Ultrasound transducer disinfection for percutaneous procedures.

--Invasive devices session--

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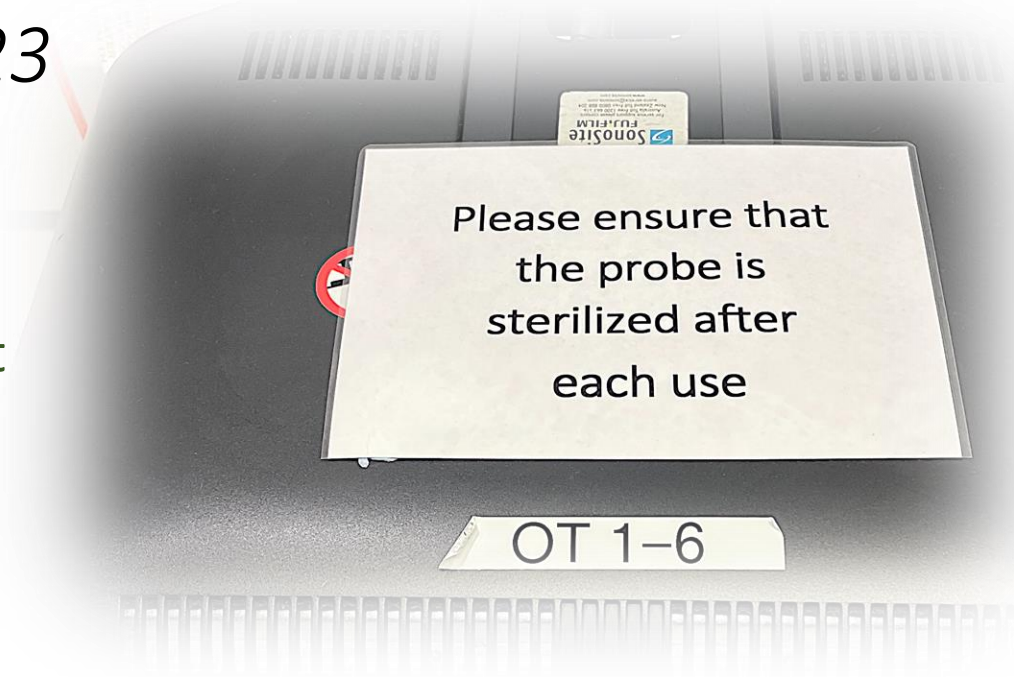

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- Co-authors:

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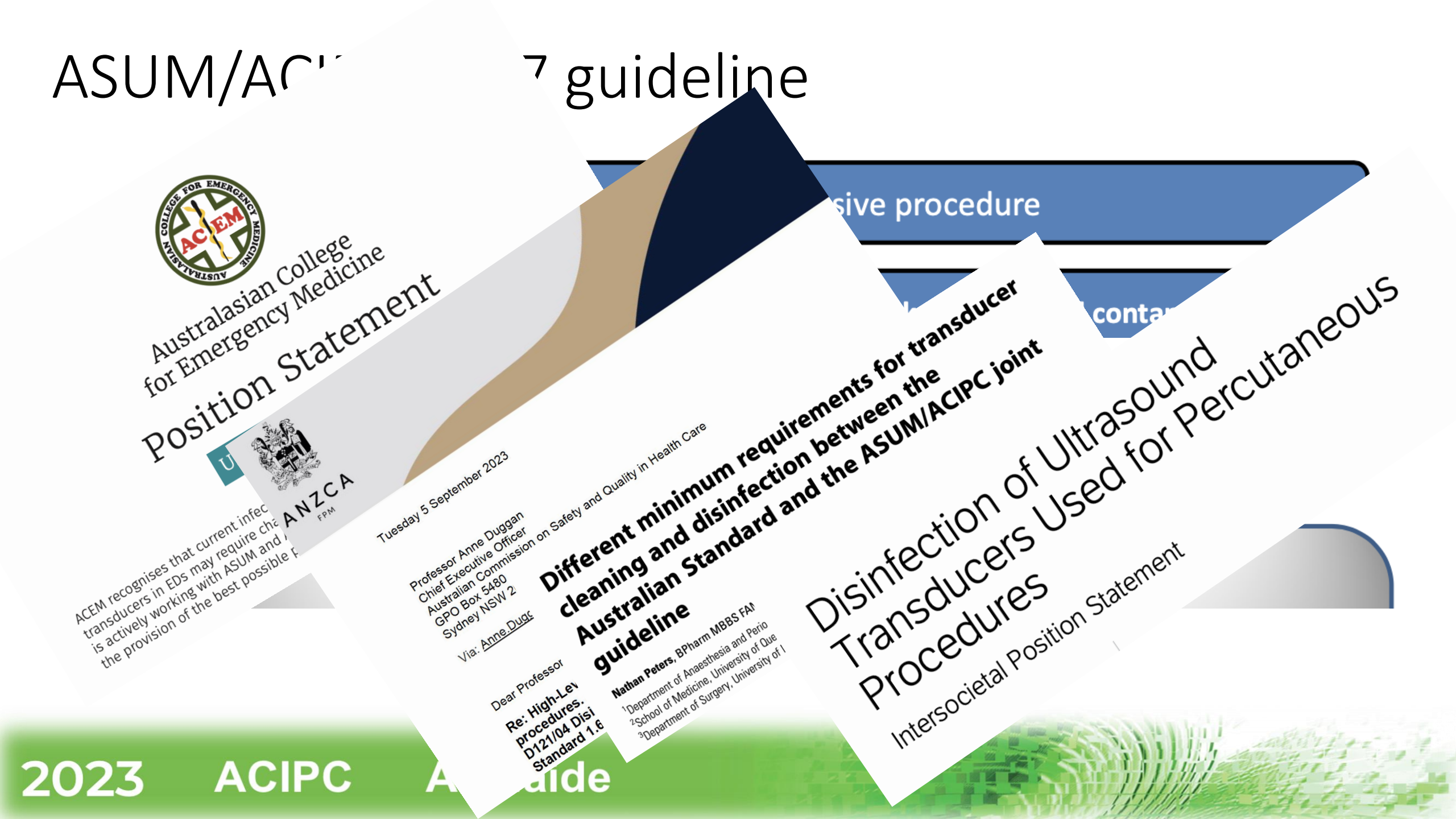
USG percutaneous procedures

- Vascular access
- Nerve blocks
- Injections
- Biopsy
- Aspirations
- Drainage

Ultrasound = ↑ Success and ↓ Complications

ASUM/AC[illegible]7 guideline



Should US transducers used in percutaneous procedures undergo **Low-level** or **High-level** disinfection?

Region	Society	HLD	LLD
Australia	**ASUM/ACIPC**	✓	
	CICM	✓	
	ACEM		✓
	ANZCA		✓
America	**AIUM**		✓
Europe	**ESR**	✓	
World	**WFUMB**	✓	

LLD

LOW-LEVEL DISINFECTION

~$0.10

- Benzalkonium Cl
- PMH Biguanide

HLD

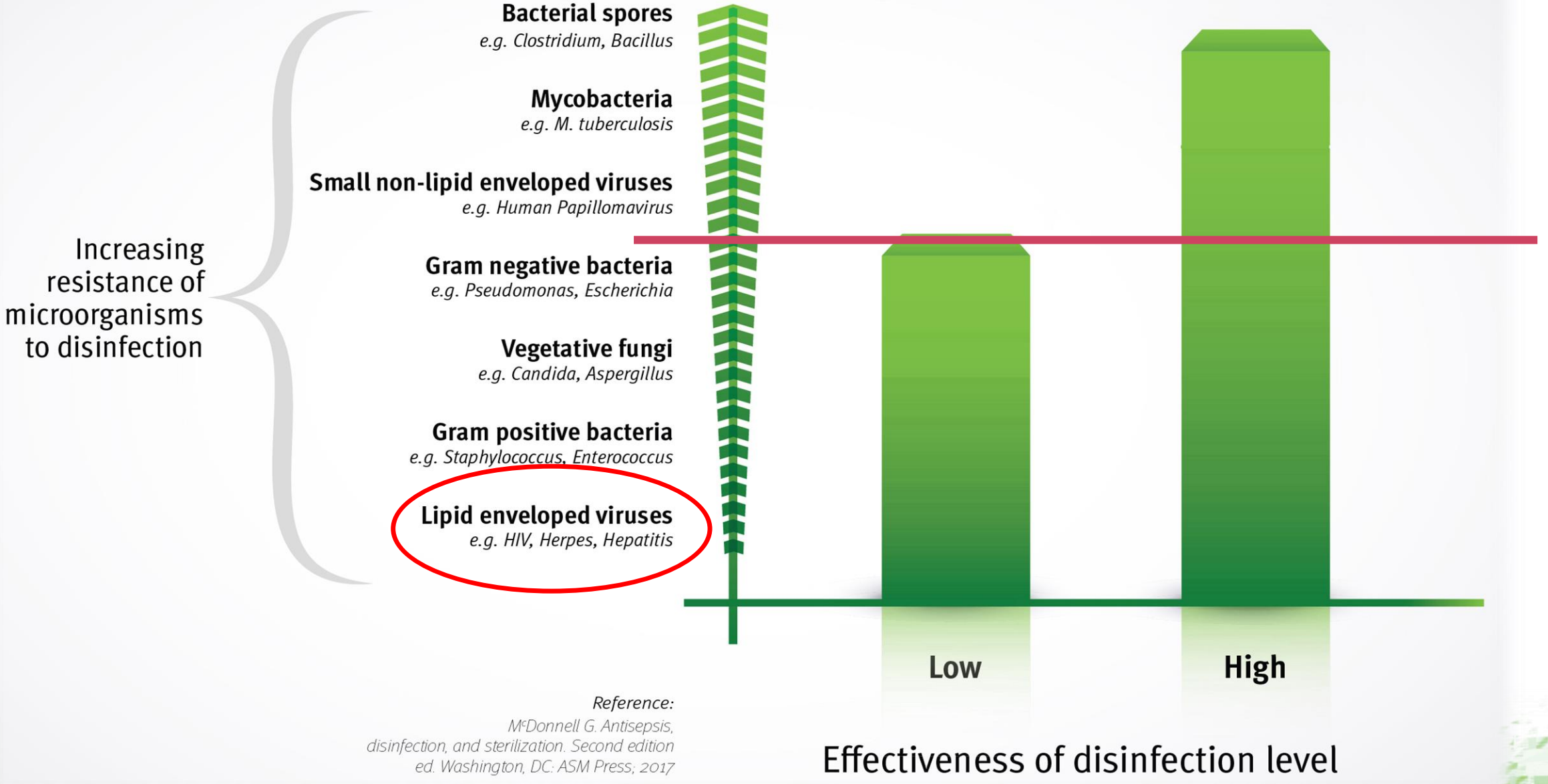
HIGH-LEVEL DISINFECTION

~$13.00

~$10,000+

- Cl dioxide; H_2O_2; UV-C light

Effectiveness of different levels of disinfection



Reference:
McDonnell G. Antisepsis, disinfection, and sterilization. Second edition ed. Washington, DC: ASM Press; 2017

Why is this important?

	Low-level	High-level
Training & annual competency	No	Yes
Perform easily at bedside	Yes	No
Traceability log & audit	No	Yes
Cost	**$0.10**	**$13**

Costs:

↓US Availability

↑Staff time

↑Money

Would HLD deliver any benefit?… well let's find out..

Hypothesis….

Microorganisms from skin:

1. Contaminate US transducers;
2. May cause infection;
3. LLD & HLD theoretically effective.

LLD should be non-inferior to HLD for skin microbes

Design - outcome

Elimination of all viable microorganisms from US transducers after LLD or HLD. (CFUs=0)

- 2 identical linear US transducers
  - LLD transducer –> only LLD
  - HLD transducer –> only HLD

Randomised to L or R arm

- Patients and Healthcare staff
  - HREC approval
  - Exclusion criteria
  - Contamination simulated on forearms + 10g sterile gel

Design - sample analysis

- Contamination→ Swab → Disinfection → Swab
  - LLD – Clinell universal wipes®
  - HLD – Tristel Trio wipes®
- Blinding of microbiologist
- Swabs plated on Horse Blood Agar plates
  - supports growth of aerobic bacteria & fungi
- Incubated in air at 37^{oc} for 4 to 5 days
- CFU counted and identified

Design – Statistics & Power

- Non-inferiority trial
  - paired statistical testing using Nam's restricted maximum likelihood estimate (RMLE) approach
  - -5% non-inferiority margin & 2.5% significance level
- Power = 470 participants with paired microbial growth
  - 650 recruited to account for no growth samples
- Prospective registration - ANZCTR

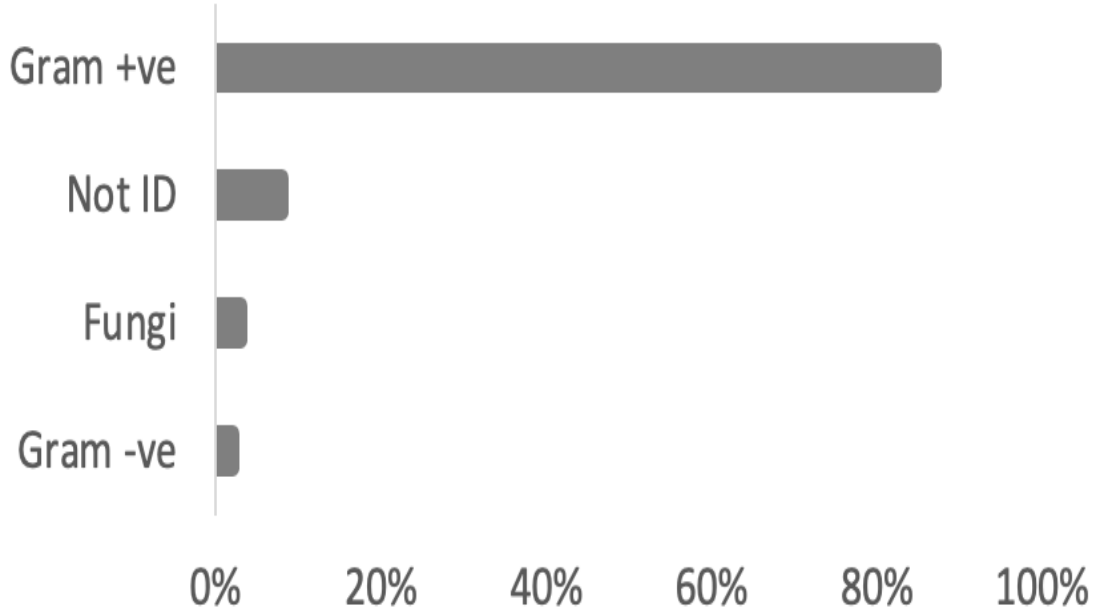
Results

654 participants:

- 76% (n=495) patients, 24% (n=157) staff
- 53% (n= 345) male, 47% (n= 309) female

Transducers contaminated:

- 73% (n=478) Both
- 13% (n= 82) One
- 14% (n=94) None



Top 3: (n=1669)

1. Coag. neg Staph (51%)
2. Micrococcus luteus (29%)
3. Staph aureus (8%)

Results

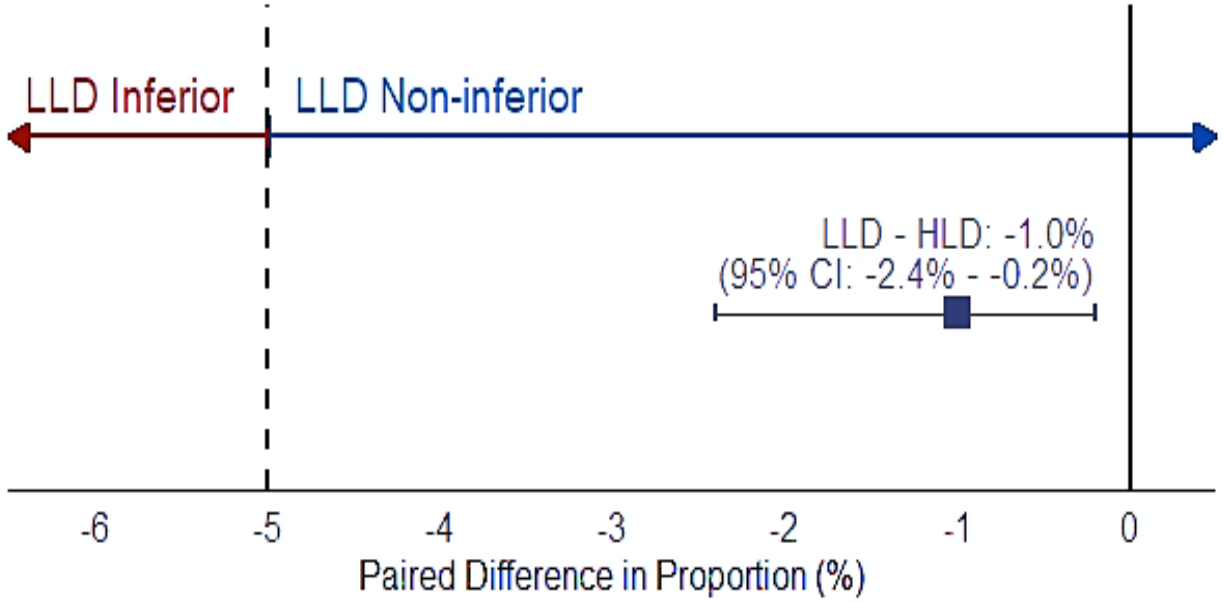
- 478 paired growth

All CFUs eliminated:

- HLD: 100% (99.4%-100.0%) (n=478)
- LLD: 99.0% (97.6%-99.7%) (n=473)

(5 with 1-2 CFUs remaining *(CoNS or M.Luteus))*

Non-inferiority plot



Limitations & generalizability

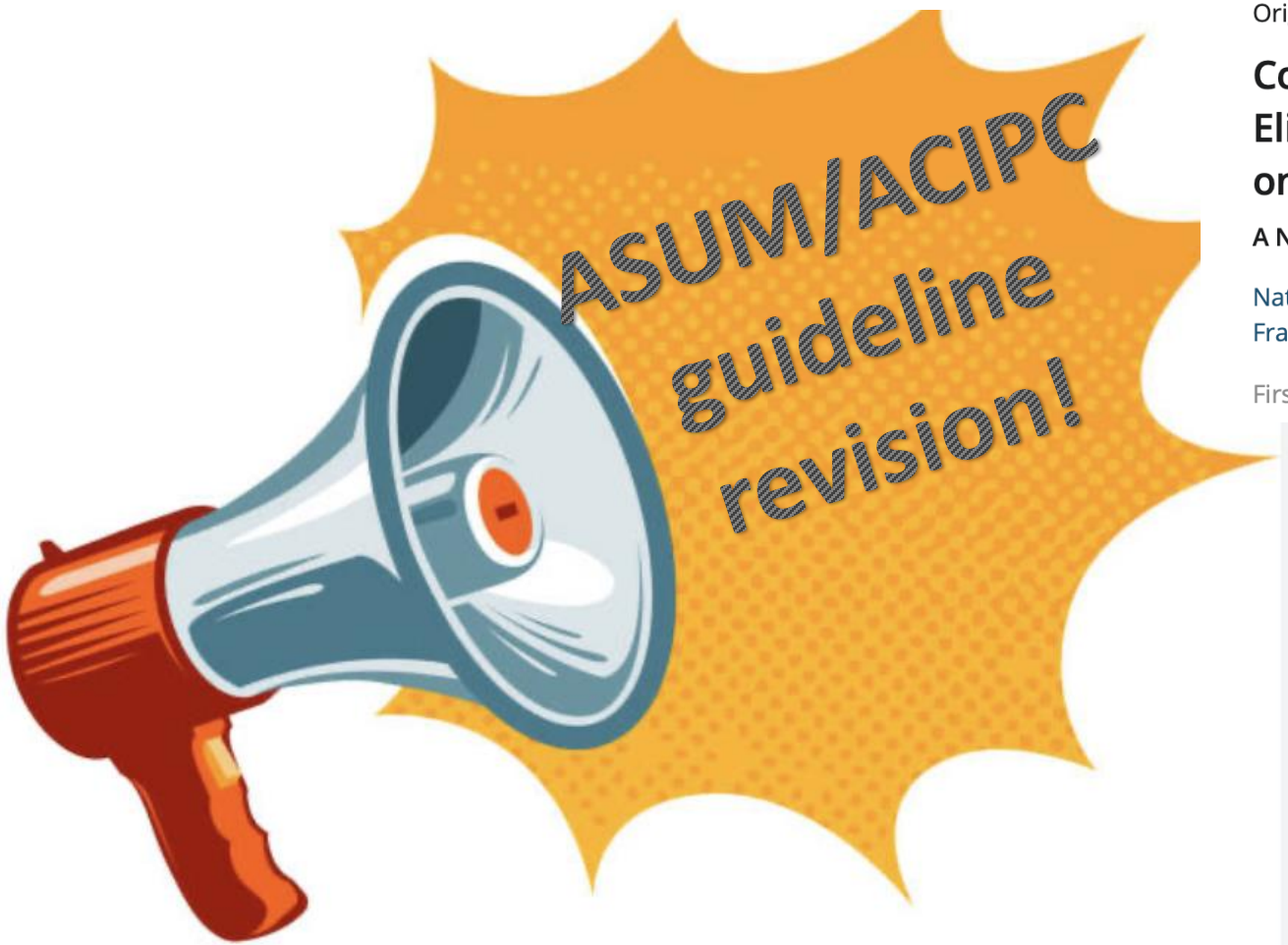
- Simulated contamination
- Unprepared skin & no transducer covers
- No blood present (Occasional, Cleaning, Covers, Sens. BBV)
- One brand of LLD and HLD
- Infection rate – not a faesible outcome

Summary & Implications

LLD is non-inferior to HLD

1. Infection risk from transducer treated with LLD would be no higher than HLD.
2. Widespread real benefits to patients, staff & organisations.
3. Strong evidence for guidelines to adopt LLD as standard.

So, what next….



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Comparison of Low-Level to High-Level Disinfection in Eliminating Microorganisms From Ultrasound Transducers Used on Skin

A Noninferiority Randomized Controlled Trial

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Thank you!