MO-ACHE Student Essay Award
The Role of Human Error in Transvaginal Ultrasound Probe Contamination
University of Missouri HMI-MHA Program, Graduation date: 14 Dec 2018
Brooke M. Clark
Email: Brooklynmclark@hotmail.com
Phone: 419-852-4278
11 Nov 2018

Ultrasound has been a routine part of pregnancy since the late 1980s. Many women come to the Radiology Department to get an ultrasound scan of their new pregnancy or possibly a scan of their pelvic organs because of pain or bleeding. None of these women think about being at risk for contracting Human Papilloma Virus (HPV) from the transvaginal ultrasound probe, but they might be. Transvaginal probe covers are used with every scan, however, the method used to cleanse and disinfect the probe is a crucial risk factor.

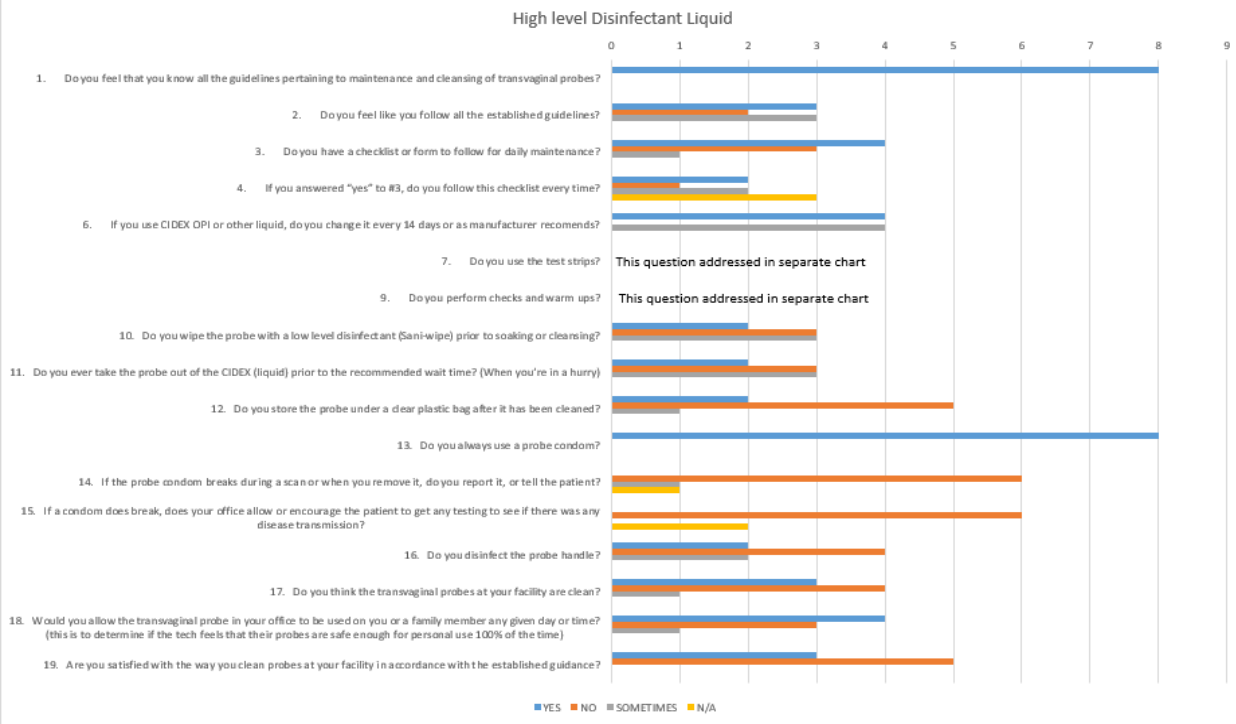
Current cleansing methods of transvaginal probes require the use of high-level disinfection. High-level Disinfection (HLD) is the process of complete elimination of all microorganisms in or on a device, except for small numbers of bacterial spores. Examples of HLD include use of liquid disinfectants Glutaraldehyde, Hydrogen Peroxide, and Ortho-phthaldehyde/OPA (The Joint Commission). A study in 2015 proved that HPV 16 and 18 were highly resistant to high-level OPA liquid disinfectant (Ryndock, Robison, Meyers, 2015). This means, if a radiology or ultrasound department uses liquid OPA disinfectant, their probes most likely remain contaminated by HPV 16 & 18.

The second piece of this puzzle is the potential human error present in the cleansing process. There are many steps and guidelines that must be adhered to in order for the high-level cleansing to be effective. If even one of these steps is missed or shortened, contamination and transmission could result. Types of human error that could impact transvaginal probe cleansing are: incomplete understanding of manufacturer recommendations; process short cuts; probes not soaking for the recommended time; not doing quality control (QC) testing on solution; not cleaning the handle of the probe; no pre-cleanse prior to soaking; not using test strips prior to every soak; not changing solution at the recommended time; not using a checklist for maintenance of solution; and no policy for perforated or broken probe covers, etc.

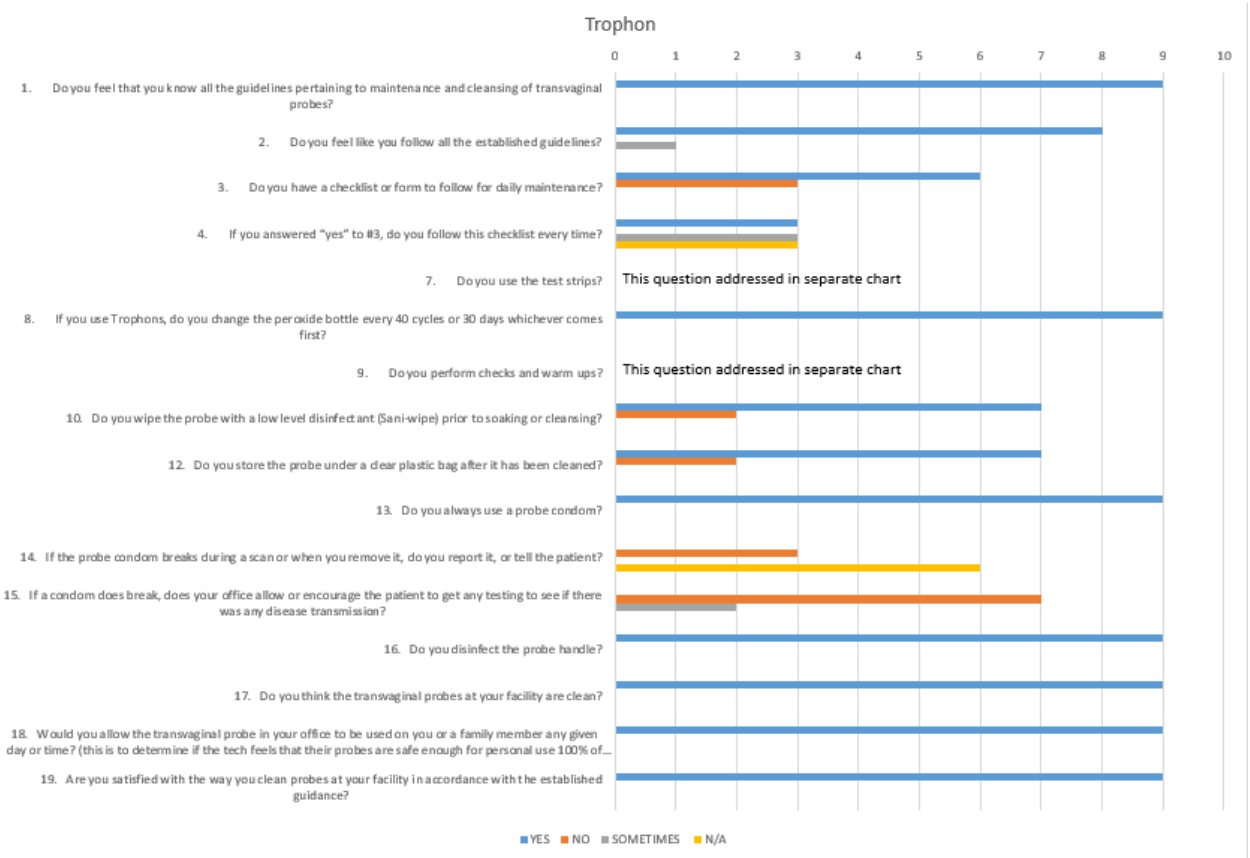
Sonographers are very busy, with a large patient exam load, and usually not much time in-between patients. The temptation to shorten the probe OPA cleansing process or soak time, or skip it all together, is always present. This is where human error can have a significant impact on patient safety and quality care. A new automated probe cleansing unit called a Trophon® EPR is a high-level disinfection system that is fast and simple. Disinfection takes place in an automated, closed system and uses a vaporized hydrogen peroxide solution (Nanosonics. 2017). The study in 2015 about the HPV 16 & 18 resistance, also showed the Trophon unit was able to completely inactivate HPV16 and almost completely inactivate HPV 18. This was 10-14 times more effective than the liquid OPA results.

Another benefit of using the Trophon EPR system is because it can cleanse the handle of the probe inside the unit. Soaking a transvaginal probe in liquid disinfectant does not allow for the handle to be soaked as well. Therefore, the handles are cleansed with low-level disinfectant wipes or spray, which leaves the handles contaminated. A prospective, bi-centric, cross-sectional study was done on 152 handles, and found, in two separate case studies in hospital ultrasound departments who cleanse with high-level liquid disinfectant, that 80% of all handles tested were contaminated (Ngu, 2015). Probes can become contaminated due to improper handling or leaking probe covers and they can stay contaminated even after liquid disinfectant due to the resistance of HPV 16 & 18.

For my research, retrospective interviews were completed with 17 Sonographers from 10 different facilities all over the USA, including Hawaii, ranging from clinics to trauma centers. Eight of the sonographers use high-level liquid disinfectant and 9 use Trophon automated cleaning systems. These are the results:



In the above chart we see inconsistency and lots of variation in the answers. All the sonographers felt that they know all recommended guidelines, but the interviews showed that they were not following the guidance consistently. Of the 8 sonographers using high-level liquid disinfectant, less than half of them followed all manufacturer recommended guidelines, even though 100% of them knew what the actual guidance says. Only half of them said they have and follow a checklist for maintenance and use.



Trophon usage was much more standardized across the board in response to the same questions. Note that most of the questions asked were answered with 100% "yes" answers. This is because the machine forces the sonographers to complete QC checks and warm-ups and does not allow early stopping of the cleansing process. 100% of Trophon users said they cleanse the handle every time because it is inside the machine when cleansing. Only 33% of the sonographers interviewed who use high level liquid disinfectant even wiped the probe handle with a low-level disinfectant wipes or spray. Low level wipes don't fully deactivate the HPV because it is highly resistant. The graphs of sonographers who use Trophons show much more consistent answers, and show greater compliance to the standards and less variation.

As Healthcare Administrators and Health Leaders, it is important to be aware of risks and opportunities to mediate that risk in a process. The process of cleansing with the use of high-

level disinfectant is lacking in standardization and has been a significant finding in many Joint Commission facility inspections. When probe cleansing, it is hard to eliminate all risk, but a large portion of it can be mitigated through this use of Trophon units in your facility.

There is some upfront cost but, a study done by the American Institute of Ultrasound Medicine broke down how this financial burden can be recouped overtime. The study done by the AIUM showed that a Trophon system's efficiency would create 7.5 additional hours for more ultrasound examinations per week, and they only needed 1.5 additional scans to be performed in order to cover the cost difference between Trophon and liquid cleansers (AIUM). In 7.5 extra hours saved, a sonographer could perform roughly 8-10 additional scans. Not only is this product beneficial financially, but it also helps standardize work flow and provide safer, higher quality patient care. As we learn more about the effects of human error and risk inherent in the healthcare field as a whole, it should be an easy decision to choose equipment that can significantly reduce risk and increase patient safety. It's not a matter of "if" disease transmission will occur through transvaginal ultrasound, it's a matter of "when" and "who" will be the victim.

References

American Institute of Ultrasound in Medicine. *Guidelines for cleaning and preparing external- and internal-use ultrasound probes between patients.* AIUM Official Statement. Retrieved from http://www.aium.org/officialstatements/57. Accessed Aug 1, 2017

A. Ngu, G. McNally, D. Patel, V. Gorgis, S. Leroy, J. Burdach. *Reducing transmission risk through high-level disinfection of transvaginal ultrasound transducer handles.* Infect Control Hosp Epidemiol, 36 (2015), pp. 581-584

Clark. B. 2018. *Sonographic Endovaginal Probe Contamination and Infection Control.* Charts and data collected during MHA summer research at the University of Missouri.

Merriam-Webster. 2018. *Human error.* (n.d.). Retrieved from https://www.merriam-webster.com/dictionary/human error

Nanosonics. 2017. *What our customers are saying.* Retrieved from https://www.nanosonics.us/trophon/what-our-customers-are-saying/

The Joint Commission. 2016. *High-Level Disinfection (HLD) and Sterilization BoosterPak.* Retrieved from https://www.jointcommission.org/assets/1/6/TJC_HLD_BoosterPak.pdf