

## PRESS RELEASE

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## Standardising wearable sleep data for clinical, research, and public health use

***New Fundamental Sleep Measures (FSM) Specification establishes a common language for sleep tracking, paving the way for more meaningful clinical care, research, and public health.***

**SINGAPORE and ROCHESTER, MN** — Consumer wearables have transformed the ability to monitor sleep over weeks, months and even years. Yet a surprisingly basic problem remains: two devices may report a measure called “total sleep time” while defining, calculating or quality-controlling it differently.

A multinational, multidisciplinary team of sleep scientists, clinicians, and engineers from academia and industry convened by World Sleep Society has developed a specification designed to address this problem. Published in [Sleep Medicine](#), the proposed framework establishes common definitions and data standards for a core set of Fundamental Sleep Measures (FSMs) generated by consumer health trackers.

The goal is not to make every wearable work in the same way. Manufacturers would remain free to choose their sensors, algorithms, machine-learning approaches, and consumer-facing interfaces. Instead, the specification standardises what key sleep measurements mean when they are exported for clinical, research or public-health use.

### **The same name should mean the same thing**

Measures such as total sleep time, sleep efficiency, wake after sleep onset and sleep regularity are already widely reported by wearable devices. However, identically named measures may not refer to the same construct across manufacturers, limiting their comparability and usefulness in healthcare and research.

The new specification addresses this by defining a common semantic framework for fundamental measures including sleep onset and offset, the main sleep period, sleep duration, wake after sleep onset, sleep regularity, 24-hour sleep including naps, and subjective sleep satisfaction. It also introduces explicit rules for handling missing or uncertain data.

Professor Michael Chee, Director at the Centre for Sleep and Cognition, NUS Yong Loo Lin School of Medicine (NUS Medicine) who led the team, said, “People naturally assume that a measurement called ‘Total Sleep Time’ means the same thing regardless of which device

produced it. In reality, manufacturers often use different definitions, algorithms, and quality controls.”

“Without common definitions, it is difficult for clinicians, researchers and healthcare systems to know whether they are comparing like with like.” added Professor Sean Drummond, School of Psychological Sciences, Turner Institute for Brain and Mental Health, Monash University, co-chair of the specification team.

### **From interesting data to useful health information**

Wearables have a major advantage over traditional sleep assessments: they can characterise sleep repeatedly in everyday life and over long periods. But exploiting that information clinically requires more than accurate sensors.

Healthcare systems depend on standardised measurements. Blood pressure, laboratory tests and other clinical measurements are useful partly because clinicians understand what a reported value represents. Wearable sleep data currently lack an equivalent level of consistency. This becomes particularly important as consumer-generated health information begins to enter electronic health records (EHRs).

The specification therefore focuses on the underlying data architecture required for interoperability. It defines not only sleep measures but also their metadata, provenance, quality indicators, time boundaries, and rules for dealing with incomplete recordings. Its objective is to allow data produced by different devices to be interpreted consistently by EHRs, research databases and population-health systems.

### **Focusing on measures people can understand—and act upon**

The framework deliberately emphasises fundamental and interpretable aspects of sleep rather than proprietary scores or detailed estimates of sleep stages.

This distinction matters clinically. A person can take practical steps to provide adequate opportunity for sleep, adjust when they attempt to sleep, or establish a more regular schedule. By contrast, consumers have much less direct control over proprietary measures such as a “deep sleep score,” whose definitions and algorithms can vary among devices.”

The specification also distinguishes behavioural intention from physiology. A person's decision to try to sleep is not the same thing as the physiological onset of sleep, and the framework requires those concepts to be represented separately.

Similarly, it recommends replacing ambiguous terminology where necessary. Rather than using “Sleep Efficiency” when a wearable cannot independently establish that a person was actually in bed *attempting to sleep*, the specification defines a reproducible ‘Sleep Percentage’ based on sleep occurring between physiological sleep onset and offset.

### **Standards without suppressing innovation**

An important principle of the project is that interoperability should not require manufacturers to disclose proprietary algorithms or build identical products.

The specification does not prescribe which sensors should be used, how algorithms should be constructed or made public, how sleep stages should be classified, or what manufacturers should display in their apps. Instead, it establishes common backend meanings for a minimum set of measures. In other words, manufacturers can continue to compete on hardware, algorithms, design and user experience while still communicating fundamental sleep information in a common language.

### **Built jointly by academic, clinical, and industry experts**

The specification, developed by a 16-member international team of academic scientists working with industry counterparts, built consensus on multiple complex issues over months of iterative discussions.

The cooperation of industry scientists from five companies that compete in the marketplace is unprecedented in this field, and was invaluable in ensuring the specification is not merely an academic exercise but a practical framework that can be readily incorporated into products.

“The collaboration demonstrates the value of the World Sleep Society mission, convening diverse stakeholders across sleep science and medicine to turn emerging challenges into opportunities”, noted Allan O’Bryan, Executive Director of the World Sleep Society.

### **Building the infrastructure for longitudinal sleep health**

The authors see standardisation as an important step toward a larger goal: moving wearable sleep information from isolated proprietary ecosystems toward data that can be meaningfully used across healthcare and public-health systems.

Long-term wearable data could eventually allow clinicians to consider not simply how someone slept last night, but whether they routinely obtain adequate sleep, maintain a stable schedule, or show sustained changes in sleep patterns alongside changes in health. For such applications to become scientifically credible, however, a basic requirement comes first: everyone must mean the same thing when they report the same sleep measure.

*“Wearables have given us an unprecedented ability to observe sleep in everyday life. Standardisation is what can turn those observations into information that clinicians, researchers and health systems can reliably understand and use”, Prof Chee concluded.*

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### **About National University of Singapore (NUS)**

The National University of Singapore (NUS) is Singapore's flagship university, which offers a global approach to education, research, and entrepreneurship, with a focus on Asian perspectives and expertise. We have 15 colleges, faculties, and schools across three campuses in Singapore, with more than 40,000 students from 100 countries enriching our vibrant and diverse campus community. We have also established around 15 NUS Overseas Colleges entrepreneurial hubs around the world.

Our multidisciplinary and real-world approach to education, research, and entrepreneurship enables us to work closely with industry, governments, and academia to address crucial and complex issues relevant to Asia and the world. Researchers in our faculties, 30 university-level research institutes, research centres of excellence and corporate labs focus on themes that include energy; environmental and urban sustainability; treatment and prevention of diseases; active ageing; advanced materials; risk management and resilience of financial systems; Asian studies; and Smart Nation capabilities such as artificial intelligence, data science, operations research, and cybersecurity.

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### **About the NUS Yong Loo Lin School of Medicine (NUS Medicine)**

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Through a dynamic and future-oriented five-year curriculum that is inter-disciplinary and inter-professional in nature, our students undergo a holistic learning experience that exposes them to multiple facets of healthcare and prepares them to become visionary leaders and compassionate doctors and nurses of tomorrow. Since the School's founding in 1905, more than 12,000 graduates have passed through our doors.

In our pursuit of health for all, our strategic research programmes focus in innovative, cutting-edge biomedical research with collaborators around the world to deliver high impact solutions to benefit human lives.

The School is the oldest institution of higher learning in the National University Health System. It is one of the leading medical schools in Asia and ranks among the best in the world (Times Higher Education World University Rankings 2026 by subject and the Quacquarelli Symonds (QS) World University Rankings by Subject 2026).

For more information about NUS Medicine, please visit <https://medicine.nus.edu.sg/>

### **About World Sleep Society**

World Sleep Society is a professional association of sleep researchers and clinicians whose mission is to convene the world of sleep medicine science, practice and advocacy. World Sleep Society operates research, educational, and advocacy programs for the international professional sleep community, including the biennial World Sleep Congress, which hosts the largest live scientific program in sleep