

Economics Education into Medical Professional Education — A Literature-Based Normative Curriculum Design Study

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Abstract: *Objective:* To examine how economics literacy can be systematically embedded into medical professional education in a low-cost, measurable, and sustainable way within an already near-saturated curriculum, and to build an operational curriculum integration model. *Methods:* The study conducted a literature-based normative curriculum design study. With Health Systems Science and constructive alignment as the analytic framework, the study synthesized international empirical cases and domestic policy texts, and derived the model through the progression “literacy positioning — curricular attribution — integration model.” *Results:* The study built a curriculum integration model with three components — embedding strategy, teaching organization, and evaluation. Economics content is embedded into existing courses through a longitudinal curricular thread, distributed spirally across three stages totaling 20–28 credit-hours. Teaching is organized around clinical decision problems and supported by clinical teachers working with health economists. A three-tier evaluation (knowledge, skill/behavior, reflection) secures the observability of the literacy. *Conclusions:* Economics literacy is a core literacy of the medical profession, not a managerial add-on; it supplies the economic dimension of the “humanities” within the medicine–humanities integration advanced by the New Medicine initiative. Its curricular intervention is best realized by embedding through a longitudinal thread, organizing teaching around clinical decisions, engaging health economists as collaborators, and securing observability through explicit, hierarchical evaluation.

Keywords: Medical education; Health economics; Curriculum integration; Health Systems Science

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1. The problem

Medical education has never been technical training sealed off from its era. Each profound shift in society, science, or technology renews medical understanding, widens the range of available choices, and pushes the

discipline forward. the COVID-19 pandemic that began in late 2019 forced a society-wide reconsideration of the mission of medicine and of medical education. In September 2020, the General Office of the State Council issued the Guiding Opinions on Accelerating the Innovative Development of Medical Education, declaring that medical education “shall occupy a position of priority for the development of education and health,” and called for the categorical cultivation of research-oriented, compound, and application-oriented talent under the New Medicine (xinyike) initiative ^[1]. New Medicine stresses “five combinations”; among them, the “integration of medicine and humanities” holds that medicine is both a science and a study of persons — curing disease while also tending to the soul — and therefore demands stronger humanistic quality, medical ethics, ethical decision-making, and communication in medical students ^[2].

That integration opens a direct policy and conceptual gateway for economics education to enter medical education. Economics literacy is not named in the framework, yet it is precisely a vital dimension of its “humanities” component. From the macro level — the rollout of diagnosis-related group (DRG) and big-data, the resource commitments of a single department — to the micro level — the design of a treatment plan, the choice among alternative drugs — physicians must constantly judge cost, efficiency, and value. This capacity weighs as heavily as the humanistic and ethical literacy rooted in the Hippocratic Oath, and indeed sets its practical limit. In short, economic literacy and economic reasoning are not external “add-on knowledge” but an indispensable facet of modern medical professionalism: beyond technique and professional identity, they oblige practitioners to face the real economic world and to reconcile professional judgment, ethical commitment, and feasibility under constraint. Together with the ethics and communication that the medicine–humanities integration emphasizes, they matter greatly for forming “warm and accountable” clinical decision-makers.

At the curricular level, integrating economics education has moved from “optional” to “necessary,” though its feasibility remains “conditionally attainable.” Domestic efforts fall into three orientations. The independent-course orientation: a few schools offer Health Economics or Pharmacoeconomics, but mainly for health-management and preventive-medicine students, with thin coverage of clinical medicine. The conceptual-advocacy orientation: most work stays at the level of arguing that integration “should” occur; although the New Medicine economics courses have been written into the core curriculum, the Chinese Standards for Undergraduate Medical Education — Clinical Medicine (2022 Edition) permits humanities and social-science content to be “integrated into professional courses,” and exploratory curriculum work exists, the operational question of “how to integrate” receives little attention ^[3–4]. The local-pilot orientation: some institutions have tried embedding economic-evaluation content into evidence-based medicine and clinical subspecialties, but without a unified literacy framework or evaluation standard, so the experience rarely transfers. The literature thus shows a bias toward “argument over design, concept over evaluation,” and notably lacks an integrated model explaining what economics literacy “where it is taught, and how it is assessed.”

International experience supplies a comparatively mature reference. Germany embedded health economics in medical curricula from 2003, chiefly in the 8th–10th semesters ^[5]; the United States frames economics as a strand of the Health Systems Science “third pillar,” carried longitudinally across the basic–clinical–clerkship continuum ^[6–7]; Canada’s Choosing Wisely and STARS movements advance cost-consciousness through student societies and electives ^[8]. Yet these models rest on different payment environments and academic structures and cannot be transplanted wholesale. This paper fills that gap:

drawing on international experience, it builds an operational curriculum integration model for economics literacy fitted to the constraints of China's five-year medical program.

2. Research design

This study is a literature-based normative curriculum design study, pursued in three steps ^[9]. Scope of literature: the study included international empirical cases of health-economics and cost-consciousness education in medical education together with domestic policy texts, emphasizing representative cases — Germany, the US Health Systems Science framework, and Canada's Choosing Wisely/STARS — plus China's New Medicine policy documents and domestic curriculum explorations ^[1, 3–7, 8, 10]; the selection criterion was a clear description of the path chosen for curricular intervention. Analytic framework: Health Systems Science (HSS) and constructive alignment (Biggs) supply the theory — the former to justify the curricular attribution of economics literacy, the latter to hold learning objectives, teaching activities, and assessment in alignment. Derivation rule: following the progression “literacy positioning → curricular attribution → integration model,” international experience is synthesized into one internally consistent scheme. A limitation of the study is that its conclusions are normative derivations not yet validated by curriculum implementation; their validity awaits pilot testing.

3. Why economics literacy is a core literacy of the medical profession

The claim that economics literacy belongs within the medicine–humanities integration of New Medicine, and thereby within the core literacy of the medical profession, rests on three cumulative grounds.

3.1. The economics-based resource-constraint hypothesis is the inherent context of clinical decisions

The medical services market differs from ordinary markets and carries distinctive properties. Arrow (1963) argued that it is set apart by information asymmetry and non-contractibility born of “uncertainty of disease occurrence” and “uncertainty of treatment effect,” so that price cannot fully certify either quality or necessity ^[11]. Society therefore compensates for the incomplete market with “non-price institutions” — professional ethics, entry restrictions, non-profit organizations. A physician's professional ethics is, to a large extent, the institutional substitute for these market failures. The upshot is that medical decision-making has, from the outset, been the allocation of scarce resources under uncertainty; economic reasoning is not an external appendage but a structural premise of medicine. Medicine cannot explain its own distinctiveness on its own — it must locate itself through economics. Resource scarcity and opportunity cost have become the standing context of every clinical decision.

Health's dual character also fixes the complexity of clinical choice. Grossman's (1972) human-capital model treats health as both a consumer good and an investment good — a peculiar capital constrained by investment ^[12]. When a physician decides “whether to order a test or use a drug,” he or she is simultaneously answering a resource-allocation question. In practice, the benefits of clinical decisions are weighed over a life cycle and against opportunity cost, not reduced to the marginal effect of a single encounter. Without this framework, a medical student facing “whether a costly intervention is worth extending limited survival” can only fall back on intuition or authority, unable to reason in a way that is expressible, testable, and shareable

with the patient. Adding economic literacy to clinical competence therefore supplies the long-missing economic dimension. At the competency level, this points to “interpreting trade-offs”: under uncertainty and scarcity, turning “should we do it” into reasoning that can be stated and checked.

3.2. The economics-based price mechanism is the key to understanding medical decisions

The payment method is not a backdrop to care but an institution that continuously shapes the behavior of both parties through price signals. Under fee-for-service, volume and revenue are linked, so more tests and more procedures carry a built-in incentive; under value-based or case-based bundled payment (DRG/DIP), the same clinical act implies different cost consequences ^[13–14]. Price theory warns that a physician who misses this mechanism cannot explain “why the same clinical problem is handled differently across payment settings,” nor form a stable cost-consciousness in practice. Cost-consciousness, then, is not a moral demand for personal thrift but an accurate grasp of how the payment system steers one’s own behavior.

Clinical decisions also lean heavily on external evidence, whose transportability depends on the conditions of its production. The second requirement of economic literacy is to separate correlation from causation: an intervention that “saves money” in a trial may do so only because its subjects, payment structure, or follow-up differ from the local setting, and need not extend to one’s own patients. Without this discernment, physicians either import external guidelines blindly or reject health-economic evidence altogether — and both reduce “cost-consciousness” to a slogan. Embedding economic literacy in clinical competence lets physicians read the silent guidance that payment methods exert on themselves and their patients, form cost-consciousness under constraint, and review external policy evidence in context — the real wellspring of the two competencies “reading evidence” and “interpreting trade-offs.”

3.3. The economics-based incentive mechanism is the key to improving medical efficiency

Incentives act on the demand side as deeply as on the supply side. Behavioral economics has long shown that patients do not always behave as “rational actors” when they seek care: status-quo bias, loss aversion, and intuitive misreading of probabilities pull them away from their true preferences and health interests, while induced demand and defensive medicine show, from the supply side, that misaligned incentives distort decisions no less ^[15]. “Effective care” therefore means more than delivering the right clinical plan; it means helping patients choose in their own interest — which requires understanding why they appear to decide irrationally.

Understanding incentive structures also leads practitioner to design better communication and intervention. A chronic-disease patient who refuses needed follow-up out of loss aversion will not be moved by more information alone; once the bias is understood, the physician can reset default options, reframe the risk, and bring long-term benefit to the foreground, converting “correct advice” into a “decision the patient can act on.” This is the substance of “participating in decision-making”: not deciding for the patient, but building — on an understanding of behavior and incentives — an interface through which the patient can reason. Economic literacy lifts “communication” from technique to institutional-behavioral understanding: it explains why a given communication works, not merely how to phrase it. At the competency level, this points to “participating in decision-making.”

The three dimensions sit at different levels, yet converge on one demand for medical education: reading evidence, interpreting trade-offs, participating in decision-making. None of these amounts to “making

physicians into economists”; each belongs to “letting physicians discharge their professional duties fully in a world of limited resources.”

4. The curricular attribution of economics literacy in medical education

4.1. Curricular arrangements in existing models

International and domestic experience present several representative forms of attribution that can orient local choice.

Independent-course-module type. Germany has formally included health economics, health-care systems, and public health in medical education since 2003; Behmann et al.’s survey of 36 faculties places this content mainly in the 8th–10th semesters, mostly as seminars and lectures^[5]. Its strength is clear status and concentrated faculty. But the “independent courses, late concentration” pattern does not naturally fit China’s near-saturated five-year schedule — exactly why it should not be copied outright.

Systems-science-pillar type. US medical education does not set up economics courses separately; it treats them as part of Health Systems Science (HSS), the “third pillar,” carried by a longitudinal thread across the basic–clinical–clerkship span^[6–7, 10]. The logic insists that “economics is an organic part of the medical knowledge structure,” not an “add-on management course”; some scholars argue directly that health economics deserves a clear place in the curriculum^[16].

Student-led-movement type. Here economics enters through elective formats — Canada’s Choosing Wisely and STARS embed cost-consciousness and resource modules via “student societies + case-based learning + electives”^[8]. The lesson is that reform need not wait for top-down redesign; it can also grow bottom-up from the front-line teacher–student community.

Guiding-major-write-in and standard-integration types. This model rests on education-authority guidance and policy, while leaving execution to individual schools. In China, for instance, the Ministry of Education’s New Medicine economics courses have been written courses into the core curriculum, and the Chinese Standards for Undergraduate Medical Education — Clinical Medicine (2022 Edition) permits integrating humanities and social-science content into professional courses^[3]. Together they open institutional space for local attribution — the former licenses “writing it in,” the latter supplies the interface for “integrating it in.”

The four forms differ in path but reveal one fact: attribution has at least three basic shapes — independent module, systems-science pillar, and embedding into existing threads. For China, the pragmatic move is not to start anew, but to take the substance of the “systems-science pillar” and realize it by “embedding into existing curricular threads.” That is the attribution premise of the model in Section 5.

4.2. The competency-model choice

Section 3 economics literacy at “reading evidence, interpreting trade-offs, participating in decision-making.” To make it teachable and assessable, this section operationalizes it into three levels — knowledge, skill/behavior, reflection — with measurable learning objectives.

“Reading evidence” maps to the knowledge level: students distinguish correlation from causation, interpret the incremental cost-effectiveness ratio (ICER), willingness-to-pay threshold, and sensitivity analysis, and review external policy evidence in context. This turns “cost-consciousness” into a testable judgment.

“Interpreting trade-offs” maps to the skill/behavior level: under resource constraints, students transparently present to patients an intervention’s cost and value, its health benefit and possible burden, converting “should we do it” from intuition into stated reasoning. Economics training lets professional spirit be “sayable and doable” under constraint; this competency also re-enacts Arrow’s claim that professional ethics substitutes for market failure ^[11].

“Participating in decision-making” maps to the reflection/synthesis level: students build a decision interface the patient can rationally enter, rather than deciding for the patient — concretely, by understanding behavioral biases (loss aversion, status-quo bias) and converting “correct advice” into an actionable decision through reset defaults and reframed risk.

The three progress in sequence: reading evidence is the premise, interpreting trade-offs the bridge, participating in decision-making the aim; together they form the full competency portrait of “discharging one’s duties in a world of limited resources.”

4.3. Setting principles for economics-literacy courses

Given the attribution forms and the competency model, economics-related courses must obey three principles — not “best practices” invented from nothing, but a dual response to international evidence and local constraint.

Principle 1 — Spiral internalization, not a single exposure — indoctrination. Economics literacy must reappear at rising depth across the basic, clinical, and clerkship stages to be internalized in practice; this also grounds the content of **Table 2**.

Principle 2 — Organize by clinical problems, not by economics’ internal logic. Each point must answer a concrete clinical decision, averting a “patchwork assembly.” Teaching units are unified by clinical questions — “should it be chosen, and for whom,” “should it be used, and on whom” — not by the discipline’s own architecture. This is both the underlying logic of medical teaching organization and the vehicle on which dual-instructor collaboration depends.

Principle 3 — Evaluation drives learning. Literacy must enter assessment for learning to occur. The principles therefore rest on constructive alignment: objectives, activities, and assessment are designed together. Of the three, this one binds hardest — it converts the first two from “advocacy” into “accountability.”

Spiral internalization settles “where and how much”; clinical-problem organization settles “whether it can be internalized”; evaluation-driven settles “whether it truly happens.” The three support one another as an organic whole, and the Section 5 model is their operational unfolding.

5. Constructing the economics curriculum integration model

Building on Section 4’sn and principles, this paper proposes an integration model of three components — embedding strategy, teaching organization, and evaluation (**Table 1**) — and analyzes it from three angles.

Table 1. Curriculum integration model for embedding economics in medical professional education

Component	Theoretical basis	Operational points
Embedding strategy (longitudinal curricular thread)	Spiral curriculum theory (Harden); academic-structure constraints	Three-stage progression, 20–28 contact hours spiral distribution, no added independent semester

Teaching organization (clinical-problem unification + dual-instructor collaboration)	Situated learning theory; avoid patchwork assembly; health-economics positioning within the HSS third pillar	Clinical decision problems as units; clinical teachers collaborate with health economists
Evaluation (explicit, hierarchical)	Constructive alignment (Biggs); evaluation-driven learning	Three levels — knowledge, skill, reflection — including cost–value

5.1. Organic integration via a longitudinal curricular thread

The first strategic choice is independent course versus organic integration, and it hinges on faculty and institutional conditions. Germany’s path puts “health economics, health-care systems, public health” into the curriculum, mainly in the 8th–10th semesters, as seminars and lectures — a “late, concentrated” pattern that does not suit China’s saturated five-year program ^[5]. The US path is the integrative template: economics sits inside systems science and runs the whole length as a thread rather than a separate course ^[6].

For most Chinese institutions, the pragmatic embedding is to “reinforce existing courses with a longitudinal thread” — organic integration. No new standalone course is added; instead, economics content is woven into preventive medicine, social medicine, evidence-based medicine, medical ethics, and clinical subspecialties. On that basis, the study designed the academic-year distribution in **Table 2**.

Table 2. Academic-year distribution of economics-literacy courses

Academic year/stage	Embedding vehicle	Module	Contact hours	Core activities
Year 1–2 (Stage 1)	Medical introduction, early clinical exposure	Theoretical foundation	4–6	Introduce scarcity, opportunity cost, marginal analysis, incentives through contexts
Year 3–4 (Stage 2)	Epidemiology, evidence-based medicine, clinical subspecialties	Evaluation methods + technical application	12–16	One ICER calculation and sensitivity analysis; literature critique; local case
Year 5 and post-graduation (Stage 3)	Internship, residency	Policy and ethics	4–6	DRG cost analysis; low-value care improvement; medical-record cost audit

Table 2’s defining feature is the three-stage, spiral distribution. The same core concept (opportunity cost, incentive) reappears at increasing depth across the three stages rather than being taught once and dropped. Generally, the embedded thread is the lowest-cost, most sustainable main route. “Reinforcing existing courses with a longitudinal thread” therefore fits national conditions best: it keeps the substance of international experience (spiral, context, evaluation-driven) without copying its shell (standalone courses or full restructuring). When a school already has health-economics faculty and stable hours, an elective extension can meet the needs of students with spare capacity.

Implementation is not frictionless. A saturated curriculum means the 20–28 hours must come by replacement, not addition: priority goes to reclaiming equal hours from evidence-based medicine (literature-appraisal sessions), social medicine (health-policy sessions), and clinical subspecialties (case discussions) — not to cutting core basic-science hours. The embedding model also requires the curriculum committee to assign explicit objectives and vehicles for economics literacy in the training scheme; absent that, it decays into formalism.

5.2. Clinical-problem-led economics-instructor collaboration

The root cure for patchwork assembly is to invert the organizing logic — units are built from clinical

decision problems, not from the economics discipline. when teaching whether to screen, instructors can us “AI-assisted retinopathy of prematurity (ROP) screening” to have students define alternatives, estimate costs and health outcomes, compute the ICER, and set willingness-to-pay scenarios at 1–3 times per-capita GDP for the Chinese context ^[17–18]. Here economics is not “added on”; it is necessary to answer the clinical question “screen, and for whom.”

The tightest constraint on avoiding patchwork is faculty. The workable solution is “clinical teacher + health economist” collaboration: clinicians pose the context and its rationale; economists handle method and evidence interpretation ^[4]. Economics stays in the clinical context; clinical work keeps its methodological rigor. Three operational elements make it real. Source: schools without dedicated health-economics faculty can draw on health-management or pharmacoeconomics teachers, or hire practitioners from payer agencies and hospital reimbursement offices as visiting collaborators. Division and training: clinicians lead context and decision guidance; economists teach concepts and methods; clinicians also receive about 4 hours of economics-methodology workshops to gain basic cost concepts and ICER literacy. Vehicle: joint lesson-planning meetings (one per module) keep economics content strictly in service of the clinical question, preventing drift into terminology teaching.

Supporting methods include case-based learning (local high-incidence diseases and high-value technologies carrying systems-science goals), cost–value communication stations in the Objective Structured Clinical Examination (OSCE) — such as VISTA’s discharge-communication station — and reflective practice ^[19].

5.3. Professional evaluation secures observability

Evaluation is not the terminus of the path but the link that makes literacy observable and learning real. Economics literacy can be assessed at three levels — knowledge, skill/behavior, reflection — with methods matched to the competency, as in **Table 3**. The knowledge level sets ICER-interpretation and literature-appraisal items in evidence-based or clinical exams, testing whether one reads ratios, thresholds, and sensitivity analyses; the skill/behavior level adds a “discussing cost and value with patients” OSCE station and medical-record cost-reasonableness feedback during clerkships; the reflection level uses a portfolio recording students’ reflections on low-value-care improvement.

Table 3. Evaluation mapping of economics literacy

Competency level	Maps to	Method	Example
Knowledge	Reading evidence	Exam ICER-interpretation items, literature appraisal	Given a pharmacoeconomics paper, judge whether its ICER falls below the willingness-to-pay threshold
Skill/behavior	Interpreting trade-offs, participating in decision-making	OSCE cost–value station, medical-record cost audit	Explain to a simulated patient “why this drug is not reimbursed”
Reflection	All three integrated	Portfolio, pre–post test	Reflection report on a low-value-care improvement project

For implementability, the three tool types need joint development and at least minimal reliability and validity statements. The knowledge-level ICER item uses a structured rubric: correct relation of ICER to threshold (1 pt), identification of key sensitivity-analysis assumptions (1 pt), and transferability to the local context (1 pt). The skill/behavior OSCE station can extend the existing patient-communication scale

with a “cost–value transparent presentation” item (e.g., “states self-pay and reimbursement ratios,” “offers an affordable alternative”); two examiners score independently, with agreement reported by Kappa. The portfolio uses a rubric across four dimensions — problem identification, evidence use, plan improvement, self-reflection — each with three levels. The pre–post test employs a purpose-built “Medical Student Cost-Consciousness Scale,” used only after Cronbach’s α reliability is reported.

6. Conclusions and recommendations

6.1. Conclusions

Three conclusions follow. First, economics literacy is a core literacy of the medical profession, not a managerial add-on; it is the economic face of the “humanities” in New Medicine’s medicine–humanities integration, and the structural premise that lets clinical decision-making produce reasoning that is expressible and testable under constraint. Second, attribution has at least three basic forms — independent module, systems-science pillar, embedding into existing threads; for China’s five-year program, the pragmatic attribution is embedding via a longitudinal thread. Third, curricular intervention is carried by the three-component model — embedding strategy, teaching organization, evaluation: strategy sets where and in what dose content appears, organization sets whether students internalize it, evaluation sets whether learning truly occurs.

6.2. Contributions

This study’s contribution is to rejoin the questions “why teach” and “how to teach” in one chain. Theoretically, it anchors economics literacy to the health-economics dimension of Health Systems Science (the third pillar), shifting it from “embellishment of humanistic literacy” to “organic part of the medical knowledge structure,” and — via Arrow and Grossman — shows economic reasoning to be the structural premise of clinical decisions, not an external extra. Curricularly, it proposes a progressive framework of “three attribution forms — three competency levels — three setting principles,” turning scattered international experience into comparable coordinates and curbing arbitrariness in path choice. Model-wise, it uses the three components to state each one’s theoretical basis, operational points, and corresponding tables, directly enabling the arrangement of objectives, activities, and assessments.

6.3. Recommendations

Three implementation recommendations follow for local institutions. First, point-to-surface, pilots first: start with one evidence-based or social-medicine course, embed a 2–4-hour economics module, and collect pre–post data to validate the model at minimal cost before scaling. Second, form a cross-disciplinary curriculum group: led by the teaching dean and including clinical core faculty, health economists, and curriculum-committee members, charged with credit-hour replacement, faculty training, and evaluation-tool development. Third, harness evaluation to drive learning: bring “cost–value communication” into the existing OSCE station system, converting economics literacy from “advocacy” into an “assessable, feedback-enabled” objective so that learning truly occurs.

6.4. Limitations and prospects

The study’s limitation is that its main evidence comes from North America and Europe (VISTA, STARS,

Choosing Wisely Canada), whose payment environments and academic structures diverge sharply from China's five-year program, so external validity must be judged cautiously; systematic reviews also note that cost-consciousness interventions for students are mostly single lectures or short modules, with thin evidence of long-term behavior change^[20]. The model itself is a literature-based normative derivation not yet tested in implementation. Follow-up should advance through a “design–implementation–evaluation–revision” cycle; concretely, a single-group pre–post pilot could embed a 4-hour economics module in one school's evidence-based medicine course, using the Cost-Consciousness Scale (to be developed and validated in and one decision-case item to measure knowledge and attitude change in 60–80 students before and after, paired with semi-structured interviews of 6–8 students to explain the mechanism — supplying empirical ground for local revision.

Disclosure statement

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