP offices), the effectiveness of good hand hygiene has mainly been demonstrated in institutionalized health care.[18,19] Gunnewiek[16] reports that 67% of 15 GPs performed hand hygiene after physical examination of a patient and after contact with body fluids, but the preliminary results of our own observational study in multiple GP offices show significantly lower compliance (data unpublished). In our present study, self-estimated compliance of GPs with hand hygiene before and after patient contact was 38% and 95%, respectively. Both—and most certainly the latter—are probably overestimations, and further research is needed to gather reliable compliance data.

Contaminated surfaces may contribute to the transmission of nosocomial pathogens when health care workers contaminate their hands or gloves by touching them or when patients come into direct contact with them.[20,21] According to 43% of the GPs in our sample, the frequency of work area cleaning and disinfection was not in accordance with the national guidelines. If we zoom out on the frequency of critical area cleaning, according to about 52% of GPs, it was not performed in conformity with the national guidelines. However, according to 100% of GPs, cleaning of noncritical (public) areas was done either in line with national guideline recommendations or more thoroughly than recommended (Table 3).

Although scientific standards to measure the effect of environmental cleaning may be missing or biased,[22,23] and many studies are directed at multidrug-resistant nosocomial pathogens (eg, methicillin-resistant *Staphylococcus aureus*) in the hospital setting,[24] the measured frequency of environmental cleaning seems to be too low to ensure a safe environment, as the transmission paths in primary care settings are similar to those in other care institutions. Although setting-specific research is missing, we believe that environmental cleaning should be an important component of a multifaceted IPC strategy in primary health care settings.

Decontamination methods for instruments are dictated by the degree of risk to the patient. For nondisposable instruments, a distinction is made between noncritical, semicritical, and critical instruments.[17] According to about 95% of GPs, decontamination of the noncritical and critical instruments in their offices was done in accordance with the national guidelines. In contrast, according to 50.6% of GPs, the laryngeal mirror in their offices was simply cleaned and dried, without any disinfection or sterilization. Only 9.1% of GPs followed the national guidelines for the cleaning and disinfection of semicritical instruments; however, 40.3% of GPs sterilized them more thoroughly than recommended. Guidelines indicate a minimum, and institutions may always go further. Nevertheless, half of the GPs in our sample have performed decontamination of semicritical instruments that is not in accordance with national guideline recommendations. The method of cleaning these instruments leaves room for improvement and is an area needing further attention by the GPs in our sample.

Another similar area seems to be the handling of stethoscopes. In general, only 8% of GPs cleaned their stethoscope in between patients. When the patient was known to carry MDROs, 69% of GPs disinfected their stethoscope after use. The fact that GPs change their behavior for known MDRO patients (8-fold increase in disinfection) seems to indicate that they assign some value to the role stethoscopes play in the transmission of MDROs and seek to apply their own protection. Still, there are many doubts about the role of stethoscopes in the development of HAIs. In a review,[25] the mean rate of stethoscope contamination across 28 studies was 85%. Potentially pathogenic organisms cultured from stethoscopes included *Staphylococcus aureus*, *Pseudomonas aeruginosa*, vancomycin-resistant enterococci, and *Clostridium difficile*. There was evidence that bacteria can transfer from the skin of the patient to the stethoscope and from the stethoscope to the skin of another patient. However, studies were not

designed to detect a correlation between stethoscope contamination and subsequent HAIs.[25]

A health care provider may use PPE to avoid the transmission of microorganisms from patient to care provider and vice versa. In our sample, 62% of GPs reported having PPE available in their offices; only 25% of them reported having equipment available during home patient visits. In almost all practices, disposable nonsterile gloves were available, but the availability of other PPEs varied. For example, 85% of GPs reported having sterile gloves available in their offices, but only 24% wore sterile gloves during minor surgical procedures. In an investigation regarding IPC measures in 16 Dutch GP offices in 2004, sterile gloves were worn in 81% of offices when the hands of GPs might come in contact with nonintact skin.[16] However, the national guidelines state that sterile gloves should be worn both when hands might come in contact with perforated skin and during suturing.[17] Despite these data about the presence and use of PPE, 83% of GPs (76 of 92) were content with their PPE availability and use. Clearly, PPE availability and use should be better integrated into daily practice in GPs' offices and during home visits. Improved guidelines and education would be helpful in improving PPE use in general practice.

The following were the barriers to adequate IPC listed by the GPs: lack of evidence and doubts regarding the efficacy of IPC measures as stated in the guidelines, and fear of side effects such as hand eczema when using ABHR. Some GPs suggested that IPC measures are not needed for nonhospitalized patients. Still, 89% of GPs believed that clear and GP-specific guidelines would be helpful in improving their IPC performance.

Limitations of the study include the small sample size (N = 100), which precluded the statistical analysis of subgroups. Moreover, all answers were self-reported, so it was not possible to verify them objectively, and some overestimation can be assumed.[26]

As far as we know, ours is the first study in our region that evaluates IPC structure and procedures at the GP level. The questionnaire was confined to the Nijmegen region, and the results are not necessarily generalizable to the rest of the Netherlands. However, in view of the fact that the national IPC guidelines apply to all Dutch GPs and the infrastructure and organization of GP offices are reasonably similar, we can assume that the results of this assay can be extrapolated to GP offices in other parts of the Netherlands. As the questionnaire was essentially a self-audit, it is likely that answers reflect at least the expected minimum shortcomings seen in actual practice. However, we believe future studies are needed not only in the Netherlands but also in Europe and the United States. It is also difficult to extrapolate our findings to IPC outcomes in GPs in other countries in Europe and the United States because of differences in IPC guideline content, financing, and GP office infrastructure and organization.

CONCLUSIONS

Many of the national IPC guidelines are not followed—or at least not to the intended extent. The current situation leaves room for improvement regarding the implementation of IPC measures in GP offices and shows the importance of area-specific guidelines and continuous IPC education. Future interventions to improve uptake of national IPC guidelines should consider the barriers and motivating factors found in this study.

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References

1. World Health Organization. The burden of health care–associated infection worldwide. Available from: http://www.who.int/gpsc/country_work/burden_hcai/en/. Accessed May 24, 2016.
2. Pittet D, Donaldson L. Clean care is safer care: a worldwide priority. Lancet 2005;366:1246-7.
3. Pittet D, Allegranzi B, Storr J, Donaldson L. 'Clean care is safer care': the global patient safety challenge 2005-2006. Int J Infect Dis 2006;10:419-24.
4. Rijksinstituut voor Volksgezondheid en Milieu. Referentiecijfers Prevalentieonderzoek ziekenhuizen. Available from: www.rivm.nl/Onderwerpen/P/PREZIES/Prevalentieonderzoek_Ziekenhuizen/Referentiecijfers_Prevalentieonderzoek_ziekenhuizen. Accessed December 5, 2014.
5. Eikelenboom-Boskamp A, Cox-Claessens JH, Boom-Poels PG, Drabbe MI, Koopmans RT, Voss A. Three-year prevalence of healthcare-associated infections in Dutch nursing homes. J Hosp Infect 2011;78:59-62.
6. Eikelenboom-Boskamp-A, Saris A, van Loosbroek M, Drabbe M, de Jongh F, de Jong JW, et al. Prevalence of healthcare-associated infections in Dutch nursing homes: follow-up 2010-2017. J Hosp Infect 2018;18:30443-52.
7. Hopmans TE, Smid EA, Wille JC, de Greeff SC. Zorggerelateerde infecties bij heropname. Ned Tijdschr Geneeskd 2015;159:A8404.
8. Centraal Bureau voor de Statistiek (NL). Gezondheid en zorg in cijfers 2008. Available from: https://www.cbs.nl/nl-nl/publicatie/2008/47/gezondheid-en-zorg-in-cijfers-2008. Accessed May 5, 2016.
9. Ciccolini M, Donker T, Köck R, Mielke M, Hendrix R, Jurke A, et al. Infection prevention in a connected world: the case for a regional approach. Int J Med Microbiol 2013;303:380-7.
10. Gignon M, Farcy S, Schmit JL, Ganry O. Prevention of healthcare-associated infections in general practice: current practice and drivers for change in a French study. Indian J Med Microbiol 2012;30:69-75.
11. White RR, Smith JM. Infection control in general practice: results of a questionnaire survey. J Public Health Med 1995;17:146-9.
12. Smith PW, Rusnak PG. Infection prevention and control in the long-term-care facility: SHEA Long-Term-Care Committee and APIC Guidelines Committee. Am J Infect Control 1997;25:488-512.
13. Ducel G, Fabry J, Nicolle L. Prevention of hospital-acquired infections—a practical guide. 2nd ed GenevaSwitzerland: WHO Press; 2002.
14. Kovaleva J, Peters FT, van der Mei HC, Degener JE. Transmission of infection by flexible gastrointestinal endoscopy and bronchoscopy. Clin Microbiol Rev 2013;26:231-54.
15. Troelstra A. Hospital infection control in the Netherlands. J Hosp Infect 2007;65:139-41.
16. Gunnewiek MK. Infectiepreventie binnen de huisartsenpraktijk, deel 1. Tijdschrift voor hygiene en infectiepreventie (THIP) 2005;6:141-5.
17. Rijksinstituut voor Volksgezondheid en Milieu. WIP-richtlijn Infectiepreventie in de huisartsenpraktijk. Available from: http://www.rivm.nl/Documenten_en_publicaties/Professioneel_Praktisch/Richtlijnen/Infectieziekten/WIP_Richtlijnen/WIP_Richtlijnen/Overige_settings/WIP_richtlijn_Infectiepreventie_in_de_huisartsenpraktijk. Accessed May 5, 2016.
18. Pittet D, Allegranzi B, Sax H, Dharan S, Pessoa-Silva CL, Donaldson L, et al. Evidence-based model for hand transmission during patient care and the role of improved practices. Lancet Infect Dis 2006;6:641-52.
19. Teare L, Cookson B, Stone S. Hand hygiene. BMJ 2001;323:411-2.
20. Boyce JM, Potter-Bynoe G, Chenevert C, King T. Environmental contamination due to methicillin-resistant *Staphylococcus aureus*: possible infection control implications. Infect Control Hosp Epidemiol 1997;18:622-7.
21. Bhalla A, Pultz NJ, Gries DM, Ray AJ, Eckstein EC, Aron DC, et al. Acquisition of nosocomial pathogens on hands after contact with environmental surfaces near hospitalized patients. Infect Control Hosp Epidemiol 2004;25:164-7.
22. Dancer SJ. How do we assess hospital cleaning? A proposal for microbiological standards for surface hygiene in hospitals. J Hosp Infect 2004;56:10-5.
23. Hachem R, Graviss L, Hanna H, Arbuckle R, Dvorak T, Hackett B, et al. Impact of surveillance for vancomycin-resistant enterococci on controlling a bloodstream outbreak among patients with hematologic malignancy. Infect Control Hosp Epidemiol 2004;25:391-4.
24. Dancer SJ. The role of environmental cleaning in the control of hospital-acquired infection. J Hosp Infect 2009;73:378-85.
25. O'Flaherty N, Fenelon L. The stethoscope and healthcare-associated infection: a snake in the grass or innocent bystander? J Hosp Infect 2015;9:1-7.
26. Adams AS, Soumerai SB, Lomas J, Ross-Degnan D. Evidence of self-report bias in assessing adherence to guidelines. Int J Qual Health Care 1999;11:187-92.