Self-reported hand hygiene perceptions and barriers among companion animal veterinary clinic personnel in Ontario, Canada

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Abstract — The objective of this study was to describe the perceived importance of and barriers to hand hygiene among companion animal clinic staff. An anonymous, voluntary written questionnaire was completed by 356 of approximately 578 individuals (62%) from 49/51 clinics. On a scale of 1 (not important) to 7 (very important), the percentage of respondents who rated hand hygiene as a 5 or higher was at least 82% in all clinical scenarios queried. The most frequently reported reason for not performing hand hygiene was forgetting to do so (40%, 141/353). Specific discussion of hand hygiene practices at work was recalled by 32% (114/354) of respondents. Although veterinary staff seem to recognize the importance of hand hygiene, it should be emphasized more during staff training. Other barriers including time constraints and skin irritation should also be addressed, possibly through increased access to and use of alcohol-based hand sanitizers.

Résumé — Perceptions et obstacles autodéclarés pour l’hygiène des mains parmi les employés des cliniques vétérinaires pour animaux de compagnie en Ontario, au Canada. L’objectif de cette étude consistait à décrire l’importance perçue des obstacles à l’hygiène des mains, ainsi que les obstacles eux-mêmes, parmi les employés des cliniques pour animaux de compagnie. Un questionnaire écrit volontaire et anonyme a été rempli par 356 personnes parmi un groupe d’environ 578 individus (62 %) provenant de 49/51 cliniques. Sur une échelle de 1 (pas important) à 7 (très important), le pourcentage des répondants qui a évalué l’hygiène des mains avec une cote de 5 ou supérieure était d’au moins 82 % dans tous les scénarios cliniques présentés. La raison la plus fréquente de ne pas effectuer l’hygiène des mains était l’oubli (40 %, 141/353). Signalons que 32 % (114/354) des répondants se sont rappelés d’une discussion spécifique sur les pratiques d’hygiène des mains au travail. Même si le personnel vétérinaire semble reconnaître l’importance de l’hygiène des mains, il faudrait insister plus sur ce sujet lors de la formation des employés. Les autres obstacles, qui incluent les contraintes de temps et l’irritation de la peau, devraient aussi être abordés, potentiellement par l’accès et l’utilisation accrues de désinfectants à base d’alcool.


Introduction

Hand hygiene is considered a critical infection control measure for preventing hospital-associated infections (HAIs) in human medicine (1,2). The hands of healthcare workers are the primary means by which pathogens are transferred between patients and surfaces, and hand hygiene serves to break the contamination/transfer cycle (1,3,4). It is difficult to clearly demonstrate the effect of improved hand hygiene on infection rates, as hand hygiene interventions are often implemented in conjunction with other infection control measures, are often studied during disease outbreaks (versus periods of endemic disease), and ethical concerns typically preclude the use of a negative control group (5–8). Nonetheless, available evidence supports the effectiveness of hand hygiene as a simple, economical, and universally applicable infection control measure in human healthcare (1,4,9,10).

There is a limited number of studies examining the use of hand hygiene for infection control in veterinary medicine (11–15). Despite the paucity of studies, hand hygiene is considered equally important as an infection control measure in veterinary clinics as in human healthcare (16), based on the many comparable procedures performed and infectious disease risks in both settings, as well as basic principles of pathogen transmission.

The primary challenge to the effective use of hand hygiene is achieving adequate compliance. Reported compliance rates in human hospitals have ranged from 5% to 81%, with an average of 40% (4,7). Direct observation of healthcare workers is most
commonly used to collect data on hand hygiene practices; therefore, these rates may be artificially inflated due to Hawthorne effects and observer bias (17,18). In 2 studies of hand hygiene compliance in companion animal veterinary personnel, self-reported compliance (i.e., always perform hand hygiene between patients) was 42% to 48% (14,15), while observed compliance in 1 veterinary teaching hospital was 21% to 42% (13).

In order to design effective interventions to improve hand hygiene in veterinary clinics, it is critical to understand the perceived importance of and barriers to this practice among veterinary staff. Nakamura et al (14) reported the most commonly cited reason for not performing hand hygiene among veterinary support staff was being too busy (72%). Other common barriers identified among human healthcare workers include lack of accessibility to hand hygiene stations, and skin irritation due to frequent use of hand hygiene products (10,19,20).

The objectives of this study were to describe among companion animal veterinary clinic staff: i) the perceived importance of hand hygiene in different scenarios and as an overall infection control measure, and ii) factors (e.g., barriers) that may be associated with hand hygiene compliance.

**Materials and methods**

A convenience sample of primary care companion and mixed animal veterinary clinics from southwestern and eastern Ontario, Canada, was recruited to participate, in conjunction with a video observation study evaluating the effectiveness of a hand hygiene poster campaign to improve hand hygiene compliance (12). Clinics in various regions were identified through known contacts of either of the investigators and using Google Maps (www.google.maps.ca) with the search term “veterinary.” Each clinic was then contacted directly by one of the investigators via e-mail, fax, or telephone, typically obtained from individual clinic websites. The hand hygiene posters used in the clinics included a message regarding the importance of hand hygiene for preventing the spread of infections, and stated that “it only takes 15 seconds to clean your hands” by either washing or using alcohol-based hand sanitizer (AHS). A written survey was provided to up to 20 staff members at each clinic at the end of the video observation period. In each clinic, the posters had been present for approximately 1 wk and the video cameras for approximately 3 wk at the time the survey was distributed. The survey was voluntary and anonymous. Staff were asked to return any completed or uncompleted questionnaires within 2 wk. Distribution and collection of the surveys was ultimately at the discretion of the clinic staff, including at clinics with over 20 staff members. Most of the survey was presented in the form of a Likert-type scale, yes/no or multiple-choice questions, and a small number of fill-in-the-blank questions. The survey also included 5 questions regarding the poster intervention, data from which are reported elsewhere (12). The survey was pilot tested by veterinarians and support staff from non-participant clinics before the study was initiated, to help improve clarity of the questions and ensure that the estimated time needed to complete the survey (approximately 10 min) was accurate. This study was approved by the University of Guelph Research Ethics Board (REB# 10AU002).

**Statistical analysis**

Coded survey data were imported into a statistical software package (STATA Intercooled 11; StataCorp, College Station, Texas, USA) for analysis. Univariable logistic regression was used to examine associations between 3 roles (veterinarian, technician/animal care staff, front office staff/manager) and barriers to hand hygiene that were identified by at least 5% of respondents. A random effect for clinic was included in each model and significance was set at $P \leq 0.05$. Data from Likert-type scale questions were dichotomized into low importance/concern (1–4) and high importance/concern (5–7). If there was a minimum of 5 responses per dichotomous category, univariable logistic regression was used to examine associations between the outcome (perceived importance of hand hygiene) in each of 9 scenarios and the 6 variables age, gender, role (veterinarian, technician/animal care staff, front office staff/manager) and recollection of having discussed hand hygiene practices at work, concern regarding hospital associated infections in general practice, and concern regarding transmission of zoonoses from patients. A random effect for clinic was included in each model and significance was set at $P \leq 0.05$. If more than one significant univariable association was found for a single outcome, then a multivariable logistic regression model was constructed using manual backward selection, and including the random effect for clinic. Variables with a $P > 0.05$ were removed one at a time starting with the largest $P$-value. If removal of a variable changed the coefficient of any remaining variable by more than 25%, the variable was considered a confounder and retained in the model. Descriptive statistics were examined for all other data.

### Table 1. Ranking by staff from 49 companion animal clinics in Ontario of the perceived importance of hand hygiene in various scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Importance of hand hygiene(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (%)</td>
</tr>
<tr>
<td>Before handling any animal</td>
<td>52 (14.6)</td>
</tr>
<tr>
<td>Before handling an animal that had surgery in the last 48 h</td>
<td>31 (8.7)</td>
</tr>
<tr>
<td>After handling a relatively healthy animal</td>
<td>19 (5.3)</td>
</tr>
<tr>
<td>After glove removal</td>
<td>63 (17.7)</td>
</tr>
<tr>
<td>After handling a sick animal(^b)</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>After contact with urine or feces</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Before eating/drinking/smoking at work</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>After using the bathroom</td>
<td>2 (0.6)</td>
</tr>
<tr>
<td>Overall importance for preventing spread of disease in:</td>
<td></td>
</tr>
<tr>
<td>veterinary clinics</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>human hospitals</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>the community</td>
<td>4 (1.1)</td>
</tr>
</tbody>
</table>

\(^a\) Low versus high importance was determined by dichotomizing survey responses (provided on a 7-point Likert-type scale) by 1 to 4 (low) and 5 to 7 (high).

\(^b\) An animal with signs of gastrointestinal, respiratory, or dermatological disease.
A total of 135 clinics were approached to participate in the study, out of approximately 1100 registered companion animal hospitals in Ontario (12%). Fifty-one clinics (38%; 51/135) participated in the video observation portion of the study and were then given the surveys. Surveys were returned from 356 individuals from 49/57 clinics, representing approximately 62% (356/578) of all eligible staff to a maximum of 20 per clinic. The estimated total number of staff per clinic ranged from 4 to 49 (mean: 11, median: 11). Within each clinic, the staff response rate ranged from approximately 25% to 100% (mean: 66%, median: 62%), except for 1 clinic that returned all surveys blank. The surveys from 1 other clinic were mailed but never received. All participating clinics were exclusively companion animal facilities.

Thirty-five percent (123/356) of respondents were technicians (registered and non-registered), 23% (83/356) were veterinarians, 9% (33/356) were animal care staff, 26% were front office staff, 5% (17/356) were practice managers, and 2% (8/356) were not specified. Ten percent of staff were male. The age range of respondents was 17 to 66 y (mean: 35 y; median: 32 y). Seventy-four percent (260/352) of individuals were full-time staff (i.e., working 35 h or more per week at the clinic).

Respondents rated the importance of hand hygiene in various scenarios on a scale of 1 (not important) to 7 (very important), the results of which are shown in Table 1. The proportion of individuals who ranked the importance of hand hygiene as a 7 in veterinary clinics was 87% (308/355), in human hospitals 95% (336/355), and in the community 86% (306/355).

Respondents were asked to select from a checklist all factors that stopped them from performing hand hygiene more frequently at work (including a fill-in-the-blank option for “other”), and to indicate which factor was the most significant with a star. The most frequently reported reason for not performing hand hygiene was forgetting to do so (40%; 141/353), followed by skin damage (22%; 78/353), and being too busy (21%; 78/353). Less than 5% of respondents cited inconvenient hand hygiene stations (17/353), failure of others to perform hand hygiene (6/353), dislike of the available products (6/353), use of gloves as a substitute for hand hygiene (4/353) or “other” (5/353). These represent all the barrier options presented on the survey. One-hundred twenty-one staff provided a response regarding which of these barriers was the most significant, with 44% (53/121) indicating forgetting, 24% (29/121) skin damage, 16% (19/121) being too busy, 5% (6/121) inconvenient stations, 1% (1/121) preferred use of gloves and 2% (2/121) other. Forty-six percent (162/353) of respondents to the barrier question selected only the final option, which indicated that they felt they performed hand hygiene as often as necessary, and that there were no barriers that interfered with their ability to do so.

Availability of plain liquid soap, antimicrobial liquid soap, and AHS in the clinic was indicated by 58% (170/295), 98% (328/333), and 93% (302/323) of respondents, respectively, from 47/49, 49/49, and 49/49 clinics, respectively. Other hand hygiene products available included bar soap (1%; 3/283 from 3 clinics) and non-alcohol-based hand sanitizer (NAHS) (10%; 27/260 from 18 clinics). Seventy-four percent (239/325) of respondents indicated they most commonly used liquid antimicrobial soap for hand hygiene, whereas 18% (53/298) most commonly used AHS. Fifty-three percent of respondents representing 47/49 clinics regularly used skin moisturizer or lotion for their hands while at work.

Respondents were asked to indicate the minimum amount of time they believed it was necessary to wash hands with soap and water (i.e., total contact time with soap) and to rub hands with an AHS in order to effectively disinfect them. They were
given 5 options for soap (5 s, 15 s, 30 s, 60 s, unsure) and 5 options for AHS (5 s, 10 s, 20 s, 30 s, unsure). Forty-six percent (162/353) and 21% (75/351) of respondents believed it was necessary to apply soap or AHS, respectively, for 30 s or more for it to be effective. Two percent (8/353) and 11% (40/351) indicated that 5 s of contact time with soap or AHS, respectively, was adequate.

Specific discussion of hand hygiene practices at work (either formal or informal, individually or in groups) was recalled by at least 1 respondent from 82% (40/49) of clinics and by 32% (114/354) of respondents overall. Forty-nine percent (163/335) of respondents believed it was necessary to apply soap or AHS, respectively, for 30 s or more for it to be effective. Two percent (8/353) and 11% (40/351) indicated that 5 s of contact time with soap or AHS, respectively, was adequate.

Respondents ranked their own clinic on a scale of 0 (worst) to 10 (best) in terms of good hand hygiene practices among veterinary clinics in general. The mean rank for each clinic ranged from 5.1 to 9.3, and the overall mean of these ranks for all 49 clinics was 7.0. Eighty-three percent (285/342) of respondents indicated they felt their clinic’s hand hygiene practices could be improved. Respondents also rated 8 potential interventions on a scale of 1 (not effective) to 7 (very effective) in terms of how effective they felt each would be for permanently improving hand hygiene practices in their clinic, or whether the intervention was already used at their clinic, the results of which are shown in Figures 1 and 2.

On a scale of 1 (not a problem) to 7 (very big problem), 40% (141/352) and 61% (207/342) of respondents felt that the magnitude of the problem posed by HAIs in primary care veterinary clinics and referral veterinary hospitals, respectively, was a 5 or more. Eighteen percent (62/352) and 7% (24/342) ranked the problem of HAIs as a 2 or less in primary care and referral facilities, respectively.

Quantitative analysis of perceived importance of hand hygiene
Logistic regression analysis was not performed for 5 outcomes (importance of hand hygiene after handling an animal with signs of gastrointestinal, respiratory, or dermatological disease, after

Figure 1. Ranking by companion animal veterinary staff of the potential effectiveness (1 = not effective, 7 = very effective) of different hand hygiene interventions for permanently improving hand hygiene practices in their respective clinics. AHS accessibility — Making alcohol-based hand sanitizer always available in each patient contact area (n = 157). Be example — Being a good example to others by always performing hand hygiene as recommended (n = 249). HH promotion — Having hand hygiene openly supported/promoted by owners and senior veterinarians (n = 217). HH education — Providing education on hand hygiene to every clinic staff member (n = 298). Feedback — Providing feedback to staff regarding their hand hygiene performance (n = 338). HH posters — Displaying hand hygiene posters in key areas as reminders (n = 242). HH instructions — Making instructions for hand hygiene visible to every clinic staff member (n = 277). Owner reminders — Inviting patient owners to remind clinic staff to perform hand hygiene (n = 325). Numbers in parentheses (n) represent the number of respondents who ranked the intervention and did not indicate that it was already used in their clinic.
contact with urine or feces, before eating/drinking/smoking at work, after using the bathroom, and overall importance for preventing spread of disease in veterinary clinics) due to lack of variation in the data. Univariable associations with a $P < 0.10$ between each of the remaining outcomes and the preselected variables of interest are shown in Table 2, except for importance of hand hygiene before handling an animal that had had surgery within the last 48 h, for which no such associations were found. Only 1 outcome (importance of hand hygiene after glove removal) had more than one significant ($P \leq 0.05$) univariable association (gender and role), but when both variables were included in a multivariable model, only gender remained significant and the coefficient for gender changed by < 10%, which was not considered significant confounding.

**Discussion**

Overall respondents seemed to be very aware of and willing to acknowledge the importance of hand hygiene as an infection control measure in veterinary clinics. Assuming the survey respondents were representative of other veterinary staff amongst whom hand hygiene compliance has been reported to be low (13–15), these results suggest that barriers (either physical or psychological) to performing hand hygiene may be the more influential factor when it comes to poor compliance, compared to a perceived lack of importance. This is important to consider when designing hand hygiene interventions.

Forgetting to perform hand hygiene was the most frequently reported barrier to hand hygiene compliance in this study. This was even more common among veterinarians than among support staff. Combating this kind of problem likely needs to go beyond reminders, be they written, verbal, or in some other form, to making hand hygiene and infection control a pervasive component of the clinic culture. In this way hand hygiene becomes habitual and does not need to be consciously remembered. It is particularly important for veterinarians to remember this practice, as they are frequently seen as clinic leaders, and therefore their attitudes and behaviors are likely to be more influential than others.

Almost half of respondents indicated that there were no barriers that interfered with their performance of hand hygiene, which would infer that they all have excellent hand hygiene compliance. However, based on compliance rates reported in other studies in veterinary clinics, this is highly unlikely. The video observation study of hand hygiene practices performed immediately prior to the survey in the same clinics found average hand hygiene compliance was only 14% (12). This perceived lack of barriers may be at least in part due to a lack of awareness of when hand hygiene ought to be performed, although this would be inconsistent with the majority of respondents denoting hand hygiene to be of high importance in the clinical situations queried, which included the most common indications for hand hygiene. Further investigation of this potential gap between perception and practice, and how to correct it, is warranted.

The use of gloves as a substitute for hand hygiene was uncommonly reported in this study, but has been reported as a barrier to hand hygiene compliance in human healthcare (10,19,20). Although gloves do provide an additional barrier between the skin of the wearer and the patient and/or objects the wearer may touch, pre-existing defects, damage/punctures that may occur during use and contamination of the hands during glove removal make gloves an imperfect barrier (4,21). Since gloves are most often used in situations where there is a need to take additional precautions to prevent contamination of a site with bacteria from the hands, or when heavy contamination of the hands or contamination with a serious infectious pathogen is expected to occur, hand hygiene before and after glove use remains necessary for infection control.

How well hand hygiene is performed when it is attempted is less commonly addressed in compliance studies, but is equally important to timing and frequency for hand hygiene to be effective. In order to effectively reduce or kill the transient microflora of the hands, it is generally recommended that soap be applied for a minimum of 10 to 20 s before rinsing, or for AHS that enough product be applied to cover all surfaces of the hands and then rubbed until dry (which should take approximately 10 to 20 s as well) (4,16,22,23). A relatively small proportion of respondents indicated that only 5 s of contact time was necessary, which would result in inadequate decontamination of the hands. In contrast, a larger proportion of respondents indicated that 30 s or more of contact time was necessary. Individuals who believe hand hygiene takes longer than is truly required may be less likely to attempt hand hygiene at all when they are very busy. Excessive hand hygiene can also potentially lead to increased skin damage, which could also become a barrier to compliance and increases microbial carriage on the hands (4,24).

At least 1 respondent from 84% of clinics indicated that a written clinic infection control manual or policies were available. This is in contrast to a 2005 study in which 0/101 Ontario veterinary clinics surveyed had a recognized infection control program of any kind (25). However, only 49% of respondents were aware of the existence of such a document in their own clinic, whether one existed or not. This lack of attention to a fundamental component of an organized infection control program may be an indicator of the overall ongoing lack of infection control culture in veterinary medicine, which likely also contributes to lack of compliance with basic infection control measures such as hand hygiene.

Concern regarding spread of zoonotic pathogens was significantly associated with 1 outcome (importance of hand hygiene before contact with any animal) and approached significance for another outcome (importance of hand hygiene after contact with a relatively healthy animal), indicating a tendency for those more concerned about zoonoses to place more importance on hand hygiene. Furthermore, 2/3 of respondents indicated that their concern regarding zoonoses at work was low (4 or less), which could reflect confidence in their clinic’s and their own individual infection control practices, or a lack of awareness of some of the zoonotic disease risks faced by veterinary staff (26,27). Education of all staff regarding such risks and means of mitigating them is important for ensuring staff safety and for protection of the clinic from liability. This could potentially provide motivation to help improve hand hygiene compliance by highlighting the importance of this and other infection control measures to individual staff members. Only 32% of respondents...
recalled discussing hand hygiene practices at work, so there is a clear opportunity to improve staff education.

Although a significant association with role was only seen for 1 outcome (importance of hand hygiene after glove use), the finding is comparable to previous reports that hand hygiene compliance tends to be higher among nurses than physicians (7,28). However, most male respondents were veterinarians and gender was also associated with this outcome, and when both variables were included in the same model, only gender remained significant. Gender also approached significance in the model for importance of hand hygiene after contact with a relatively healthy animal. Male gender has been identified as a factor in poor hand hygiene compliance in other studies (19), and 1 veterinary study found male gender was associated with a lower infection control “precaution awareness” score (15). Further investigation of this trend should be considered in future studies.

The limitations and potential sources of bias in this study must be considered when weighing the results. Study participants at both the clinic and individual level were selected on a voluntary basis. It is possible that clinics and staff members with a greater interest in infection control or who were more comfortable with their current practices would be more willing to participate. The hand hygiene poster campaign that took place in the week prior to survey administration, as well as providing consent for the video observation study regarding “general infection control practices,” may have influenced the responses of participants. The poster campaign was intended to emphasize the general importance of hand hygiene to clinic staff, and to help improve hand hygiene compliance by promoting its use and by providing strategic reminders to perform hand hygiene. There was no educational campaign or discussion with clinic staff regarding the importance of hand hygiene in different scenarios and settings such as those queried in the survey; therefore, the effect of participation in the preceding study on these specific responses would likely be modest at most. The substantial proportion of responses to the question regarding required hand hygiene product contact time that were < 5 s or > 30 s, despite the posters clearly indicating that 15 s was needed, also indicates that the degree of influence of the posters on survey responses was not high. Despite the survey being anonymous and self-administered, the potential for bias due to the desire to give the “expected” response must also be considered. It would have been ideal to compare individual survey responses to actual hand hygiene practices recorded during the video observation study; however, this would have required the survey respondents and the individuals on the video recordings to be identified, and the lack of anonymity would most likely have decreased clinic and staff willingness to participate.

The results of this study suggest that, overall, veterinary staff consider hand hygiene to be of high importance both before and after contact with animals in various situations, although individuals’ responses may have been artificially inflated to some extent by participation in an observational study regarding infection control and hand hygiene practices prior to completing the study questionnaire. Nonetheless, discussion of hand hygiene practices with staff should be done more often, both in formal settings (i.e., clinic meetings or training) and informally in the context of routine activities. This can help to ensure that staff know when and why hand hygiene is necessary, how to perform hand hygiene properly, and helps to incorporate infection control into the clinic culture (29). Staff may have a tendency to forget to perform hand hygiene, and improving the infection control culture could also help to avoid this by making the practice more habitual. Increasing availability and emphasizing use of AHS has the potential to address other barriers to hand hygiene identified by participants in this study, as the majority of staff still primarily use soap and water hand washing and therefore do not take advantage of the various benefits of using AHS. In order to be effective, hand hygiene and infection control require the active participation of every member of the clinic team. Therefore, all staff regardless of age, gender, or role need to be considered with regard to hand hygiene interventions, and to collectively encourage compliance.

Acknowledgments

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