■ CONCEPT STAGE — Pre-development propo

Acoustic Diagnostic Mesh System

A wearable, non-invasive first-line triage tool for dynamic head and neck diagnostics

The ADMS uses an array of MEMS microphones and inertial sensors embedded in a flexible mesh to passively capture the acoustic signatures of bones, joints, tendons, arteries, and soft tissues during natural movement. A 5–10 minute session produces a structured, AI-interpreted output that supports evidence-based triage decisions — without radiation, specialist attendance, or invasive procedure. This concept addresses a well-documented NHS diagnostic gap: dynamic conditions that are invisible to static CT and MRI, yet responsible for significant referral burden and diagnostic delay.

£2M–£8M
Estimated annual saving per NHS Trust

5–10 min
Session time. No radiation. No specialist required at triage

Class IIa
Expected MHRA/UKCA device classification

THE DIAGNOSTIC GAP ADMS ADDRESSES

Static Imaging Blindspot

CT and MRI capture anatomy at rest. A cervical joint that misaligns only at 35° of rotation appears entirely normal on static scan — yet symptoms are real and disabling.

Referral Cost Pressure

A single MRI costs £350–£800. Head and neck imaging referrals have risen 23% over five years. ADMS is designed as upstream triage — reducing unnecessary scan orders at source.

Diagnostic Delay & Harm

Patients with hidden mechanical or vascular causes can wait months or years for correct diagnosis. ADMS surfaces acoustic indicators earlier, enabling faster, targeted escalation.

Acoustic Signature Palette — Tissue Types & Frequency Ranges

Bone / Joint	Tendon / Ligament	Artery / Vessel	Fluid / Soft Tiss.	Muscle Fibre
200–2k Hz	500–5k Hz	20–500 Hz	10–200 Hz	50–400 Hz
Misalignment · degeneration	Laxity · micro-tear	Stenosis · compression	CSF anomaly · oedema	Tone · spasm · nerve tension

HOW THE ADMS WORKS

A flexible mesh containing MEMS microphones and IMU motion sensors is placed over the patient's head and neck. The patient reproduces their symptomatic movements. Every acoustic event is captured with a precise 3D source location and the exact motion that triggered it. An AI model triangulates source positions, classifies tissue type by frequency signature, and maps findings against a validated anatomical model. The clinician receives a structured output — not raw audio — showing which structure, what sound type, and what movement is involved. This is a triage support tool; clinical judgement and escalation thresholds remain with the clinician at all times.

Technology Precedent

Geophysics

Seismic sound maps underground formations at kilometre depth

Ultrasound

Sound already reveals internal anatomy non-invasively in routine NHS use

Smartphone IMU

Consumer sensors track motion to sub-degree precision

MEMS Mic Arrays

ADMS-Guided Clinical Pathway

1	2	3	4	5
Patient Presents	**ADMS Session**	**AI Analysis**	**Triage Decision**	**Targeted Action**
GP / ENT / ED head or neck complaint	5–10 min scan acoustic-motion map	Tissue type · source location · confidence	Low / Moderate / High complexity flag	Discharge · referral or urgent imaging

CLINICAL SAFETY & GOVERNANCE

HIGH **False Negative Risk**

ADMS must not be used to rule out serious pathology. It functions as a triage supplement, not a diagnostic replacement. Clinical protocols must specify mandatory escalation thresholds.

HIGH **AI Misclassification**

All AI outputs carry uncertainty. Clinician override is always available. Confidence intervals and output explainability are embedded requirements — not optional design features.

MED **Infection Control**

Single-use liners or validated decontamination protocols required. Materials must be compatible with standard NHS cleaning agents. IPC compliance assessed before clinical deployment.

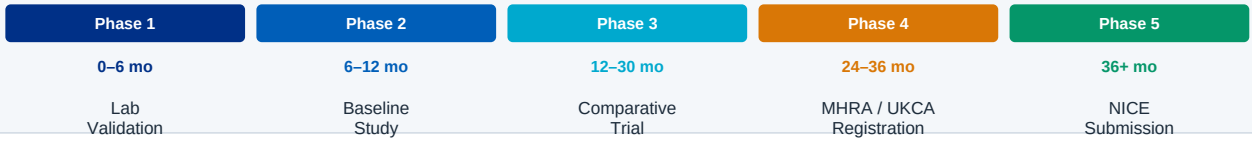
LOW **Direct Patient Harm**

ADMS emits no energy into the body. Contraindication screening required for acute cervical instability. Session duration is short; skin irritation risk is minimal with hypoallergenic materials.

Governance: ADMS deployment requires a Clinical Oversight Committee (radiologists, neurologists, ENT, patient safety lead). A Clinical Safety Case under DCB0129/DCB0160 is required before any clinical use. Adverse events must integrate with the NHS NRLS reporting system.

EVIDENCE & REGULATORY PATHWAY

Evidence & Regulatory Roadmap



MINIMUM ACCEPTABLE PERFORMANCE THRESHOLDS

≥ 85%

Sensitivity

Protects against false negatives — no missed serious pathology

≥ 75%

Specificity

Prevents unnecessary escalation from false positive outputs

≥ 90%

Negative Predictive Value

For vascular and neurological categories specifically

Required

Subgroup Performance

Validated across age >65, high BMI, and paediatric populations

DATA GOVERNANCE & GDPR

Lawful Basis

Article 9(2)(h) — medical diagnosis and treatment — with explicit patient consent.

Data Architecture

Raw audio never transmitted externally. Only processed feature vectors used for AI training. NHS-approved cloud infrastructure.

DPIA

Mandatory before deployment. Novel biometric data type triggers high-risk classification under ICO guidance.

NHS DSPT

Full compliance with NHS Data Security and Protection Toolkit required. Annual certification.

Research Atlas / Biomechanics Dataset

Anonymised acoustic data governed by REC approval, Data Access Agreement, and published governance policy.

INVITING CONVERSATION — NOT MAKING DEMANDS

Feasibility Discussion

We welcome an initial conversation with NHS Innovations or a willing clinical lead to explore whether this concept aligns with current diagnostic priorities.

Academic Partnership

We are actively seeking a university or NHS research partner to co-develop the laboratory validation phase — the essential first step before any clinical work.

Innovation Programme

This concept may be a candidate for NHSX Digital Health, Academic Health Science Networks, or MedTech Funding Mandate — subject to further assessment.