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Infection prevention and control measures in practices of the Swiss sentinel network during seasonal influenza epidemics

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SUMMARY

Background: There are limited data on the transmission of influenza in the context of primary care practices, despite the fact that a significant proportion of the population consult their primary care physician for an influenza-like illness every year.

Aim: To describe the use of influenza prevention and control methods in private practices of the Swiss sentinel network.

Methods: This online cross-sectional survey collected data about infection prevention and control measures in the 166 private practices of the Swiss sentinel surveillance network during the 2018–2019 influenza season. Questions pertained to the practice setting, infection prevention and control recommendations, influenza vaccination status of the physicians and their staff, adherence to hand hygiene, and mask wearing.

Findings: Among the 122 practices that answered (response rate 73.5%), 90.2% of the responding physicians had been vaccinated themselves, and 46.7% (56/120) estimated that their staff vaccination coverage was >60%, although it was offered to employees in all practices. Most practices ($N=68$, 55.7%) had no specific recommendations for their staff concerning mask wearing. Most physicians reported washing or disinfecting their hands before examining a patient ($N=91$, 74.6%), after examination ($N=110$, 90.2%) and before a medical procedure ($N=112$, 91.8%). However, this rate was lower for arrival at the practice ($N=78$, 63.9%) and leaving the practice ($N=83$, 68.0%).

Conclusion: Most physicians in the Swiss sentinel surveillance network have been vaccinated themselves. However, the vaccination rates among their staff are low, despite vaccine availability. Hand hygiene measures were also suboptimal. These results warrant further efforts to implement infection prevention and control measures in the ambulatory setting.

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Introduction

Influenza is a very common disease affecting a significant proportion of the population every year. While mild in most

cases, it can be fatal for vulnerable groups. The roles of different transmission settings are largely unknown [1]. Schools and day care centres likely play an important role, as do hospitals for vulnerable groups [2]. However, the role of the primary care sector in the transmission chain is unclear, as most data on healthcare-associated infections are based on inpatient studies rather than the ambulatory sector.

Primary care physicians (PCPs) play key roles during the seasonal influenza epidemics, by vaccinating the population in particular vulnerable groups and managing the vast majority of influenza cases. For example, in Switzerland, it was estimated that during the 2018–2019 season, 2.5% of the Swiss population consulted a PCP for an influenza-like illness (ILI), defined as a history of fever (>38°C) and presence of either sore throat or cough [3]. Some primary care practices participate in the Swiss influenza surveillance system (Sentinella), on which the Federal Office of Public Health (FOPH) relies to officially declare each influenza epidemic season (defined as incidence of influenza above 68/100,000 population for the past season) [3]. This system is composed of primary care practices from all over Switzerland who take part voluntarily in epidemiological disease surveillance by sending ILI case data to FOPH, and collecting swabs and sending them to the National Reference Centre for Influenza for analysis [4]. These practices do not receive any additional training or extra material (apart from swabs) for infection prevention and control, as they are meant to be representative of Swiss primary care practices. Many countries have such a sentinel approach to monitor influenza epidemics, which is complementary to newer approaches based on voluntary self-reporting by the population via connected tools [5].

The main challenge with influenza infectivity is that people begin to be infectious 24 h prior to the appearance of symptoms. Therefore, infection control that solely targets symptomatic individuals (e.g. wearing a mask in the case of symptoms) is unable to prevent the transmission of influenza. In addition, transmission occurs via different routes, mainly by direct contact or droplets, but also via aerosols [6]. Furthermore, the clinical diagnosis of influenza is not reliable [7]. Concerning healthcare-associated infections, a study in Canada showed that 17.3% of patients admitted to hospital with a positive influenza test had acquired their infection in a healthcare facility [8].

Due to their daily interaction with sick people in general, and especially those with influenza, healthcare workers (HCWs) are at higher risk of infection [1], and also are more likely to transmit influenza virus, especially as they can be asymptomatic carriers [9–13]. For example, 23% of HCWs in four Scottish hospitals had likely acquired asymptomatic influenza infection during the season, defined as an increase of at least 50% in antibody titre, during the 1993–1994 epidemic [14]. A systematic review published in 2019 showed that there was very little data about interventions to reduce the transmission of influenza in primary care practices; most recommendations made in primary care are extrapolated from studies undertaken in inpatient settings [15]. A recent survey in The Netherlands showed that there were no proper data for healthcare-acquired infections treated by PCPs, and that some PCPs believed they were mainly related to hospital settings and not outpatient settings [16,17].

Even if the effectiveness of vaccination is difficult to assess, vaccination remains one of the only proven methods for

prevention of influenza [18,19], leading to a lower rate of influenza infection in vaccinated HCWs [9]. A study in 2016 showed that the vaccination rate among HCWs was highly variable, and as low as approximately 40% in Europe compared with 77% in the USA [20]. A recent Italian study found a vaccination rate of 30% among PCPs [21]. In Switzerland, that rate was estimated to be approximately 16% for 2012 and 2017 [22].

General infection control measures, such as basic hand hygiene with soap and water or alcohol-based solution, are other recognized ways to reduce transmission [23,24]. The impact of air humidity is more controversial, as some degree of air humidity has been shown to reduce the infectivity of influenza [25], but in some tropical countries, the opposite seems to be true, with the rainy season increasing the risk [26]. Social distancing has been demonstrated as a safe measure to lower the transmission of influenza [27], as well as encouraging working from home for people symptomatic of ILI [28]. It should be noted that the role of transmission via contaminated surfaces remains controversial, as it is difficult to estimate the recontamination time of surfaces [24]. Despite the scarcity of direct evidence, there are guidelines concerning healthcare-related infection protection measures, such as those from the Centers for Disease Control and Prevention [29,30]. In Switzerland, no guidelines exist for ambulatory settings at national level, although some recommendations have been developed at regional level [31]. A national strategy has been developed specifically for influenza, but is general and is not specifically targeted at private practices, and the emphasis is placed on vaccination rather than other measures [32].

The aim of this survey was to describe the use of influenza prevention and control methods in practices of the Swiss Sentinella network, in order to inform whether further action is needed in terms of prevention of healthcare-associated influenza infection in primary care in Switzerland.

Methods

A cross-sectional survey was conducted among the 166 primary care practices of the Swiss sentinel network (Sentinella) between 12th March and 25th April 2019. The Sentinella network includes general practitioners and paediatricians from all over Switzerland, put in place by FOPH to monitor transmissible diseases in the country, mainly influenza. These private practices take part voluntarily in the collection of data.

In each Sentinella practice, a single physician is identified as the responder for the sentinel network. The number of practices can vary depending on how many practices choose to participate, but at the time of this study, it was 166. In 2019, 37.5% of Sentinella physicians were female, which is comparable to the proportion reported by the Swiss Physicians Federation [33].

The topics addressed by the questionnaire were as follows:

- number of physicians and their specialty; opening date of practice; number of staff per practice and their professions; staff vaccination coverage (previous season and plans for coming season);
- existence of practice recommendations and measures about prevention and protection methods (estimated percentage of staff vaccinated, mask availability and use, hand hygiene timing, type of room ventilation);

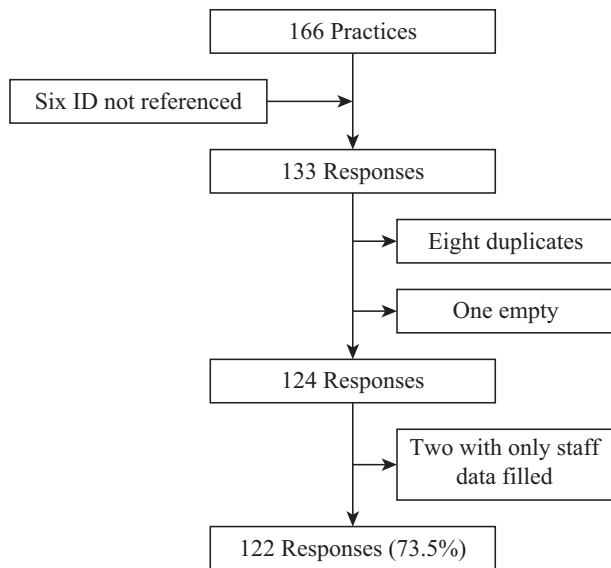


Figure 1. Flowchart showing the response rate of practices invited to participate in the survey on infection prevention and control measures. ID, identification.

- responding physician: self-reported frequency of hand hygiene (handwashing, alcohol-based disinfection);
- physical characteristics of practices: number of rooms, ventilation, availability of handwashing facilities, hydro-alcoholic solutions, frequency of room cleaning and furniture disinfection; and
- possibilities for isolation of patients with respiratory symptoms, and availability of masks and hydro-alcoholic solutions for patients.

The questionnaire, designed using REDCap (Research Electronic Data Capture, Vanderbilt University, Nashville, TN, USA), was piloted in French among three family physicians who were not Sentinella members, and reviewed by members of the Hospital Prevention and Control of Infection Committee of the Vaud district [34]. It was translated into German by a bilingual investigator, and a German-speaking staff member of FOPH reviewed the translation. French and German are the two main languages in Switzerland and the usual working languages in the Sentinella network. Finally, the questionnaire was approved by the Sentinella programme commission, which includes regional representatives of responding physicians, Swiss university institutes of family medicine, and FOPH. FOPH sent the link to the online questionnaire to all Sentinella members during epidemiological week 11 of 2019 (see online supplementary material). The link remained active until week 16, with one e-mail reminder. Participants who preferred paper-based data collection could print out a pdf version of the questionnaire, fill it in, and post it back to FOPH, who forwarded it to the investigators after removing personal information. A data entry clerk entered paper-collected data in the database. A descriptive analysis was conducted using Stata 15 (StataCorp, College Station, TX, USA).

Physician participation in the survey was voluntary and no specific written consent was required. FOPH manages the Sentinella system and guarantees participants' anonymity by using a unique code for each practice. The investigators had no

Table 1

Practice characteristics from the Sentinella network during influenza season 2018–2019

	(N=122)	
Main practice specialty (with at least one specialist) (N, %)	N	%
General practice	108	88.5
Paediatrics	16	13.1
Number of staff (median, IQR)	Median	IQR
Number of physicians	2	1–3
Number of half-days of consultation per week per physician	7.5	5.7–9.0
Number of other staff	4	2–7
Number of full-time equivalent, other staff (30 missing)	2.6	1.6–4.0
Physical characteristics (median, IQR)	Median	IQR
Practice opening year	1999	1990–2011
Total number of rooms	7	6–10
Number of consultation rooms	3	2–4
Number of waiting rooms	1	1–1
Possibility of isolation of patients presenting with respiratory symptoms (N, %)	N	%
Separation within the same waiting area	8	6.6%
Isolation in a separate room	80	65.6%
Neither separation nor isolation	34	27.9%
Continuous ventilation (N, %)	26	21.3%

IQR, interquartile range.

access to identifying data. As the data contained no patient-specific information, it was not under the scope of the Human Health Research Law and did not require ethical review.

Results

One hundred and thirty-three questionnaires were received from the 166 member practices of the Sentinella network (80.12%), of which 15 were paper-based. After removing duplicates and incomplete forms, and including non-referenced identifiers that were considered to be data entry errors and accepted as valid, there were 122 valid responses (73.5%, Figure 1).

Practice characteristics

Most practices included a general physician (88.5%) and/or a paediatrician (13.1%). Only a small number of physicians were from other specialties. The median number of physicians per practice was two, and they were consulting for a median of 7.5 half-days per week. There were four additional staff on average, mainly medical assistants, administrative secretaries or

Table II
Infection prevention and control practices in 122 private practices of the Sentinella network, 2018–2019

	N	% (missing excluded)
Vaccination		
Offered to staff	122	100.0%
Physicians aware of staff vaccination coverage (seven missing)	105	91.3%
Vaccination coverage		
Influenza vaccination of answering physician (one missing)	110	90.9%
Estimated vaccine coverage of staff (two missing)		
0–20%	18	15.0%
21–40%	22	18.3%
41–60%	24	20.0%
61–80%	21	17.5%
81–100%	35	29.2%
Availability of alcohol-based disinfection solution for staff (one missing)		
All year round	121	100.0%
During influenza epidemic season alone	0	0.0%
Not available	0	0.0%
Availability of alcohol-based disinfection solution for patients in the waiting room (one missing)		
All year round	63	52.1%
During influenza epidemic season alone	13	10.7%
Not available	45	37.2%
Availability of protective masks for patients (two missing)		
All year round	23	19.2%
During influenza epidemic season alone	34	28.3%
Not available	63	52.5%
Conditions of access to protective mask for patients		
In case of respiratory symptoms	52	42.6%
Freely accessible	24	19.7%
Other	46	37.7%
Recommendations regarding protective mask wearing for staff (multiple answers possible)		
During care to patients	14	11.5%
In case of respiratory symptoms	50	41.0%
If not vaccinated against influenza	15	12.3%
No specific recommendation	68	55.7%
Use of air humidifier in the consultation room (three missing)		
Yes	9	7.6%
No	110	92.4%

cleaners. The median number of consultation rooms was three, with one waiting room (Table I). In most practices, patients with influenza symptoms were asked to wait in a separate room ($N=80$, 65.6%); in other practices, there was no separation from other patients ($N=8$, 6.6%) or the question was not answered ($N=34$, 27.9%) (Table II).

Vaccination

Regarding vaccination against influenza, out of 122 responses, 110 (90.2%) physicians reported that they had been vaccinated themselves against influenza. Reasons given by those who had not been vaccinated were: having allergic reactions or an immunologic contraindication ($N=2$); having no interest in vaccination ($N=2$); getting influenza every year regardless of vaccination ($N=1$); never getting sick during the past decade ($N=1$); or forgetting ($N=1$). Vaccination was offered free of charge to employees in all practices, and most physicians reported that they knew ($N=105$, 86.1%) which staff members had been vaccinated. Staff vaccination coverage rates were estimated to be >60% and >80% in 46.7% (56/120) and 29.2% (35/120) of practices, respectively (Table II).

Hand hygiene

Most physicians reported that they washed or disinfected their hands before examining a patient ($N=91$, 74.6%), after examination ($N=110$, 90.2%) and before a medical procedure ($N=112$, 91.8%). However, this rate was lower on arrival at the practice ($N=78$, 63.9%) or when leaving the practice ($N=83$, 68.0%) (Figure 2).

Almost all practices provided access to hand sanitizer for their staff ($N=121$, 99.2%). Nevertheless, when it came to providing disinfectant to patients, this rate decreased, with some providing it only during the influenza season ($N=13$, 10.7%) or not at all ($N=45$, 37.2%) (Table II).

Mask wearing

Masks for self-protection were rarely made available to patients ($N=63$, 52.5%), with 28.3% ($N=34$) of practices providing them only during the influenza season and only 19.2% ($N=23$) providing access all year long. These masks were distributed either at the reception ($N=52$, 42.6%) or on free access ($N=24$, 19.7%). Some masks were also distributed by other means (46, 37.7%), but no further details were supplied. Regarding mask wearing by practice workers, the questionnaire asked which recommendations were given by the physicians to their staff; in the majority of cases, no recommendations were made ($N=68$, 55.7%). Some practices recommended that masks should be worn during patient care ($N=14$, 11.5%), or only with respiratory symptoms ($N=50$, 41%), or even if the staff member was not vaccinated ($N=15$, 12.3%).

Ventilation and cleaning

Natural ventilation with fresh air renewal by opening the windows in the waiting rooms was performed once daily in 36 (29.5%) practices, but the majority of practices did so more often ($N=64$, 52.5%). Fresh air renewal in consultation rooms occurred once daily in 30 (24.6%) practices, and multiple times per day in 76 (62.3%) practices. Continuous mechanical

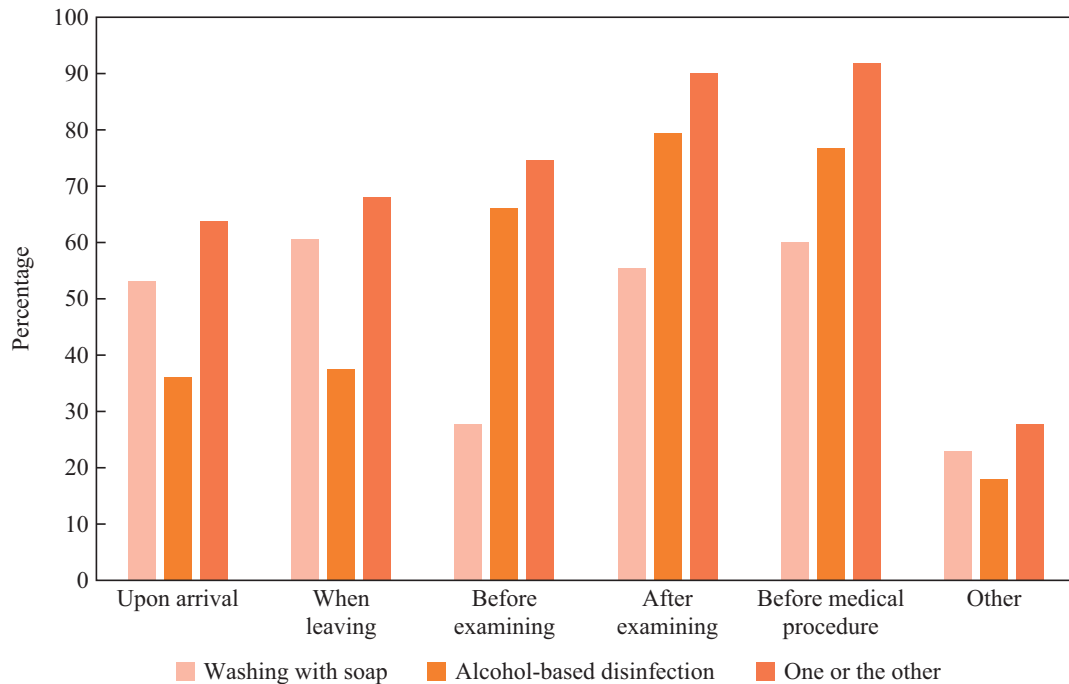


Figure 2. Hand hygiene measures and timing of physicians in the 122 responding practices of the Sentinella network, 2018–2019. Note that ‘other’ refers to an open question, which allowed participants to list additional handwashing moments, such as going to or returning from a break or from the toilet.

ventilation was present in 26 practices (21.3%), and nine (7.4%) practices used air humidifiers (Figure 3).

Discussion

This survey found that some infection prevention and control measures are already implemented in private practices of the Swiss sentinel network, but there is room for improvement. For example, reported vaccination coverage among physicians was excellent, but coverage in other staff was lower. Adherence to hand hygiene rules was good after examining a patient

and before medical procedures, but suboptimal at other time points. Most practices were cleaning and ventilating their consultation and waiting rooms frequently, which may contribute to a reduction in the transmission of influenza. Patient isolation was rarely feasible when there is only one waiting room. There were often no clear recommendations about mask wearing, whether for staff or for patients. In general, Swiss PCPs are aware of the rules for hand hygiene provided by the World Health Organization (Clean your hands campaign), and also the national recommendations about vaccination [32].

This study has some limitations. First, the survey was based on self-declaration, which leads to inevitable desirability bias.

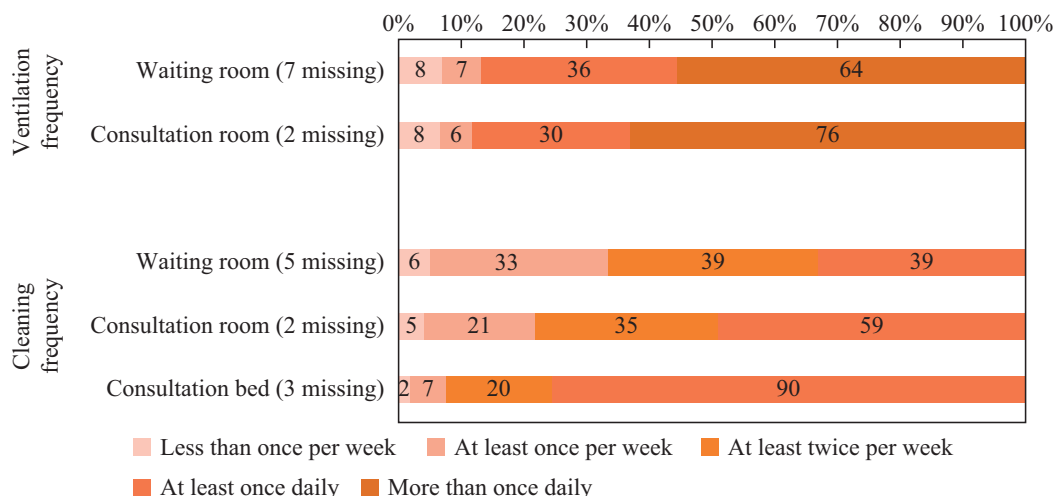


Figure 3. Ventilation and cleaning frequency of different places in the 122 responding practices of the Sentinella network, 2018–2019.

Second, the exact rate of vaccination coverage amongst the staff was not requested, instead asking for the rate estimated by the physician. However, assuming that the reporting physician follows the health of his/her staff, the given approximation is probably close to the reality. Third, regarding hand hygiene, despite good reported availability of hand disinfectants, the authors were not able to observe direct use by the staff or physicians, and data are only available for physicians and not their staff.

The influenza vaccination coverage among primary care staff was lower than the usual 75% coverage recommended by the World Health Organization [20,21]. Nevertheless, it was still higher than most rates found in the health sector around the world [20]. In comparison, an Italian study showed a vaccination rate of 22% among medical residents [11], but a French survey showed a rate of 78% for influenza vaccination among general practitioners [35]. This year in Switzerland, the estimated vaccination rate for HCWs was 23% [3]. A positive point is that the vaccination was offered in every participating practice, and that physicians themselves are vaccinated. They could act as role models to improve vaccination uptake among their staff, as this has been shown to be effective [20]. A systematic review demonstrated that vaccination of HCWs was associated with a lower risk of ILI for themselves [36] and that it drastically reduces the risk of infection for patients [19].

The hand hygiene questions revealed substantial variation; in certain conditions, proper hand hygiene was respected 90% of the time, whereas in the absence of direct contact with patients, this percentage was much lower. This is unsurprising as little attention has been given to hand hygiene in the primary care sector. The 'Five Moments for Hand Hygiene' advocated by the World Health Organization were developed for the hospital setting and may require some adaptation before implementation in the primary care context [23], considering that hand hygiene, if done properly, can reduce the transmission of influenza [24]. Many physicians use soap-based cleaning almost as frequently as alcohol-based hand rub, which was similar to the results of a Dutch study [16]. Hand hygiene could be optimized by a campaign from FOPH or specific training for private practices.

In addition, according to the results of this survey, there were often no clear recommendations given by the physicians in the participating practices about the use of protective masks for patients or staff. Despite the fact that mask wearing is recommended by most health authorities [7], some reviews showed that the protective effect of using masks was not proven against influenza [1,37], and a study in 2019 proved that there was no difference between high-filtration or normal medical masks [38]. The present study did not collect data on the utilization rate of masks by HCWs. Nevertheless, data were obtained on the availability of masks for staff for their personal use. It is hoped that this study will increase physician awareness of their role to implement the wearing of protective masks during seasonal respiratory epidemics.

In terms of generalizability, Sentinella practices may not be fully representative of Swiss family practices as they voluntarily participate in influenza surveillance, and may therefore be more concerned about infection prevention and control. However, the practices in this survey are comparable with Swiss primary care practices in terms of practice size and activity [33,39]. In addition, all Swiss regions are represented in the network. Although adherence to prevention and control

measures is likely to be better in Sentinella practices compared with the average Swiss practice, the weaknesses in prevention and control habits identified in this survey can still be used to develop better targeted recommendations.

The recent outbreak of coronavirus disease 2019 has revealed the general lack of awareness of infection prevention and control measures in primary care practices. Detailed guidelines should be developed for such settings, reinforced by targeted training and an audit system as performed in hospitals. While efforts have been made in the area of vaccination, domains of personal protective equipment and hand hygiene should also be reinforced. More evidence is needed regarding ventilation and room humidification.

More data are definitely needed in the field of infection prevention and control in primary care practices, as well as more evidence regarding the impact of specific measures and interventions to increase their implementation. In particular, hand hygiene and room ventilation should be recommended clearly and promoted intensely at practice level. In addition, specific studies assessing the effectiveness of staff vaccination and mask wearing on influenza transmission in primary care practices are required. As the first study of its kind, the data collected here are very valuable as they will pave the way for future, more comprehensive studies. In particular, it would be very interesting to repeat the survey during the COVID-19 pandemic to capture changes that took place in primary care practices.

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Conflict of interest statement

None declared.

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Appendix A. Supplementary data

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