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# The ultrasound unit and infection control – Are we on the right track?

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## Abstract

Best practice guidelines for the disinfection of ultrasound transducers and infection prevention in ultrasound departments are generally recommended by either government health groups or the ultrasound societies of individual countries. The literature shows a wide variance in not only transducer cleaning methods but basic hygiene practices in the ultrasound workplace. This paper describes results from a UK survey of disinfection of ultrasound transducers and hygiene practice in the workplace. The survey revealed that some ultrasound practitioners did not follow current guidelines with regard to the correct disinfection method of transducers, cords or ultrasound machine keyboards. Furthermore, the survey exposed the lack of training from the product manufacturers on how to use the disinfection product appropriately. These inconsistencies may be responsible for compliance issues and highlight the need for an awareness campaign and a unified approach to infection control by ultrasound practitioners.

## Keywords

Ultrasound, patient safety, disinfection

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## Introduction

Infection control is becoming a prominent issue for those involved in medical ultrasound practice. The lack of, or non-compliance to, cleaning and infection control guidelines in the ultrasound workplace could be responsible for the transmission of significant healthcare-related infections between practitioner, machine and the patient. The ultrasound user may neglect basic hygiene precautions, such as adequately cleaning transducers between patients, not using transducer covers for certain examinations, not washing the hands nor regularly cleaning the ultrasound machine keyboard and transducer cords, nor taking appropriate care and use of ultrasound coupling gel.

Best practice guidelines for disinfection of ultrasound transducers and infection prevention in ultrasound departments are generally recommended by either government health groups or the ultrasound societies of individual countries. Guidelines may also be adapted from expert collaborations, such as with the World Federation of Ultrasound in Medicine and Biology (WFUMB) amongst others.[1–4] There is a wide variance in suggested cleaning methods for ultrasound transducers post-patient contact, not only between countries but also between institutions within a country, which can lead to confusion and a mix of standards.[5]

The literature reveals many examples of transducers becoming contaminated during an ultrasound examination.[6–12] Although published guidelines generally support the need for high-level disinfecting (HLD) of endocavity transducers that have come into contact with mucous membranes during a transvaginal,

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transrectal or transoesophageal scan, or when used for an intraoperative procedure, there is often a lack of awareness of the importance of thorough cleaning of all transducers after any procedure.[13–16] There are ultrasound practitioners who admit to not using any other form of cleaning, other than to wipe the gel off the transducer with the towel or paper used to drape the patient.[17]

Surface transducers that have been used on open wounds, infected skin, armpits, testes or perineum, have the potential to cause cross-contamination and so should undergo HLD. HLD should eliminate all microorganisms, including mycobacterium, small and medium viruses, and fungal spores; however, some bacterial spores can still be present. Low-level disinfection (LLD), using antibacterial and antifungal detergent-based wipes, eliminates most bacteria but only some viruses and fungi, and so are used for cleaning non-critical instruments such as transabdominal transducers used on intact skin.

Transducer covers should not only be used for any ultrasound procedure where there is contact with mucous membranes but also for ultrasound-guided procedures, such as biopsies, and when scanning patients with contagious infections or open wounds. The early literature reported probe cover perforations as high as 81%, and although the quality of products has improved, breakages still occur, which can lead to transducer contamination with blood and body fluids.[18–20] Sheath perforations may not be visible to the naked eye, with micro-tears exposing the transducer to possible bacterial or viral contamination. For this reason, it is important that the ultrasound practitioner is aware of the importance of thoroughly cleaning all transducers post scan.

In addition to contaminated probes, there is potential for contamination of ultrasound gel. There are multiple gel products on the market that have passed rigid production standards to ensure that there is no contamination with pathogenic organisms once the gel is dispensed into bottles ready for distribution. Regardless of these safety standards, there have been multiple cases of infection caused by poor quality scan gel and incorrect post production handling, with *Pseudomonas aeruginosa, Klebsiella oxytoca*, *Stenotrophomonas maltophilia*, *Raoutella planticola* and *Burkholderia cepacia* present in recalled gel products since 2012.[21–25] Heating of ultrasound gel is another source of potential bacterial contamination and although warm gel may be of comfort to the patient, it is not recommended.[26]

Despite numerous studies demonstrating the importance of disinfection of ultrasound probes, the entire ultrasound unit must be considered as a potential source of infection.[27] A recent Australian study, which showed the prevalence of bacterial contamination on ultrasound probes, cords, keyboards and gel, concluded that the basic infection prevention and control issues of ultrasound users must be addressed.[26]

## A snapshot of UK responses to a global survey on disinfection practices

In an attempt to further comprehend a global perspective of ultrasound probe disinfection and infection prevention in the ultrasound unit, a survey was designed and promoted by WFUMB to all of its six-member federations and associated ultrasound societies. The online survey asked a series of questions relating to transducer cleaning, gel care and basic hygiene in the ultrasound workspace. It also asked for additional comments. A total of 188 of the respondents were from the United Kingdom (data as of 31 August 2016). Table 1 describes the training background for all UK respondents. The majority of respondents were sonographers, followed by radiologists.

A total of 86% respondents were from public hospitals and the remainder from private clinical practice. When assessing workload, 26% of respondents

**Table 1.** Training background of United Kingdom respondents

| Training background | Responses % (number) |
|---|---|
| Radiologist | 12.37 (23) |
| Obstetrician/gynaecologist | 2.96 (5) |
| Vascular/cardiologist | 1.61 (3) |
| Emergency medicine specialist | 2.15 (4) |
| Medical practitioner specialising in ultrasound | 3.76 (7) |
| Medical practitioner using ultrasound occasionally | 0.54 (1) |
| Sonographer/ultrasound technician | 64.52 (120) |
| Formal qualification in ultrasound | 2.96 (5) |
| Other (please specify)[a] | 9.68 (18) |
| Total | 186[b] |

[a]Responses included: midwife sonographer, intensivist, nurse, trainee and consultants.
[b]Of a total of 188 respondents, two skipped question.

**Table 2.** Number of scans performed per day by United Kingdom respondents

| Number of scans performed per day | Responses % (number) |
|---|---|
| Nil | 1.07 (2) |
| Less than 3 | 4.28 (8) |
| 4–7 | 13.37 (25) |
| 8–11 | 10.70 (20) |
| 12–15 | 18.18 (34) |
| 16–19 | 26.74 (50) |
| More than 20 | 25.67 (48) |
| Total | 187[a] |

[a]Of a total of 188 respondents, one skipped question.

**Table 3.** Frequency of cleaning the ultrasound machine keyboard and cords

| Cleaning frequency | Machine keyboard response % (number) | Machine cords' response % (number) |
|---|---|---|
| After each patient | 15.14 (28) | 44.09 (82) |
| Once a day | 57.30 (106) | 34.95 (65) |
| Once a week | 14.59 (27) | 10.22 (19) |
| Once a month | 3.78 (7) | 3.23 (6) |
| Once every six months | 1.62 (3) | 1.08 (2) |
| Never | 7.57 (14) | 6.45 (12) |
| Total | 185[a] | 186[b] |

[a]Of a total of 188 respondents, three skipped question.
[b]Of a total of 188 respondents, two skipped question.

performed 16–19 scans per day, whilst 25% performed more than 20 scans per day (see Table 2).

When wiping external probes, 53% wiped clean with a paper towel, followed by either a wipe system or spray system. Some respondents commented that upon spraying with an approved spray system, there are some users that wipe straight away, instead of waiting for the appropriate time for the effective agent to work. As such, many manual systems are user-dependent, which raises concerns if users are not trained properly. When cleaning internal probes, wipe systems followed by spray systems were used over other HLD automated or manual systems. A total of 60% of respondents did not complete a competency assessment prior to using any cleaning product.

With regard to cleaning the ultrasound unit, the machine cords are cleaned after each patient more often than the keyboard (Table 3). Some respondents never cleaned either the keyboard (7%) or the cord (6%).

With regard to support and training, a total of 55% of respondents undertook a workplace disinfection induction, whilst 72% received support from Infection Control specialists. A total of 33% of respondents had no access to a written infection control policy relating to ultrasound machines and probes. When purchasing a machine, 56% received no training from the machine manufacturer on how to clean the ultrasound probe. When purchasing a disinfection product, 46% did not receive any training from the product manufacturer on how to use the product appropriately.

Many of the open-ended responses relating to probe disinfection requested universal guidelines that need to be clearer without need for interpretation. Current challenges include: 'due to the high throughput of work in the UK and limited staffing, probe disinfection procedures are poor, particularly for intracavity probes' and 'definitely needs better monitoring in the UK (too time consuming with over full lists – more than 20 patients a day)'.

Furthermore, 'machine manufacturer's guidance often does not relate to products available in the UK. Lists of each individual probe/year of manufacture make it almost impossible to be certain that you are doing the right thing. A national consensus would be ideal, particularly in the UK/NHS'.

When asked about professional hygiene practices in the workplace, a majority of respondents commented that hygiene varied considerably between operators and although 'hygiene practice needs improving, there is much resistance to change and therefore consideration needs to be given to how to make this easy to do and reasonably priced'.

## Conclusion

This article, which presents a snapshot of the UK responses from the WFUMB survey, revealed that some ultrasound practitioners in the UK did not follow any guidelines in regard to the correct disinfection method of transducers, cords or ultrasound machine keyboards.

The survey revealed the lack of training on the correct use of their chosen disinfection product and suitable, UK specific, disinfection methods for ultrasound probes by the manufacturers. This issue highlights that breaches in reprocessing may occur

due to lack of knowledge and appropriate training. Ultrasound operators undergo rigorous training to use the ultrasound technology; however, ultrasound education programmes may not cover specific training in infection prevention and control.

The status of infectious patients is often not disclosed to ultrasound operators and so poses a potential risk to the operator and to the next patient if there has not been adequate disinfection of ultrasound probes. Furthermore, challenges such as not enough time to clean between patients in a busy ultrasound unit can potentially lead to negligence and improper practice, which may contribute to the spread of healthcare-related infections.

Bacterial and viral contamination could occur across all areas of the ultrasound examination. Implementing workable guidelines that pertain to infection prevention and control, specifically within the ultrasound department may reduce the risk to both the operator and the patient.

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## Guarantor

JB.

## Contributorship

SCW and JB designed the global survey and analysed the results together. SCW wrote the first draft of the manuscript and JB finalised the manuscript. Both authors reviewed and approved the final version of the manuscript.

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