



# Competency-Based Teaching Innovations In Shalya Tantra: Aligning The CBDC Framework With NCISM Standards For Enhanced Surgical Proficiency

Dr. Akbar Walandkar<sup>1</sup>, Dr. Shital Nathgosavi<sup>2</sup>

<sup>1</sup>Professor, Department of Shalya Tantra, Hon. Annasaheb Dange Ayurved College, Ashta, Maharashtra, India

<sup>2</sup>Associate Professor, Department of Samhita Siddhanta, Sou Shantadevi Vedprakash Patil Ayurved College, Hatta, Maharashtra, India

## Abstract

**Background:** Competency-Based Medical Education (CBME) has gained global recognition as an effective approach for aligning clinical training with measurable outcomes and patient safety standards<sup>[4–6]</sup>. Shalya Tantra, the surgical discipline of Ayurveda, is deeply rooted in classical texts such as the *Sushruta Samhita*. Despite its rich surgical heritage, traditional pedagogy has remained largely theory-oriented, limiting measurable surgical competency development. The introduction of the Competency-Based Dynamic Curriculum (CBDC) by the National Commission for Indian Systems of Medicine (NCISM) represents a paradigm shift toward outcome-driven education emphasizing procedural proficiency, ethical conduct, and clinical reasoning. <sup>[12–13]</sup>.

**Objective:** This study aimed to analyze the alignment of the Shalya Tantra CBDC syllabus with NCISM competency mandates and to evaluate the effectiveness of innovative teaching–learning strategies in improving surgical skills, ethical decision-making, and learner engagement.

**Methods:** A mixed-methods design was employed, comprising qualitative content analysis of undergraduate and postgraduate Shalya Tantra curricula, a three-round Delphi survey involving experienced educators, and a pilot implementation of simulation-based training assessed using Objective Structured Clinical Examinations (OSCEs). Quantitative data were analyzed using nonparametric statistical methods.

**Results:** Curriculum mapping demonstrated comprehensive alignment between course outcomes and program outcomes across eight modules. Delphi consensus (85%) favored simulation-based learning, problem-based learning (PBL), and team-based learning (TBL) over conventional lectures. OSCE scores showed a statistically significant improvement in procedural competence, with median scores increasing from 52% to 78% ( $p < 0.001$ ). Ethical communication and emergency decision-making competencies also improved significantly.

**Conclusion:** The CBDC framework substantially enhances surgical proficiency and ethical preparedness in Shalya Tantra education. Simulation-based learning, OSCE-driven assessment, and experiential learning effectively bridge classical Ayurvedic principles with contemporary clinical expectations. National-level implementation and longitudinal outcome studies are recommended.

**Keywords:** Shalya Tantra, Competency-Based Education, CBDC, NCISM, Surgical Simulation, Ayurveda Surgery

## I. Introduction

Shalya Tantra occupies a central position in Ayurveda as the discipline devoted to surgical and para-surgical management. Classical Ayurvedic texts, particularly the *Sushruta Samhita*, describe advanced operative techniques, surgical instruments (*Yantra-Shastra*), and perioperative principles (*Trividha Karma*), highlighting the sophistication of ancient Ayurvedic surgery. However, despite this robust classical foundation, traditional teaching methods have relied heavily on didactic instruction, limiting the acquisition of hands-on surgical skills and clinical reasoning abilities<sup>[12,15]</sup>.

The evolving healthcare environment emphasizes patient safety, ethical accountability, and outcome-based training. Graduates of Shalya Tantra programs often report inadequate exposure to procedural skills, emergency management, and structured competency assessments. These gaps are particularly critical in areas such as *Marmaghata* (vital point injuries), *Raktasrava* (hemorrhage), and para-surgical procedures like *Kshara Sutra* therapy.

Globally, medical education has transitioned toward competency-based frameworks that prioritize demonstrable skills and professional readiness<sup>[4,7]</sup>. Aligning with these trends, NCISM introduced the Competency-Based Dynamic Curriculum (CBDC), which mandates explicit learning outcomes, experiential learning dominance, and modern assessment tools such as OSCEs and Direct Observation of Procedural Skills (DOPS). This study evaluates whether the CBDC framework effectively enhances surgical proficiency and ethical competence in Shalya Tantra education<sup>[16]</sup>.

## II. Materials and Methods

### Study Design

A mixed-methods educational research design was adopted, incorporating curriculum analysis, expert consensus development, and pilot intervention assessment. The methodological framework was guided by Miller's Pyramid of clinical competence and OSCE-based assessment models<sup>[10, 11]</sup>.

The Delphi technique was selected for expert consensus due to its validated use in health professions education research<sup>[9,22]</sup>.

Simulation-based education was incorporated based on strong evidence demonstrating its effectiveness in improving procedural accuracy, learner confidence, and patient safety outcomes<sup>[17-19]</sup>.

### Curriculum Content Analysis

Undergraduate and postgraduate Shalya Tantra syllabi prescribed by NCISM were analyzed. Course Outcomes (COs) were mapped to Program Outcomes (POs) across cognitive, psychomotor, and affective domains. Instructional hours were evaluated based on the mandated 1:2:3 ratio for lectures, practicals, and experiential learning.

### Delphi Survey

A three-round Delphi survey was conducted among 25 Shalya Tantra educators with more than ten years of teaching experience. Teaching strategies were evaluated using a five-point Likert scale, with consensus defined as  $\geq 80\%$  agreement.

### Pilot Simulation and Assessment

Forty postgraduate students underwent structured simulation-based training in suturing, *Siravedha*, emergency shock management, and informed consent. Competency was assessed using a ten-station OSCE. Pre- and post-intervention scores were analyzed using the Wilcoxon signed-rank test ( $p < 0.05$ ).

## Ethical Considerations

Institutional ethical approval was obtained. Written informed consent was secured from all participants, and confidentiality was maintained.

## III. Results

Curriculum mapping revealed strong alignment between NCISM-defined competencies and Shalya Tantra learning modules. Experiential learning constituted nearly 50% of instructional time. Delphi consensus (85%) strongly supported simulation-based learning, OSCEs, and PBL as effective teaching strategies.

OSCE performance improved significantly following the intervention, with median scores increasing from 52% to 78% ( $p < 0.001$ ). Substantial gains were observed in suturing skills, hemorrhage control, ethical communication, and emergency decision-making.

## IV. Discussion

The findings demonstrate that the CBDC framework effectively addresses long-standing gaps in Shalya Tantra education. Simulation-based learning and structured assessments promote active learning, reflective practice, and measurable competence. Integrating classical Ayurvedic principles within modern assessment frameworks preserves disciplinary authenticity while enhancing clinical relevance.

## V. Conclusion

The Competency-Based Dynamic Curriculum represents a transformative advancement in Shalya Tantra education. By emphasizing experiential learning, structured assessment, and ethical integration, CBDC significantly enhances surgical proficiency and professional readiness. These reforms align Ayurvedic surgical education with globally accepted medical education standards.

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