

A non-inferiority trial comparing automated UV-C LED to manual ClO₂ for high-level disinfection of ultrasound probes

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1 BACKGROUND

Manual chemical high-level disinfection of ultrasound probes is operator dependent and subject to variability. Automated ultraviolet-C (UV-C) light-emitting diode (LED) disinfection provides a chemical- and mercury-free alternative, that may reduce operator dependence and chemical exposure, but comparative clinical evidence remains limited.

2 AIM

To compare the effectiveness of automated UV-C LED disinfection with manual chlorine dioxide (ClO₂) for reprocessing of transabdominal and transvaginal ultrasound probes in a non-inferiority trial.

3 METHODS

Design: Single-centre non-inferiority study in the departments of Gynaecology, Obstetrics and Urology at Ghent University Hospital (ethics ref.:ONZ-2024-0561).

Samples: 296 probes (5 excluded from the non-inferiority analysis: treated with a wipe only).

Participants: 27 healthcare practitioners.

Intervention: Reprocessing time was recorded and methods were alternated after clinical use (transvaginal probes were used with cover):

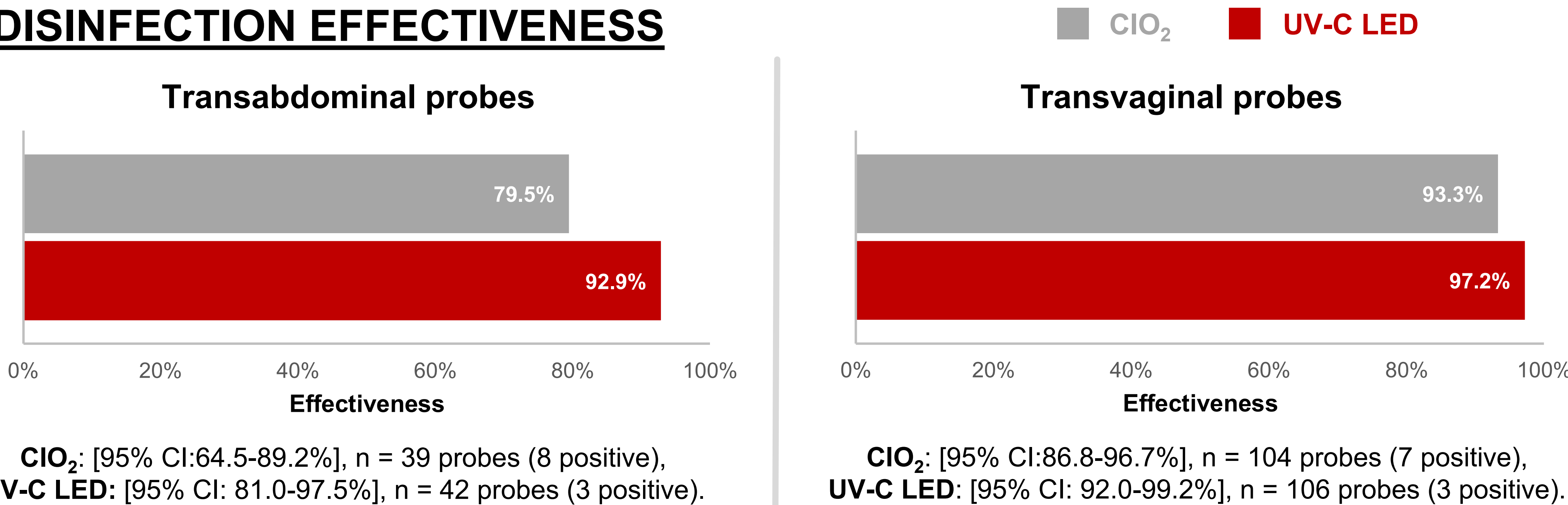
- Manual cleaning + manual ClO₂ disinfection according to routine practice
- Manual cleaning with a water-moistened tissue + Automated UV-C LED disinfection (200 sec. cycle)

Evaluation of effectiveness: Post-disinfection swabs: 100 µL cultured on tryptic soy agar + 5% sheep blood at 37°C for 48h.

Primary outcome: Absence of viable organisms post-disinfection.

KEY FINDINGS

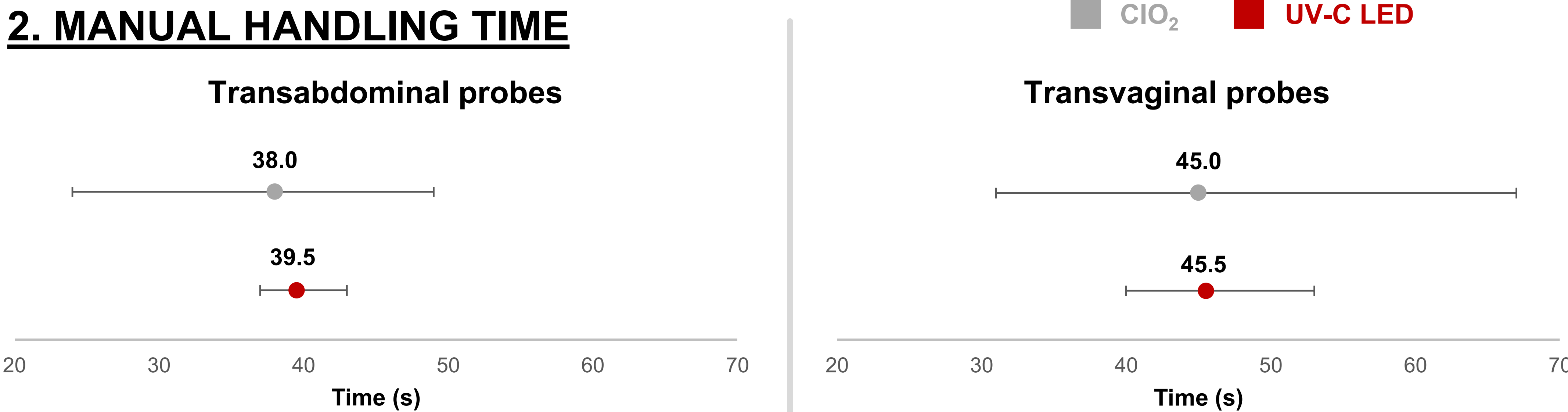
1. DISINFECTION EFFECTIVENESS



Effectiveness and 95% confidence interval (CI) using the Wilson/Brown method

UV-C LED disinfection met the criterion for non-inferiority for both probe types, based on the difference in effectiveness (UV-C LED minus ClO₂, using Newcombe/Wilson with continuity correction): transabdominal: 95% CI -0.039 to 0.305; transvaginal: 95% CI -0.035 to 0.109 (non-inferiority margin - 0.05).

2. MANUAL HANDLING TIME



Time (median) and interquartile ranges

Manual handling times were comparable between methods, with greater variability for ClO₂.

3. CONTACT-TIME ADHERENCE WITH MANUAL ClO₂ DISINFECTION

Recorded reprocessing time < 30 s*

Transabdominal probes

14/39 (35.9%)

Transvaginal probes

19/104 (18.3%)

*Timing began when the first tissue was taken, therefore, recorded durations close to 30 s may overestimate adherence to the required contact time.

The manufacturer-specified minimum contact time was not consistently observed for ClO₂.

CONCLUSION

Automated UV-C LED disinfection was non-inferior to manual ClO₂ disinfection for both probe types under clinical conditions.

Although the automated UV-C cycle lasted 200 s, manual handling times were comparable between methods, while manual ClO₂ showed greater variability and inconsistent adherence to the recommended 30 s contact time.

Automated and standardised UV-C LED reprocessing may reduce operator-dependent variability and improve consistency in clinical practice.