SLOAN WATER TECHNOLOGY LTD®

The Liquid Acoustic Wound Stream:

A first-in-patient study for a Novel Medical Device

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Chronic Wounds

Are wounds that fail to heal in a timely manner

- 1.4 m patients & >£5 bn cost annually (UK)
- Leads to pain, reduced mobility & social isolation
- Social deprivation gradient in patient impact
- Infection is largest remediable cause of chronicity
- Current treatment costly, intrusive & poorly implemented

Medical Device Regulation

- It is illegal
  - To sell; or
  - To use

a medical device without the approval of the regulator

Approval:

- Medicines and Healthcare products Regulatory Authority (MHRA)
  - UKCA for Great Britain
  - UKNI CE for Northern Ireland
  - CE for Europe

Approval

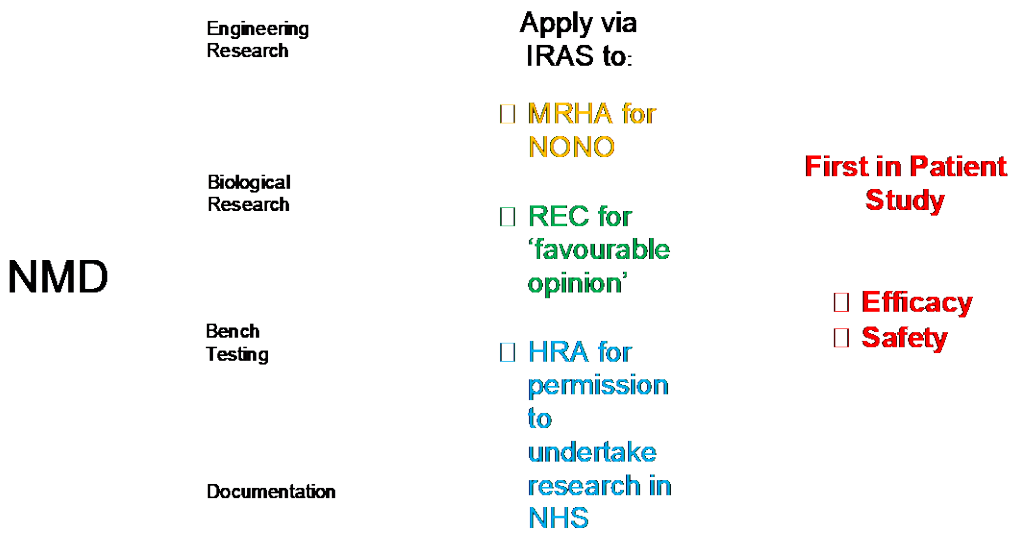
A medical device may not be used on patients without approval

Unless the device is used on patients, it can't be approved

So the trial must be authorised

Describe and justify the proposed study (with evidence) to

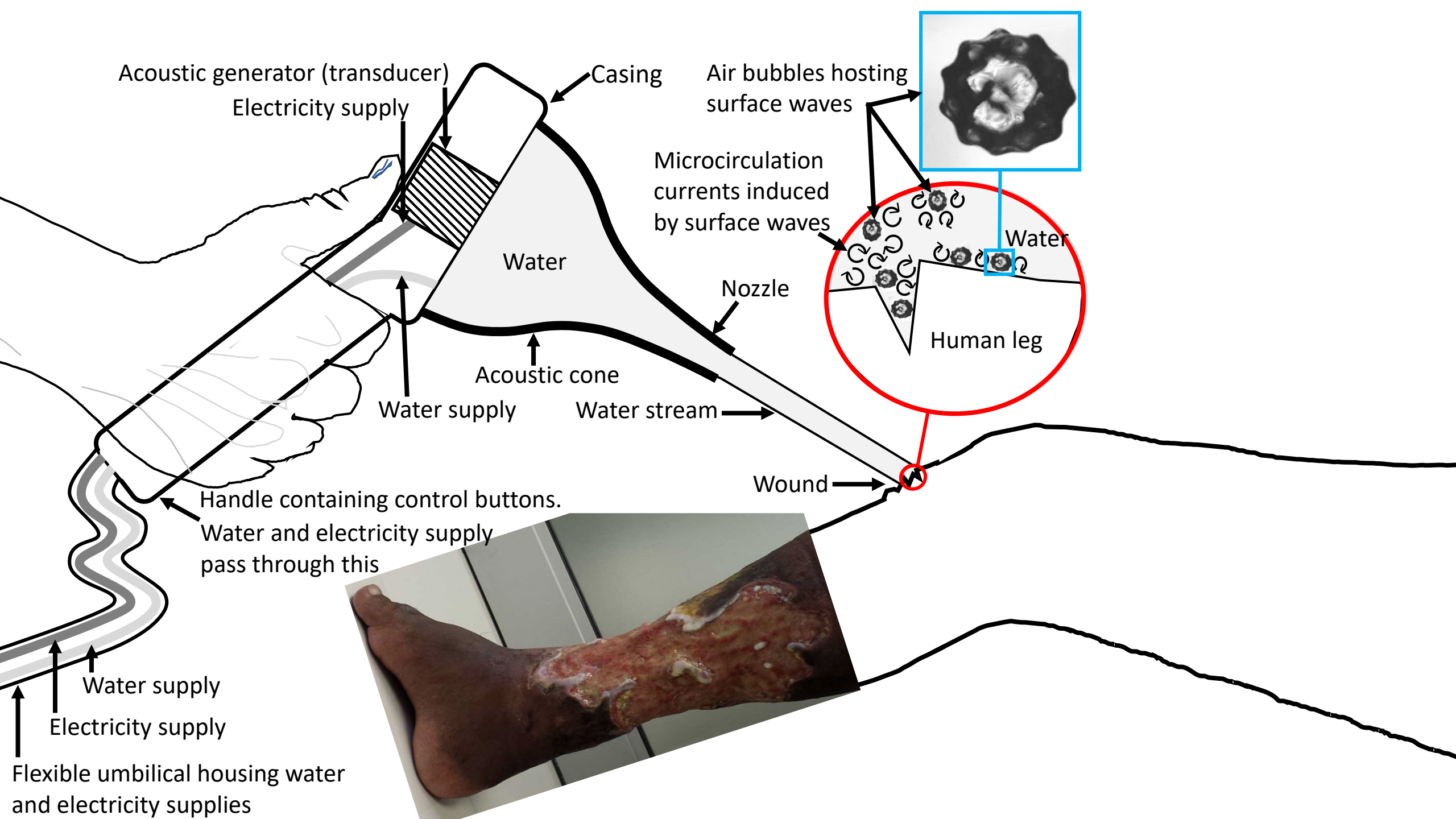
- Medical and Healthcare products Regulatory Agency (MHRA)
  - Efficacy & Safety
  - Notice of No Objection (NONO)
- Research Ethics Committee (REC)
  - Favorable Opinion
- Health Research Authority
  - Permission



Claim & Justification:

The LAWS device safely removes bacteria & biofilm (B&B) from chronic wounds

- B&B present in all wounds
- B&B delays healing
- Removal of B&B improves healing
- Current removal methods ineffective, costly and intrusive
- Our device removes B&B safely from infected wound models
- This First-in-Patient study will demonstrate removal of real world B&B


Acoustic generator (transducer)
Electricity supply
Casing
Air bubbles hosting surface waves
Microcirculation currents induced by surface waves
Water
Nozzle
Water
Human leg
Acoustic cone
Water supply
Water stream
Wound
Handle containing control buttons.
Water and electricity supply pass through this
Water supply
Electricity supply
Flexible umbilical housing water and electricity supplies

Purpose of Study

Primary objective / outcome

- Provide efficacy data

Secondary objectives / outcomes

- Provide additional safety data
- Provide patient acceptability data for device
- Estimate early wound healing rate
- Estimate organizational parameters for future RCT

Primary Objective - Efficacy

Provide efficacy data to support claimed action of LAWS device

Study Questions

- Does LAWS remove bacteria of either planktonic or biofilm phenotype
- If yes, by how much
- Establish a dose response curve
- Is washing with LAWS better than washing with plain water
- Bacterial Load Assessment
  - Sampling
  - Analysis

Bacterial Load Measurement

Sampling

- Swabbing the wound using the Levine technique
  - Tissue sampling unsuitable for older patients with compromised skin healing

Analysis

- qPCR for 16S rRNA gene (present in all bacteria)
  - Culture based assay only counts live aerobic bacteria from some species

How many patients are required?

- Result of qPCR is ‘x’ genome copies (or bacteria) per sample
- May be in the range 10^4 to 10^9 (ex publish studies)
- Use log transformed data to ensure normal distribution
- We want to see a 2 log reduction (99% removal) with treatment (clinical significance)
- Set alpha error (false positive rate) at 0.05 (p value); and
- Set beta error {1- [false negative rate]} at 90%
- Assume ‘x’, before treatment is 8, after treatment is 6 and SD of 1

Study Size &Output:

Each group must contain at least 5 participants

Numerical Analysis (statistical significance)

Swab results, in genome copies per swab, assembled in a 2x2 table

	Control group	Treatment group
Before washing	a	b
After washing	c	d

If LAWS removes bacteria, then b > d

If LAWS better than water, then [b-d] > [a-c]

Measure significance with Student's t-test

Thank you