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An assessment of the impact of educational interventions on hand hygiene compliance

A Knowledge Summary by

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KNOWLEDGE SUMMARY

PICO question

In small animal veterinary professions, does implementation of an educational intervention, when compared to no intervention, improve hand hygiene compliance?

Clinical bottom line

Category of research question

Treatment

The number and type of study designs reviewed

Three papers were critically appraised. They were all prospective observational cohort studies

Strength of evidence

Weak

Outcomes reported

Two out of the three papers did not find educational implementation to have a statistically significant positive effect on hand hygiene compliance (HHC) in small animal veterinary professionals

Conclusion

The veterinary evidence reviewed does not provide strong justification for the use of education in the improvement of HHC in small animal practice. This contrasts with extensive human evidence which supports the use of educational interventions (Helder et al., 2010). However, a limited veterinary knowledge base in the field of HH, combined with the flawed methodologies of the appraised literature, suggests that this finding is not representative of the effect education could have on HHC.

The conclusion drawn from the evidence assessed within this Knowledge Summary is that educational interventions are not significantly linked to an improvement in HHC within a small animal veterinary setting. When considering the volume of human evidence which supports education as a tool to improve HHC, the authors suggest this Knowledge Summary should be repeated in the future when additional veterinary evidence is available to reassess the conclusion drawn

How to apply this evidence in practice

The application of evidence into practice should take into account multiple factors, not limited to: individual clinical expertise, patient's circumstances and owners' values, country, location or clinic where you work, the individual case in front of you, the availability of therapies and resources.

Knowledge Summaries are a resource to help reinforce or inform decision-making. They do not override the responsibility or judgement of the practitioner to do what is best for the animal in their care.

Clinical Scenario

The head nurse in a small animal veterinary practice has noticed a decline in hand hygiene compliance (HHC) within the team and wants to implement a strategy to improve this. They are unsure whether further education will influence HHC within the team. They have seen from human medicine studies that education increases compliance significantly and wants to see whether there is appropriate literature in the veterinary field to support the findings.

The aim of this Knowledge Summary is to appraise and consolidate veterinary research, so that veterinary professionals can understand the impact of educational interventions on HHC.

The evidence

All three articles, generated from scientific database searches, were retrieved from peer-reviewed and respectable scientific journals. Two studies, conducted by Smith et al. (2013) and Shea & Shaw (2012), were based in teaching hospitals and focused on multimodal educational approaches. Shea & Shaw (2012) provided a wholistic representation of HHC throughout various departments in the hospital, whereas, Smith et al. (2013) based the study in an intensive care unit. Similarities within methodology allowed for in-depth comparison of the two studies.

Anderson et al. (2014) utilised first opinion clinics as the sample population, therefore the results could be easily transferred into general practice, such as the clinical scenario. This study utilised recommended hand hygiene protocols to promote objective data collection at a recognised standard. The study methodology produced robust results that could be replicated further to aid protocol changes within practice.

All three studies demonstrated independent merits and limitations, however, the evidence provided by the articles collectively is not strong enough to recommend a change in clinical practice.

Summary of the evidence

Anderson et al. (2014)	
Population:	Veterinary professionals in primary care companion animal clinics (South West and East Ontario, Canada). Practices were recruited via two of the authors contacts, or via search on google maps.
Sample size:	38 clinics; including 449 individuals (veterinarians, technicians, receptionists, students, volunteers). No power calculations used to estimate sample size.
Intervention details:	• Two video cameras installed: one in a consultation room and one in the "most likely" hand hygiene location in the backroom. • Baseline data of hand hygiene opportunities collected for 9–13 days after which, posters were mounted. • Two different posters were used that were easily visible for staff. Poster A was placed in every consultation room, and poster B was placed in three locations in the backroom. • Post intervention data was collected for up to 8 days or 40 appointments, depending on which happened first. • Videos were assessed and coded according to World Health Organization's (WHO, 2009) and a technique score was awarded. • An anonymous survey looked at individual perception, response to the posters and perception of general hand hygiene practice.
Study design:	Prospective observational study

Outcome studied:	Primary variable related to PICO was poster implementation and its impact on HHC. Objective WHO guidelines were followed. Mixed logistic regression and mixed linear regression were used to perform statistical analysis.
Main findings: (relevant to PICO question):	• No significant effect of posters on HHC. Odds ratio = 1.04, 95% confidence interval and p-value = 0.5 ($p<0.05$). Appropriate hand hygiene conducted in 14% of opportunities. Survey: • 272/289 (94%) of individuals noticed the posters. • Individuals stated the posters improved their hand hygiene awareness and practices (no figure given).
Limitations:	• Only one coder, which could result in observer bias, providing subjective measurements. The coder could not be blinded to the presence or absence of the posters. • Clinics were not randomly selected, which could lead to inherent bias. • No standardised time point when posters were installed, instead a time range, therefore the data set was not consistent. • Informed consent of filming gave potential rise to the Hawthorne effect (Eckmanns et al., 2006). • Two different poster styles reduced consistency of intervention.

Smith et al. (2013)	
Population:	Health care workers (HCWs): veterinary assistants, technicians, students, interns, residents and faculty at the intensive care unit (ICU) of a Veterinary Teaching Hospital at the University of Georgia, College of Veterinary Medicine.
Sample size:	Uncontrolled due to staff movement, but interventions shown explicitly to 168 staff/students. No power calculations used to estimate sample size required.
Intervention details:	• Observation time period determined with a randomisation procedure. 10–15 hand hygiene opportunities measured each period. • Over 12 weeks (-4 to -1 weeks for pre-intervention & 1 to 8 weeks for post-intervention) a single observer made randomised observations of hand hygiene opportunities using the World Health Organization's guidelines and subsequent adherence (WHO, 2009). • Pre-intervention observations conducted in week -3 to -2 and post-intervention in week 6 to 7. Intervention: • Educational video on correct technique for hand hygiene presented three times during week 1 to 24/65 (37%) of residents, faculty and interns and to 100/103 (97%) of incoming senior veterinary students who attended the presentation. The number of current senior veterinary students and technicians were not recorded. There is no explanation of how these individuals were

	chosen to participate. • 25 posters showcasing an adapted WHO educational campaign were placed in different hospital locations and rotated every 3 weeks.
Study design:	Prospective observational study
Outcome studied:	• Hand hygiene adherence pre and post educational implementation. • Data collection was objective whilst following WHO guidelines when deciding on appropriate opportunities/adherence. • Statistical analysis was performed using a Fisher exact test to compare the pre and post intervention hand hygiene adherence demonstrated by the participants.
Main findings: (relevant to PICO question):	• Pre-intervention: 222 observed hand hygiene opportunities, 61 were appropriate (27%). • Post-intervention: 249 observed hand hygiene opportunities, 73 were appropriate (29%). • No significant difference observed post intervention, P = 0.76 ($p<0.05$). No confidence intervals or effect size listed.
Limitations:	• The population was uncontrolled due to regular rotation of staff members therefore individual improvement was unable to be assessed. • Population who participated in educational intervention were not necessarily observed in any of the data collection periods • The hand-rub station by the entrance of ICU was not observed: may have missed HH attempts related to observed opportunities • Hawthorne effect (Eckmanns et al., 2006): participants may have changed their behaviour whilst being observed. • Post-intervention observations were not conducted until 6 weeks post-intervention. The authors have suggested there was a potential for a significant effect to be missed in the undocumented period. However, education should induce a long-lasting effect, so this may not be considered relevant. • 84% of participants who received the intervention already had extra hand hygiene training so this educational campaign may not have been as impactful.

Shea & Shaw (2012)	
Population:	HCWs; faculty, interns, residents, students, technicians in Teaching Hospital at the Cummings School of Veterinary Medicine, Tufts University Individuals of population were not controlled between pre- and post-intervention results.
Sample size:	Baseline n = 568 hand hygiene opportunities, Post-intervention n = 103 hand hygiene opportunities Intervention events: Presentation n = 48 individuals; Online Module n = 103 individuals
Intervention details:	• Anonymous direct observation; assessed number of hand hygiene opportunities and adequacy of hygiene for baseline and post-

	intervention data. • Observed by various HCWs. • Hand hygiene opportunities were defined as before and after handling an animal. Appropriate hand hygiene technique considered as either: ○ antibacterial foam ○ soap and water ○ wearing gloves and removing immediately after handling. • Baseline data collected over two weeks (568 hand hygiene opportunities). • Authors reported baseline compliance rate to population throughout campaign. Campaign implemented over 4 weeks: ○ posters ○ signs ○ presentation (voluntary and available to 48 individuals) ○ antibacterial foam slogans ○ intern/resident discussion at induction (mandatory) ○ online module (voluntary and available to 103 individuals). • Post-intervention data sampled 2 months after campaign completion. • Baseline and post-intervention data collection was anonymous and mandatory.
Study design:	Prospective observational study
Outcome studied:	• Baseline and post-intervention percentage of adequate hand hygiene opportunities were compared. • Data collected by multiple individuals through manual recording; observer bias meant that data collection was subjective. • Online module participation and presentation attendance were recorded. • Statistical analysis using Chi-squared test.
Main findings: (relevant to PICO question):	• There was a significant positive effect post educational intervention: • the population was 4.2 times (calculated using logistics regression) as likely to use soap with water or antibacterial foam post-intervention (P = 0.005) • 20.6% hand hygiene opportunities appropriate at baseline compared to 41.7% hand hygiene opportunities appropriate post-intervention (P = 0.001). • 20/48 (41.7%) of eligible population attended presentation. • 25/103 (24.3%) of eligible population completed module. • Confidence interval and effect size not included.
Limitations:	• There was an uncontrolled sample size due to rotation of staff members around the hospital. Therefore, individual improvement was unable to be assessed. • Post-intervention hand hygiene opportunities were less than 1/3

	of baseline; observer bias holds greater implication on the results, thereby potentially distorting the data which decreases the reliability of the study. • Subjective assessment between multiple observers. • The observers were aware of the campaign which led to observer bias as they may have looked for improvements in HHC post-intervention. • No standard of hand hygiene was referenced in the study design therefore it is impossible to assess whether the criteria for HHC in the study would meet gold-standard practice. • Different types of educational intervention were applied at once; unable to assess the effect of each intervention independently. • Post-intervention data collected 2 months post-campaign: the change in compliance immediately compared to long-term is not reviewable.

Appraisal, application and reflection

Helder et al. (2010) listed hand hygiene compliance (HHC) as a protective measure against nosocomial infections in human medicine and concludes that educational implementation has a statistically significant positive effect on HHC. Despite the stressed importance of HHC within human medicine (Randle et al., 2006), extensive database searches generated only three articles which answered the PICO; this displays a lack of veterinary evidence.

The study conducted by Anderson et al. (2014) showcased the highest transferability to general practice as the population consisted of first opinion clinics. Nevertheless, the authors used “known contacts” (Anderson et al., 2014) for recruitment. It was noted that the population who volunteered may have had a prior interest in hand hygiene, which could have exposed the results to inherent bias; this may have limited the true representation of the veterinary community.

The World Health Organization (WHO) deemed direct observation the most appropriate data collection method for assessment of HHC (WHO, 2019). Anderson et al. (2014) utilised video cameras to facilitate direct observation of participants to limit observation error. Pre-defined guidelines based on ‘My 5 Moments for Hand Hygiene’ (WHO, 2009) allowed objective quantification of hand hygiene opportunities. To gain informed consent the participants were briefed on the video camera purpose, therefore the Hawthorne effect may have elevated the compliance with hand hygiene protocols (Eckmanns et al., 2006). In a study that assessed HHC observation methodology, (Scherer et al. 2018) it was found that direct observation is subject to bias which can falsely increase the HHC rates observed when compared to a novel technique such as covert observations in 15 minute intervals, (Chang et al., 2016; Morgan et al., 2013; and Yin et al., 2014).

It is plausible to suggest that any improvement in HHC originally associated with the Hawthorne effect, (Eckmanns et al., 2006) may have been subject to habit formation due to progressive repetition (Kurz et al., 2015). Overall, Anderson et al. (2014) detected no significant post-intervention change. The article detailed extensive transparent statistical analysis such as logistic regression, odds ratio and confidence intervals, which were all appropriate assessments of the data provided and subsequently, increased reliability of results.

The two remaining studies by Shea & Shaw (2012) and Smith et al. (2013) utilised similar methodology; both assessed the impact of a multimodal educational campaign on HHC and did not collect data immediately post-intervention. Shea & Shaw (2012) waited 2 months and Smith et al. (2013) waited 6 weeks. Both studies were set in teaching hospitals where regular staff rotation limited the ability to control the population; pre- and post-observations were not conducted on the same individuals so reproducibility of the results is limited. Shea

& Shaw (2012) found a statistically significant positive effect of the educational campaign on HHC. Despite the similarity in study design, Smith et al. (2013) did not discover a statistically significant effect; the absence of data collection immediately post-intervention was instead discussed as a limitation. Human medicine studies such as Dubbert et al. (1990) and Phan et al. (2018), have demonstrated the importance of obtaining immediate post-intervention data as well as delayed, to assess the effect of time on the impact of the educational interventions. The lack of justification of both methodologies may have compromised the result integrity. However, the statistical analysis applied, conducted with a Chi-squared test for Shea & Shaw (2012) and a Fishers' exact test for Smith et al. (2013), was an appropriate assessment of the data.

Excluding Shea & Shaw (2012), the two other studies used WHO (2009) guidelines of hand hygiene as an established measurement of compliance. Shea & Shaw (2012) did not report which hand hygiene guidelines were used as the basis of study design, therefore comparison with the other articles is difficult. Human evidence, such as the WHO (2009) hand hygiene guidelines, is heavily relied upon to form veterinary hand hygiene protocols due to lack of veterinary evidence. Comparison was also difficult due to the differences in educational interventions between all three studies; it was not clear which aspect of the intervention had an effect on HHC. Further research could be conducted to compare individual educational approaches to find the most efficacious intervention.

The general techniques and opportunities for hand hygiene have been stated to be transferable between human and veterinary medicine, (Mann, 2017) using the One Health principle (Committee on the National Needs for Research in Veterinary Science et al., 2005). However, there is a current disparity between the human and veterinary evidence with regards to the effect of education on HHC (Helder et al., 2010). In addition, there is a lack of research which compares the motivational factors of HHC for human and veterinary care providers; therefore, it is difficult to determine whether the One Health concept should be applied to veterinary practice in the field of hand hygiene.

To validate the conclusions drawn by Shea & Shaw (2012), further research is needed with application of a standardised, clinically relevant assessment of hand hygiene in veterinary medicine. The veterinary evidence reviewed does not provide strong justification for the use of education in the improvement of HHC in small animal practice. This contrasts with extensive human evidence which supports the use of educational interventions (Helder et al., 2010). However, a limited veterinary knowledge base in the field of hand hygiene, combined with the flawed methodologies of the appraised literature, suggests that this finding is not representative of the effect education could have on HHC. Until there is definitive assessment on the application of human hand hygiene research to veterinary medicine, it is recommended to utilise the results of this Knowledge Summary alongside the human evidence-base in order to improve HHC.

Methodology Section

Search Strategy	
Databases searched and dates covered:	● CAB Abstracts on OVID Platform – 1973–15/10/19 ● Web of Science – 1900–15/10/19 ● CINAHL – 1981–15/10/19 ● PubMed – 1948–15/10/19 ● Medline on OVID Platform – 1946–15/10/19
Search terms:	**CAB Abstracts:** 1. vet* OR RVN OR SVN OR "small animal" OR "companion animal" OR "domestic animal" 2. "hand washing" OR "hand sterilising" OR "hand hygiene" OR " handwash" OR "World Health Organisation" OR sterillium OR "hand cleaning" OR chlor* OR hibi*

	3. edu* OR teach* OR intervention OR resource OR poster 4. compliance OR effectiveness OR efficacy OR "standard operating procedure" OR SOP OR "standard operating protocol" 5. 1 AND 2 AND 3 AND 4 **Web of Science:** (vet* OR RVN OR SVN OR "small animal" OR "companion animal" OR "domestic animal") AND ("hand washing" OR "hand sterilising" OR "hand hygiene" OR " handwash" OR "World Health Organisation" OR sterillium OR "hand cleaning" OR chlor* OR hibi*) AND (edu* OR teach* OR intervention OR resource OR poster) AND (compliance OR effectiveness OR efficacy OR "standard operating procedure" OR SOP OR "standard operating protocol") **CINAHL:** S1: Vet* OR RVN OR SVN OR "small animal" OR "companion animal" OR "domestic animal" S2: "hand washing" OR "hand sterilising" OR "hand hygiene" OR "handwash" OR "World Health Organisation" OR sterillium OR "hand cleaning" OR " chlor* OR hibi* S3: edu* OR teach* OR intervention OR resource OR poster S4: compliance OR effectiveness OR efficacy OR "standard operating procedure" OR SOP OR "standard operating protocol" S5: S1 AND S2 AND S3 AND S4 **PubMed:** (vet* OR RVN OR SVN OR "small animal" OR "companion animal" OR "domestic animal") AND ("hand washing" OR "hand sterilising" OR "hand hygiene" OR " handwash" OR "World Health Organisation" OR sterillium OR "hand cleaning" OR chlor* OR hibi*) AND (edu* OR teach* OR intervention OR resource OR poster) AND (compliance OR effectiveness OR efficacy OR "standard operating procedure" OR SOP OR "standard operating protocol) **Medline:** (vet* OR RVN OR SVN OR small animal OR companion animal OR domestic animal) AND (edu* OR teach* OR intervention OR resource OR poster) AND (hand washing OR hand hygiene OR handwash OR world health organisation OR sterilium OR hand cleaning OR chlor* OR hibi*) AND (compliance OR effectiveness OR efficacy OR standard operating procedure OR SOP OR standard operating protocol) {Including Related Terms}
Dates searches performed:	15/10/2019

Exclusion / Inclusion Criteria	
Exclusion:	Does not answer PICO, not an experiment, duplicate
Inclusion:	Answers PICO, small animal medicine based, English language

Search Outcome					
Database	**Number of results**	**Excluded – [Does not answer PICO]**	**Excluded – [Not an experiment]**	**Excluded – [Duplicate]**	**Total relevant papers**
CAB Abstracts	27	23	1	0	3
Web of Science	24	20	1	3	0
CINAHL	19	19	0	0	0
PubMed	92	89	0	3	0
Medline	26	22	1	3	0
Total relevant papers					**3**

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

REFERENCES

1. Anderson, M., Sargeant, J. and Weese, J. (2014). Video observation of hand hygiene practices during routine companion animal appointments and the effect of a poster intervention on hand hygiene compliance. *BMC Veterinary Research*, 10(1), pp.106. DOI: https://doi.org/10.1186/1746-6148-10-106
2. Chang, N., Reisinger, H., Jesson, A., Schweizer, M., Morgan, D., Forrest, G. and Perencevich, E. (2016). Feasibility of monitoring compliance to the My 5 Moments and Entry/Exit hand hygiene methods in US hospitals. *American Journal of Infection Control*, 44(8), pp.938–940. DOI: https://doi.org/10.1016/j.ajic.2016.02.007
3. Committee on the National Needs for Research in Veterinary Science, Board on Agriculture and Natural Resources, Division on Earth and Life Studies, and National Research Council (2005). The role of veterinary research in human society. Critical Needs for Research in Veterinary Science. *National Academic Press*. Washington, D.C. pp.13–20. DOI: https://doi.org/10.17226/11366
4. Dubbert, P., Dolce, J., Richter, W., Miller, M. and Chapman, S. (1990). Increasing ICU Staff Handwashing: Effects of Education and Group Feedback. *Infection Control & Hospital Epidemiology,* 11(4), pp.191–193. DOI: https://doi.org/10.1086/646148
5. Eckmanns, T., Bessert, J., Behnke, M., Gastmeier, P. and Rüden, H., (2006). Compliance With Antiseptic Hand Rub Use in Intensive Care Units The Hawthorne Effect. *Infection Control & Hospital Epidemiology*, 27(9), pp.931–934. DOI: https://doi.org/10.1086/507294

6. Helder, O., Brug, J., Looman, C., van Goudoever, J. and Kornelisse, R. (2010). The impact of an education program on hand hygiene compliance and nosocomial infection incidence in an urban Neonatal Intensive Care Unit: An intervention study with before and after comparison. *International Journal of Nursing Studies*, 47(10), pp.1245–1252. DOI: https://doi.org/10.1016/j.ijnurstu.2010.03.005
7. Kurz, T., Gardner, B., Verplanken, B. and Abraham, C. (2014). Habitual behaviors or patterns of practice? Explaining and changing repetitive climate-relevant actions. *Wiley Interdisciplinary Reviews: Climate Change,* 6(1), pp.113–128. DOI: https://doi.org/10.1002/wcc.327
8. Mann, A. (2017). The importance of hand hygiene. *Veterinary Nursing Journal*, 32(3), pp.82–85. DOI: https://doi.org/10.1080/17415349.2016.1269624
9. Morgan, D., Pineles, L., Shardell, M., Graham, M., Mohammadi, S., Forrest, G., Reisinger, H., Schweizer, M. and Perencevich, E. (2013). The Effect of Contact Precautions on Healthcare Worker Activity in Acute Care Hospitals. *Infection Control & Hospital Epidemiology*, 34(1), pp.69–73. DOI: https://doi.org/10.1086/668775
10. Phan, H., Tran, H., Tran, H., Dinh, A., Ngo, H., Theorell-Haglow, J. and Gordon, C. (2018). An educational intervention to improve hand hygiene compliance in Vietnam. *BMC Infectious Diseases*, 18(1). DOI: https://doi.org/10.1186/s12879-018-3029-5
11. Randle, J., Clarke, M. and Storr, J. (2006). Hand hygiene compliance in healthcare workers. *Journal of Hospital Infection*, 64(3), pp.205–209. DOI: https://doi.org/10.1016/j.jhin.2006.06.008
12. Scherer, A., Reisinger, H., Goto, M., Goedken, C., Clore, G., Marra, A., Chasco, E., Evans, C., Rubin, M. and Perencevich, E. (2018). Testing a novel audit and feedback method for hand hygiene compliance: A multicenter quality improvement study. *Infection Control & Hospital Epidemiology*, 40(1), pp.89–94. DOI: https://doi.org/10.1017/ice.2018.277
13. Shea, A. and Shaw, S. (2012). Evaluation of an educational campaign to increase hand hygiene at a small animal veterinary teaching hospital. *Journal of the American Veterinary Medical Association*, 240(1), pp.61–64. DOI: https://doi.org/10.2460/javma.240.1.61
14. Smith, J., Packman, Z. and Hofmeister, E. (2013). Multimodal evaluation of the effectiveness of a hand hygiene educational campaign at a small animal veterinary teaching hospital. *Journal of the American Veterinary Medical Association,* 243(7), pp.1042–1048. DOI: https://doi.org/10.2460/javma.243.7.1042
15. World Health Organization (2009). My 5 Moments for Hand Hygiene.
16. World Health Organization (2019). WHO | Hand hygiene monitoring and feedback.
17. Yin, J., Reisinger, H., Weg, M., Schweizer, M., Jesson, A., Morgan, D., Forrest, G., Graham, M., Pineles, L. and Perencevich, E. (2014). Establishing Evidence-Based Criteria for Directly Observed Hand Hygiene Compliance Monitoring Programs: A Prospective, Multicenter Cohort Study. *Infection Control & Hospital Epidemiology*, 35(9), pp.1163–1168. DOI: https://doi.org/10.1086/677629