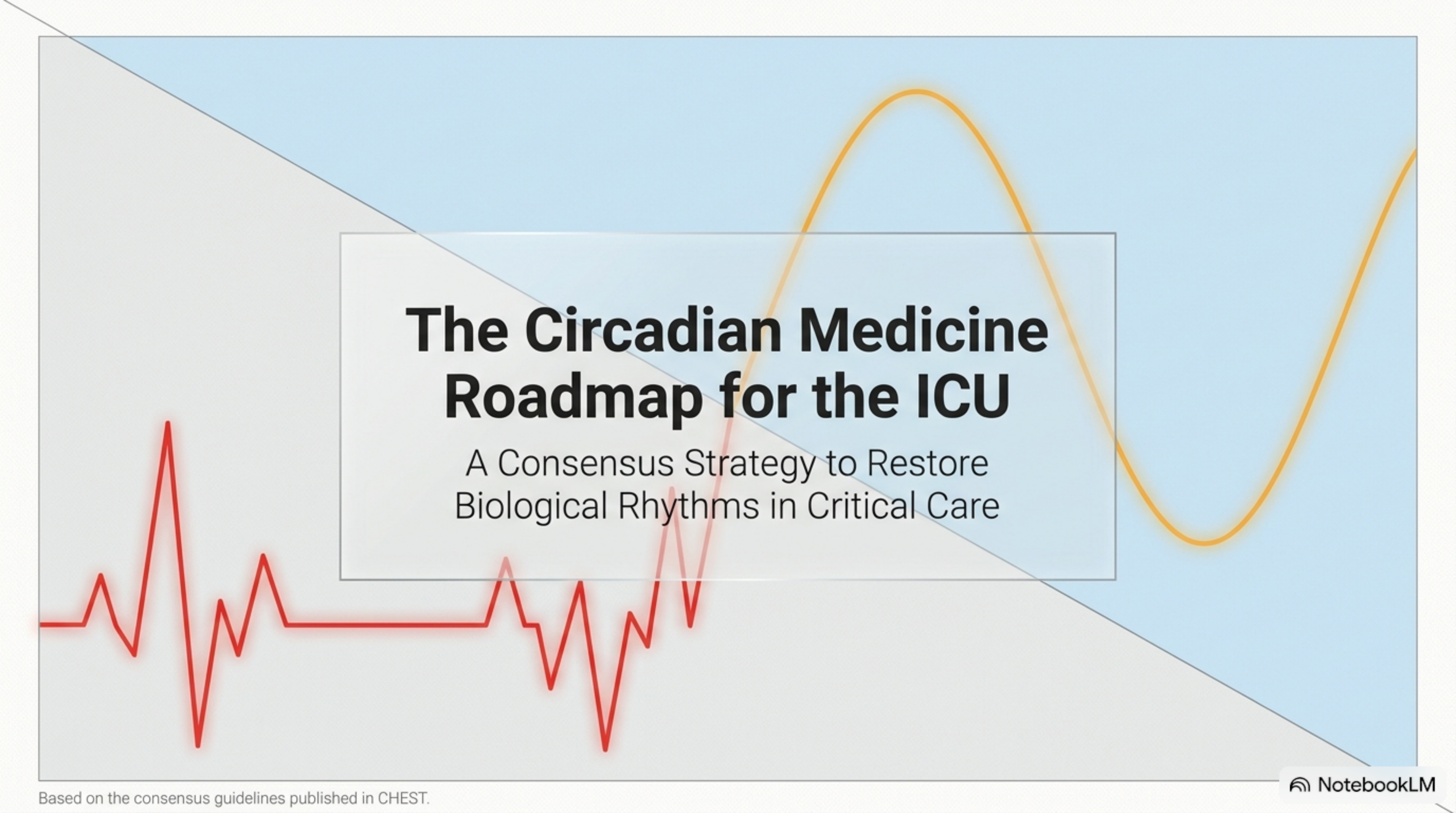


The background of the slide features a light blue upper half and a light grey lower half, separated by a diagonal line. A red ECG line is visible in the lower-left quadrant, and a large orange sine wave spans across the upper-right quadrant.

The Circadian Medicine Roadmap for the ICU

A Consensus Strategy to Restore
Biological Rhythms in Critical Care

Healing Requires Rhythm. The ICU Abolishes It.

The Biological Imperative



In healthy states, most organ systems express 24-hour molecular and physiological rhythms synchronized by behavior and environment.

The Clinical Disruption



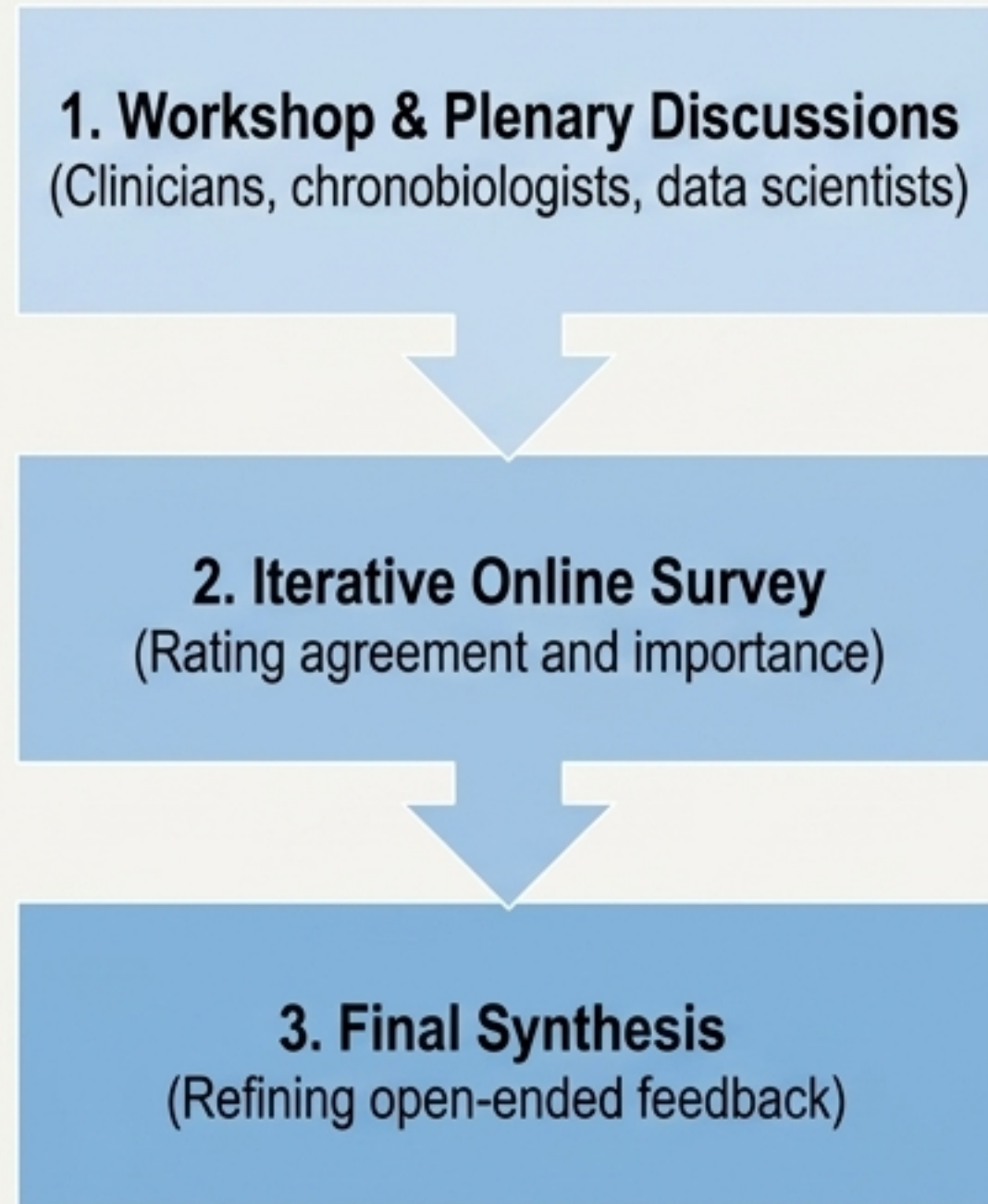
The ICU environment, medical interventions, and critical illness itself sever these timing cues. This adaptive response, if persistent, impairs coordinated organ function and delays recovery.

The Anatomy of Desynchronization

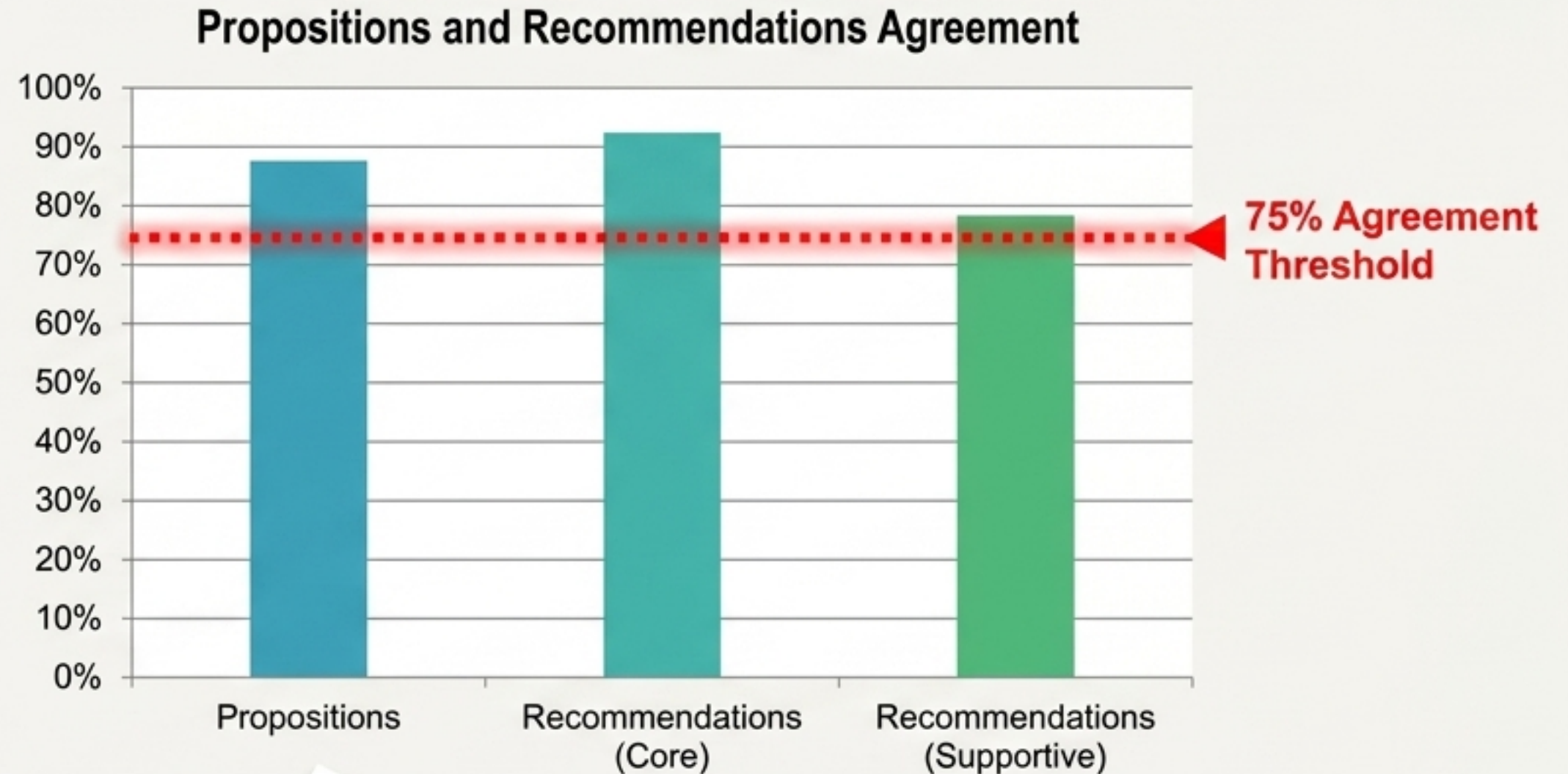
Rhythmic Daily Life	Arrhythmic ICU
 Natural light and darkness	 Constant artificial light
 Daytime nutrition and overnight fast	 Continuous enteral nutrition
 Activity and rest cycles	 Reduced activity, immobility, and sedation
 Normal ambient sound	 Constant noise, healthcare processes, and mechanical ventilation
	

Establishing the Consensus Framework

The Process



The Standard



Every Proposition and Recommendation retained in this roadmap exceeded a strict 75% predefined agreement threshold among the expert panel.

The Foundational Tenets of Circadian ICU Medicine

Synthesizing the 6 Core Propositions into Three Strategic Pillars



Biological Promise

Translating circadian biology to clinical care holds immense promise for improving acute and long-term outcomes, though significant evidence gaps remain.

Propositions 1 & 2



Clinical Reality

Rhythm disruption is highly prevalent. It is unclear if restoring clock function benefits all patients equally, or only specific subgroups at certain illness stages.

Propositions 3 & 4

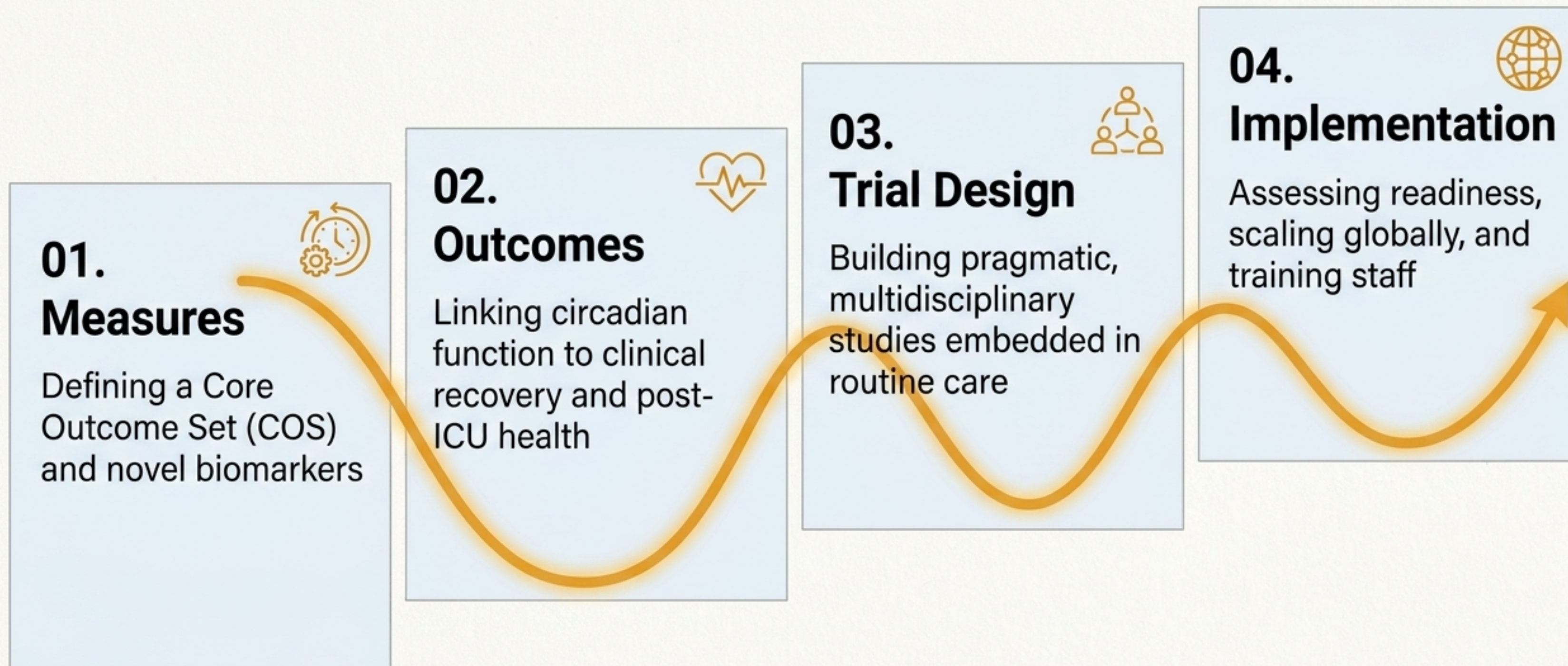


The Measurement Gap

Conventional measures of circadian function are often invalid in critical illness. Coordinated education and novel, validated measurement tools are urgently required.

Propositions 5 & 6

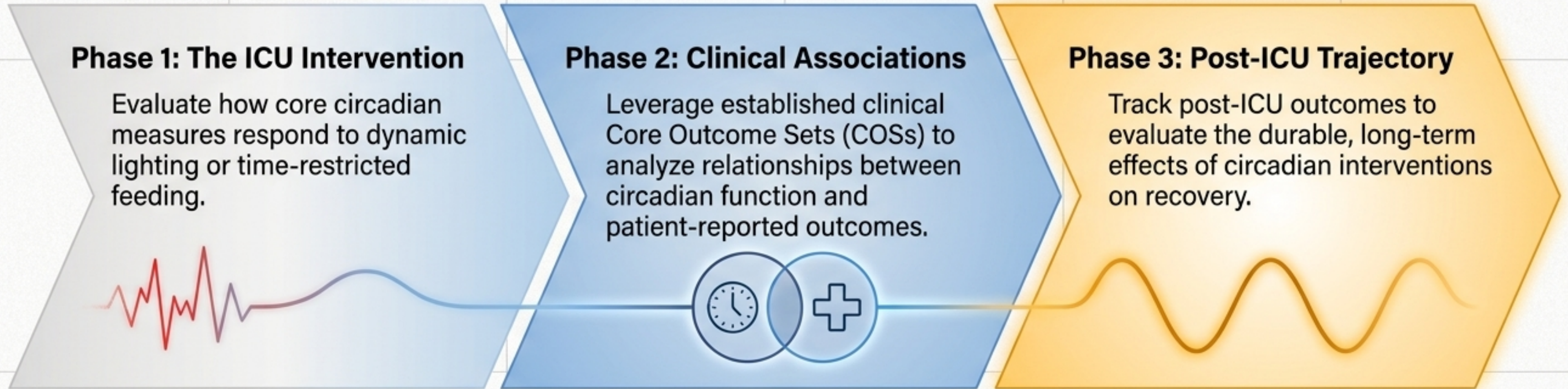
The 4-Pillar Implementation Strategy



Pillar 1: Reimagining Circadian Measurement

The Failure of Standard Proxies	The Mandate for a Core Outcome Set
A.  Actigraphy: Unreliable due to patient immobility, sedation, or ICU-acquired weakness.	 Develop a consensus-driven Core Outcome Set (COS) specific to the ICU. Leverage routinely collected clinical data and apply advanced data science methods. Ensure accurate, automated time-stamping of all routine clinical care to facilitate 24-hour rhythm analysis.
B.  Vital Signs (HR, BP, Temp): Confounded by critical care interventions (e.g., vasopressors, ECMO, atrial fibrillation).	

Pillar 2: Linking Rhythm to Recovery Outcomes



Critical Insight: Rhythms may change dynamically. Interventions might be most effective at specific stages of illness—for example, if initial flatlining is an adaptive defense mechanism, timing the intervention to the later recovery phase is critical.

Pillar 3: Designing the Pragmatic Circadian Trial

Embed low-risk circadian interventions directly into routine clinical care.



Must include physicians, nurses, dietitians, physiotherapists, data scientists, basic scientists, and patient advocates.



Must report illness stage, clinical classifications, predisposing disruption factors, and define Minimum Clinically Important Differences.



Evaluate not just clinical efficacy, but **staff acceptance, cost, and potential contamination bias (spillover to control patients)**.

Pillar 4: Global Implementation & Dissemination



1. Local Readiness

Assess the cultural factors, potential barriers, and readiness of local healthcare settings before altering routines.



2. Educational Infrastructure

Develop targeted educational resources and clinician training programs for ICU staff to ensure protocol compliance and understanding.



3. Global Multicenter Scaling

Ensure international multicenter trials are broadly representative. Implementation models must span a spectrum of economic settings, explicitly including both low-income and high-income regions to prove universal feasibility.

The Vision: The Circadian-Optimized ICU

Biological Disruption

Synchronized Recovery



By translating chronobiology into critical care through rigorous, multidisciplinary trials, we can create environments that actively synchronize with patient biology to accelerate recovery.