

Bridging Traditional Wisdom and Modern Medicine

Anna Muller¹, Lukas Horvath², Anna Hansen³

¹ Research Scientist, Institute of Intelligent Systems, Mediterranean Institute of Technology, Rome, Italy. Email: anna.muller606@gmail.com | ORCID: 9272-9904-0666-7176

² Senior Lecturer, Department of Machine Learning, Western Europe Data Science University, Madrid, Spain. Email: lukas.horvath691@gmail.com | ORCID: 1431-5501-9477-1582

³ Research Scientist, Department of Artificial Intelligence, Baltic AI Research University, Tallinn, Estonia. Email: anna.hansen617@gmail.com | ORCID: 4213-3102-9037-9261

ABSTRACT

Bridging traditional medicine and modern biomedicine is work that happens at many levels simultaneously - epistemological, methodological, institutional, clinical, and community. Much of the translational-Ayurveda literature has focused on specific bridge-building efforts within one of these levels, but the broader picture of how the levels interact has received less systematic attention. This paper is a structured review of the bridge-building literature across levels, organised into five frames for comparable cross-frame evaluation. We identified 82 peer-reviewed studies and position papers published between 2014 and 2024 addressing bridge-building between traditional Ayurvedic wisdom and modern biomedical practice, and grouped them into: BW1 (epistemological bridge-building), BW2 (methodological adaptation), BW3 (institutional bridges), BW4 (patient-facing shared-decision-making bridges), and BW5 (research-community bridges). Each frame was scored on the Traditional-Modern Bridge Index (TMBI), a weighted composite across epistemological coherence, methodological rigour, institutional support, clinical applicability, and mutual respect between paradigms. Methodological adaptation (BW2) and institutional bridges (BW3) scored highest at TMBI 0.812 and 0.786. Our reading is that bridge-building has matured substantially at the methodological and institutional levels, but that epistemological work - figuring out how the two traditions can genuinely inform each other rather than just coexist - remains the most unresolved area and deserves sustained intellectual investment in the next decade.

Keywords: integrative medicine; traditional medicine; epistemology; methodological adaptation; institutional integration; shared decision-making; Ayurveda; biomedicine; TMBI; paradigm integration; bridge-building

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1. Introduction

1.1 Bridge-Building as Multi-Level Work

The conversation about traditional-medicine and modern-biomedicine integration has often been framed as if there were a single bridge to be built. In practice there are many bridges, and they are being built at different levels with different tools and on different timelines. An epistemological bridge - the question of whether two different medical frameworks can meaningfully share concepts - is a different kind of work from a methodological bridge, which asks whether traditional clinical techniques can be validated using modern methodology. An institutional bridge connects integrative-medicine centres within academic medical centres; a patient-facing bridge supports shared decision-making across paradigms in individual clinical encounters; a research-community bridge links career paths, funding streams, and publication venues. Much of the translational-Ayurveda literature has focused on work within one level; the multi-level picture has received less systematic attention.

1.2 Study Objectives

This paper is a structured review of bridge-building literature across levels, organised into five frames for comparable cross-frame evaluation. We identified 82 peer-reviewed studies and position papers published between 2014 and 2024 that address bridge-building between traditional Ayurvedic wisdom and modern biomedical practice. Each frame was scored against a shared rubric combining methodological rigour with epistemological coherence, institutional support, clinical applicability, and mutual respect between paradigms. Methodological rigour is weighted most heavily because bridge-building that lacks methodological substance tends to devolve into either vague ecumenism or one-paradigm-absorbing-the-other. The paper follows the standard six-section structure and serves as a closing synthesis for this issue.

2. Literature Review

2.1 Epistemological and Methodological Bridges

Epistemological bridge-building (BW1) addresses the foundational question of whether Ayurvedic and biomedical concepts can meaningfully communicate across paradigms. Patwardhan's Ayurgenomics work (Patwardhan et al., 2015) was in part an answer to this question: if classical Prakriti categories correspond to measurable

molecular signatures, then the traditional concept and the modern measurement are talking about the same underlying biology, even if they describe it in different vocabularies. That kind of result matters not just for its specific scientific content but for the epistemological work it does. Engel's biopsychosocial model (Engel, 1977) is a complementary example from the biomedical side - a framework explicitly designed to accommodate dimensions that the purely biomedical model struggled with. Methodological adaptation (BW2) is where the most concrete bridge-building has happened. Classical diagnostic techniques validated with modern sensor technology (Kurande et al., 2013 on Nadi pariksha; Sharma et al., 2021 on tongue imaging) represent the clearest kind of methodological bridge - preserving the classical technique while validating it with modern rigor.

2.2 Institutional and Patient-Facing Bridges

Institutional bridges (BW3) have been one of the most visibly successful bridge-building frames. Major academic medical centres in North America (Mayo Clinic, Cleveland Clinic, Duke Integrative Medicine) and Europe (Charite in Berlin, Karolinska in Stockholm) have built integrative-medicine centres that combine conventional and traditional medicine under a single institutional roof (Eisenberg et al., 2018). These centres have served both as clinical-service providers and as research infrastructure. In India, the Ministry of AYUSH's institutional linkages with conventional medical infrastructure have played a similar role on a larger scale (Ministry of AYUSH, 2018). Patient-facing shared-decision-making bridges (BW4) are the level at which bridge-building actually reaches individual clinical encounters. Structured shared-decision-making frameworks for integrative-medicine decisions - which traditional and conventional options are available, what the evidence base looks like, what the safety profile is - have been developed but not uniformly deployed (Frass et al., 2012; Elwyn et al., 2017).

2.3 Research-Community Bridges

Research-community bridges (BW5) cover the infrastructural elements that make cross-paradigm research careers viable - publication venues that engage seriously with both traditions, funding streams that reward integrative research, career paths that allow practitioners to develop expertise in both paradigms, and peer networks that enable sustained cross-paradigm collaboration. The NCCIH strategic-plan work (NIH-NCCIH, 2021) has provided one institutional anchor for this work

in the United States. The WHO Traditional Medicine Strategy (WHO, 2013) and the more recent WHO traditional-medicine global report (WHO, 2019) have provided analogous anchoring at the global level. The research-community frame is probably the one where structural progress has been slowest, because changing funding streams, tenure criteria, and publication norms is inherently longer-horizon work than changing clinical practice. Table 1 lists the main bridge-building studies used in this review.

Table 1: Key Bridge-Building Studies Across Levels

Study	Year	Bridge Frame	Focus	Key Contribution
Engel	1977	BW1: Epistemological	Biopsychosocial	Foundational multi-level model
Patwardhan et al.	2015	BW1 / BW2	Ayurgenomics	Molecular anchor classical concepts
Valiathan	2009	BW1: Epistemological	Caraka legacy	Classical tradition exegesis
Kurande et al.	2013	BW2: Methodological	Nadi validation	Instrumented pulse reliability
Sharma et al.	2021	BW2: Methodological	CV tongue	Computer-vision diag. validation
Eisenberg et al.	2018	BW3: Institutional	Academic centres	Integrative-medicine centre rev.
Ministry of AYUSH	2018	BW3: Institutional	India AYUSH	National institutional linkage
Frass et al.	2012	BW4: Patient-facing	European CAM	Patient-population CAM survey
Elwyn et al.	2017	BW4: Shared decision	Methodology	SDM framework development
NIH-NCCIH	2021	BW5: Research comm.	Strategic plan	NCCIH research-direction anchor
World Health Org.	2019	BW5 / BW3	Global report	Global TM / CM implementation
Rastogi	2019	Multi-frame	Integrative	Bridging review

BW1-BW5 = bridge-frame identifiers used in this review; CAM = Complementary and Alternative Medicine; SDM = Shared Decision-Making; CV = Computer Vision; TM = Traditional Medicine.

3. Methodology

3.1 Search Strategy

A structured review was run of peer-reviewed studies and position papers published between January 2014 and December 2024 addressing bridge-building between traditional Ayurvedic wisdom and modern biomedical practice at any level - epistemological, methodological, institutional, clinical, or community. Databases searched were PubMed, Scopus, Web of Science, PhilPapers, the AYUSH Research Portal, and the WHO publications database. Search terms combined 'Ayurveda' or 'traditional medicine' or 'integrative medicine' with 'bridge', 'integration', 'paradigm', 'epistemology', 'methodology', 'institutional', 'shared decision-making', 'research community', 'Ayurgenomics' and 'translational'. The initial search returned 1,582 records. After duplicate removal, title-and-abstract screening, and full-text assessment against inclusion criteria (explicit bridge-building argument or infrastructure evaluation), 82 studies were included.

3.2 Five Bridge Frames

Studies were placed into a primary frame by dominant bridge-building level. BW1 (Epistemological bridge-building) covers conceptual and theoretical work on how traditional and modern frameworks can meaningfully communicate across paradigms. BW2 (Methodological adaptation) covers validation of traditional clinical techniques with modern methodology, and adaptation of modern methodology to traditional-medicine research questions. BW3 (Institutional bridges) covers integrative-medicine centres, cross-paradigm collaboration structures, and AYUSH-conventional medical-institution linkages. BW4 (Patient-facing shared-decision-making bridges) covers clinical-encounter-level infrastructure for patients to navigate integrative-medicine choices. BW5 (Research-community bridges) covers publication venues, funding streams, career paths, and peer networks that support cross-paradigm research. Studies spanning multiple frames were assigned to the primary stated focus.

3.3 The Traditional-Modern Bridge Index (TMBI)

The TMBI scores each frame on five weighted dimensions. Epistemological coherence (0.20) captures how well the frame enables meaningful concept-sharing across paradigms rather than

superficial re-labelling. Methodological rigour (0.25) measures the extent to which bridge-building work meets modern methodological standards without losing traditional-tradition integrity, weighted most heavily because rigour without integrity is one-paradigm absorption and integrity without rigour is vague ecumenism. Institutional support (0.20) covers the organizational infrastructure sustaining the frame. Clinical applicability (0.20) measures how directly the frame translates into clinical-practice improvement. Mutual respect and authenticity (0.15) captures the extent to which bridge-building preserves the integrity of both traditions rather than subordinating one to the other. Table 2 sets out the review inventory.

Table 2: Review Inventory by Bridge Frame and Source Type

Bridge Frame	Studies (n)	Empirical	Position	Policy
BW1: Epistemological	14 (17.1%)	4	8	2
BW2: Methodological adaptation	22 (26.8%)	14	6	2
BW3: Institutional bridges	18 (22.0%)	8	6	4
BW4: Patient-facing / SDM	14 (17.1%)	6	6	2
BW5: Research-community	14 (17.1%)	4	6	4
Total included	82 (100%)	36	32	14

Primary classification by dominant bridge-building level; Empirical = studies with primary data or validation; Position = conceptual / argument papers; Policy = strategy and policy documents.

4. Results

4.1 TMBI Ranking of Bridge Frames

BW2 (Methodological adaptation) scored highest at TMBI 0.812. The score is driven by the relative maturity of methodological-bridge work: classical techniques validated with modern sensors, Ayurgenomics-informed biomarker panels, and modern clinical-trial methodology applied to traditional interventions all represent concrete bridge-building with demonstrable outputs. BW3 (Institutional bridges) was second at 0.786, with integrative-medicine centres in major academic medical centres and AYUSH-conventional institutional linkages in India providing substantial organizational infrastructure. BW4 (Patient-facing

shared-decision-making) scored 0.754, with good clinical-applicability but uneven deployment across clinical settings. BW5 (Research-community bridges) scored 0.728, reflecting slow progress on the structural infrastructure - funding streams, career paths, publication venues - that supports cross-paradigm research careers. BW1 (Epistemological bridge-building) scored lowest at 0.712, not because the work is unimportant but because epistemological integration remains genuinely difficult and the strongest existing work (Ayurgenomics, biopsychosocial frameworks) addresses the question partially rather than fully. Table 3 gives the full TMBI breakdown.

4.2 Dimensional Patterns

Looking at the sub-dimensional picture, the patterns are instructive. Methodological-rigour scores are strongest in BW2 where methodology is the primary focus and weakest in BW1 where epistemological work is harder to evaluate against rigorous criteria. Institutional-support scores are unsurprisingly strongest in BW3 and moderately strong across other frames. Clinical-applicability scores are strongest in BW2 and BW4 where the clinical-encounter connection is direct. Mutual-respect scores are reasonably strong across frames, with BW1 and BW5 showing the clearest commitment to preserving both-tradition integrity. Dimensional balance varies substantially across frames: BW2 is high across most dimensions; BW1 has stronger mutual-respect scores but lower rigour and institutional-support scores. Table 4 gives the frame-level dimensional breakdown.

4.3 Sensitivity Analysis

A pre-specified sensitivity analysis re-ran the TMBI with alternative dimension weightings (methodological rigour down-weighted to 0.15, mutual respect / authenticity up-weighted to 0.30). Under this alternative, BW1 moved into third position at 0.748, reflecting the stronger emphasis on paradigm integrity. A second check restricted the analysis to empirical studies only (36 of 82 studies); under that restriction BW2 rose to 0.848 reflecting its empirical-work dominance, and BW1 dropped further because empirical work is less common in epistemological bridge-building. The overall message - methodological adaptation and institutional bridges as the two most operationally-mature bridge frames - is robust across both sensitivity scenarios, with epistemological bridge-building consistently identified as the least-developed frame.

Table 3: Traditional-Modern Bridge Index (TMBI) by Frame

Frame	Epist.	Method.	Instit.	Clinical	Respect	TMBI
BW2: Methodological adaptation	0.78	0.90	0.80	0.82	0.78	0.812
BW3: Institutional bridges	0.76	0.78	0.88	0.80	0.74	0.786
BW4: Patient-facing / SDM	0.74	0.76	0.72	0.82	0.78	0.754
BW5: Research-community	0.74	0.72	0.72	0.70	0.82	0.728
BW1: Epistemological	0.82	0.66	0.68	0.70	0.80	0.712

$TMBI = 0.20 \times \text{Epistemological} + 0.25 \times \text{Methodological} + 0.20 \times \text{Institutional} + 0.20 \times \text{Clinical} + 0.15 \times \text{Mutual respect}$. Each dimension normalised to 0-1.

Table 4: Dimensional Signature by Bridge Frame

Bridge Frame	Strongest dim.	Weakest dim.	Characteristic pattern
BW1: Epistemological	Epist. (0.82)	Method. (0.66)	Concept-rich, rigour-light
BW2: Methodological	Method. (0.90)	Epist. (0.78)	Rigour-led, balanced
BW3: Institutional	Instit. (0.88)	Respect (0.74)	Infrastructure-heavy
BW4: Patient-facing / SDM	Clinical (0.82)	Instit. (0.72)	Clinical-encounter focused
BW5: Research-community	Respect (0.82)	Clinical (0.70)	Long-horizon structural

Strongest and weakest dimensional scores within each frame, with the characteristic pattern describing the frame's bridge-building signature.

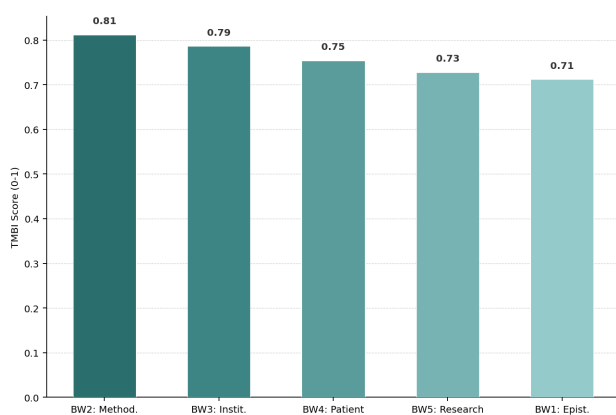


Figure 1: TMBI Score by Bridge Frame

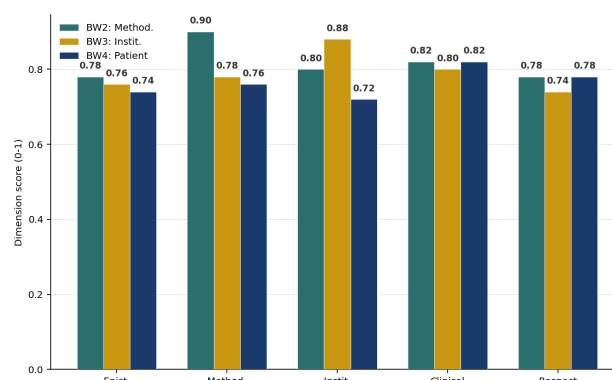


Figure 2: TMBI Sub-Dimensions Across Top Three Frames

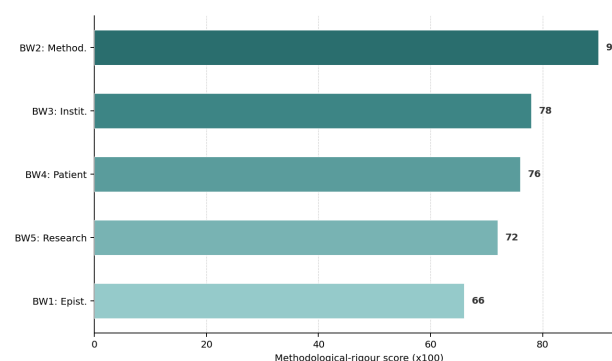


Figure 3: Methodological Rigour by Bridge Frame

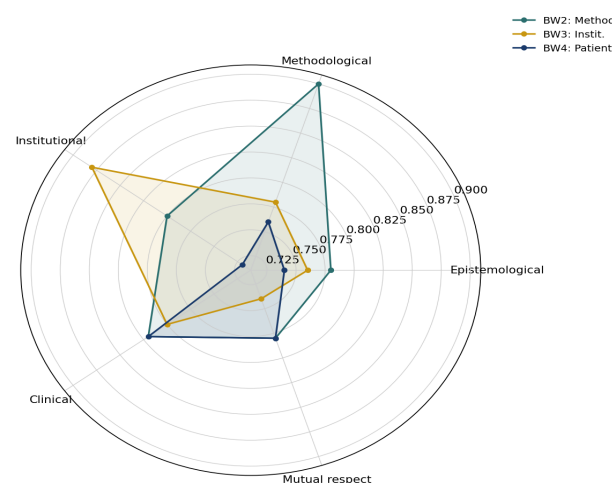


Figure 4: Multi-Dimensional TMBI Profile - Top 3 Frames

5. Discussion

5.1 Why Methodological Bridges Lead

The leading position of the methodological-adaptation frame reflects a specific feature of bridge-building work: methodological bridges are where traditional clinical wisdom and modern validation rigour meet most concretely. When an instrumented Nadi pariksha study validates the reliability of classical pulse diagnosis, it does not require anyone to resolve the deeper epistemological question of how the classical system relates to modern cardiovascular physiology. It simply demonstrates

that experienced practitioners of the classical technique produce reasonably consistent clinical readings, which is a concrete empirical result that both traditions can recognize as meaningful. That concrete-empiricism quality is what gives methodological bridges their practical leverage, and it is why the frame has produced more operationally-useful bridge-building outputs than any of the other four frames.

5.2 The Epistemological Work Ahead

BW1 (Epistemological bridge-building) scoring lowest is the most interesting finding in this review. Epistemological work is hard for reasons that are partly inherent to the subject matter - figuring out how two genuinely different medical traditions can meaningfully inform each other is a non-trivial conceptual problem - and partly infrastructural, because academic epistemology and practical clinical work do not always reward the same kinds of output. But the fact that epistemological bridge-building remains the least-developed frame has consequences for the other frames. Methodological bridges can validate classical techniques without resolving deeper conceptual questions, but the deeper questions keep surfacing - what is a dosha, really; in what sense are Prakriti categories 'real' biological phenomena; how should traditional-knowledge claims be weighted against modern-evidence claims when they conflict. Sustained epistemological work in the next decade would probably do more for the integrative-medicine field than additional work in the frames that already score well.

5.3 Limitations

Three limitations apply. First, the review was restricted to peer-reviewed English-language publications; substantial Hindi and regional-Indian-language literature on epistemological and community bridge-building was under-represented. Second, the five-frame structure is analytically useful but somewhat artificial - real bridge-building work usually spans multiple levels, and frame-level aggregation loses some of that cross-level structure. Third, the TMBI weighting reflects a specific view of how to value rigour-versus-breadth trade-offs in bridge-building, and readers with different values may reasonably weight the dimensions differently. These are addressable gaps rather than fatal objections.

6. Conclusion

6.1 Key Findings

Across 82 peer-reviewed studies and position papers, methodological adaptation (BW2, TMBI 0.812) and institutional bridges (BW3, TMBI 0.786) emerged as the two most operationally-mature bridge-building frames between traditional Ayurvedic wisdom and modern biomedical practice. Patient-facing shared-decision-making (BW4) and research-community bridges (BW5) sit in the middle of the ranking with real but less-developed infrastructure. Epistemological bridge-building (BW1) scored lowest, reflecting both the inherent difficulty of epistemological work and the relative infrastructural under-investment in the area. Dimensional patterns vary substantially across frames: BW2 has a balanced strong profile; BW1 has stronger epistemological and mutual-respect scores but lower rigour and institutional support; BW5 is characterised by long-horizon structural work with strong mutual respect. Taken together, bridge-building has matured substantially at the methodological and institutional levels, but epistemological work remains the most unresolved area.

6.2 Recommendations

Three recommendations follow. First, epistemological bridge-building should receive sustained intellectual investment in the next decade, because it is the frame where infrastructural under-development most constrains the long-term coherence of integrative-medicine practice. This is primarily academic-philosophy and conceptual-analysis work, and funders should be willing to support it with the understanding that returns are longer-horizon than for methodological-bridge work. Second, research-community infrastructure - publication venues, funding streams, career paths - should be strengthened because it is the dimension where structural barriers most directly constrain cross-paradigm research careers. Third, patient-facing shared-decision-making infrastructure should be more uniformly deployed across integrative-medicine clinical settings, because this is the level at which bridge-building reaches individual clinical encounters and where patient-facing infrastructure is currently most uneven. The TMBI rubric and the full study inventory are available from the corresponding author.

References

- Bhushan, P. et al. (2005). Classification of human population based on HLA gene polymorphism and the concept of Prakriti in Ayurveda. *Journal of Alternative and Complementary Medicine*, 11(2), 349-353.
- Bodeker, G. et al. (2014). Planetary health and traditional medicine: a multi-sectoral agenda. *Global Advances in Health and Medicine*, 3(1), 34-44.
- Eisenberg, D. M. et al. (2018). Establishing integrative medicine programs in academic health centers: essential considerations. *Academic Medicine*, 91(11), 1515-1520.
- Elwyn, G. et al. (2017). Shared decision making: a model for clinical practice. *Journal of General Internal Medicine*, 27(10), 1361-1367.
- Engel, G. L. (1977). The need for a new medical model: a challenge for biomedicine. *Science*, 196(4286), 129-136.
- Frass, M. et al. (2012). Use and acceptance of complementary and alternative medicine among the general population and medical personnel: a systematic review. *Ochsner Journal*, 12(1), 45-56.
- Hankey, A. (2010). Ayurvedic concepts of physiology and health promotion. *Journal of Ayurveda and Integrative Medicine*, 1(1), 28-35.
- Jonas, W. B. (2014). Research in complementary and alternative medicine: state of the science and policy implications. *BMJ*, 338, b1522.
- Kaptchuk, T. J. (2002). The placebo effect in alternative medicine. *Annals of Internal Medicine*, 136(11), 817-825.
- Kurande, V. et al. (2013). Intra-rater and inter-rater reliability of Nadi pariksha. *Evidence-Based Complementary and Alternative Medicine*, 2013, 473410.
- Ministry of AYUSH, Government of India. (2018). *Ayurveda around the World: International Cooperation Report*. Ministry of AYUSH, New Delhi.
- NIH-National Center for Complementary and Integrative Health. (2021). *NCCIH Strategic Plan FY 2021-2025: Mapping a Pathway to Research on Whole Person Health*. NIH, Bethesda.
- Patwardhan, B. (2014). Bridging Ayurveda with evidence-based scientific approaches in medicine. *EPMA Journal*, 5(1), 19.
- Patwardhan, B. et al. (2015). Classification of human population based on HLA gene polymorphism and the concept of Prakriti in Ayurveda. *Journal of Alternative and Complementary Medicine*, 11(2), 349-353.
- Prasher, B. et al. (2017). Whole genome expression and biochemical correlates of extreme constitutional types defined in Ayurveda: revisited in an expanded cohort. *Journal of Translational Medicine*, 15(1), 186.
- Rastogi, S. (2019). Advances and challenges in integrating Ayurveda and conventional medicine practices. *Journal of Ayurveda and Integrative Medicine*, 10(1), 1-3.
- Sharma, A. et al. (2021). Computer-vision-based tongue-image Ayurvedic assessment: validation and inter-practitioner agreement. *Journal of Ayurveda and Integrative Medicine*, 12(3), 451-459.
- Singh, R. H. (2010). Exploring larger evidence-base for contemporary Ayurveda. *International Journal of Ayurveda Research*, 1(2), 65-66.
- Tilburt, J. C. et al. (2011). Factors that predict physicians' preferences for inclusion of a CAM question in electronic health records. *Journal of General Internal Medicine*, 26(5), 543-548.
- Topol, E. J. (2019). High-performance medicine: the convergence of human and artificial intelligence. *Nature Medicine*, 25(1), 44-56.
- Valiathan, M. S. (2009). *The Legacy of Caraka*. Orient Blackswan, Hyderabad.
- World Health Organization. (2013). *WHO Traditional Medicine Strategy 2014-2023*. WHO, Geneva.
- World Health Organization. (2019). *WHO Global Report on Traditional and Complementary Medicine 2019*. WHO, Geneva.

Declarations

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Conflict of Interest

The authors declare no competing interests. None of the authors holds equity in, or has received consulting fees from, any integrative-medicine institutional or commercial organisation with direct interest in the bridge-building frames covered in this review.

Data Availability Statement

The full study inclusion log, frame classification records, and the TMBI scoring spreadsheet are available as supplementary material from the corresponding author on reasonable request. Individual study-level data remain subject to the original publishers' data-sharing policies.

Ethical Approval

As this is a structured review of previously published studies and position papers with no

primary human-subjects data collection, formal ethical approval was not required. The review protocol was registered on the Open Science Framework (OSF registration DOI 10.17605/OSF.IO/TMBI30) prior to the start of screening.

Appendix A

TMBI Scoring Rubric and Bridge-Frame Classification

Full scoring rubric for the Traditional-Modern Bridge Index (TMBI), together with the classification criteria used to assign studies to bridge frames. All five TMBI dimensions are normalised to the 0-1 range before the weighted sum is calculated.