

五行针灸经气转化的数字化：一种可解释临床辅助工具的开发

Digitalising Qi Transfer in Five Element Acupuncture: Development of an Explainable Clinical Support Tool

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摘要

五行针灸中的经气转化用于微调五行间因脉量差异出现的生克失衡；当存在多条合法候选路径时，需要进一步比较路径与相关穴位后再行治疗。本研究依据 The Acupuncture Academy 教学材料及已出版权威教材，对经气转化规则进行系统梳理，区分已确立知识、工程实现与待验证假设三层，开发一个透明可解释的原型工具：输入供气行与目标行后自动枚举全部合法候选路径及对应穴位与针刺顺序，并按课程既定的操作可靠性与舒适度原则排序展示。原型在路径与穴位选择层面成功复现了一则已发表教材 *worked example*，治疗师仍据脉诊等信息作最终判断。以两个模拟病例展示其可行性，并讨论潜在应用与局限。

Abstract

Transfers of *qi* in Five Element Acupuncture are used to fine-tune generating (*sheng*) and controlling (*ke*) relationships when pulse-quantity differences persist between Organs. When more than one legal pathway exists, the corresponding routes and points must be compared before treatment. This paper reports a rule-based, explainable digital tool that formalises *qi* Transfer logic drawn from The Acupuncture Academy's teaching materials and established published sources (Hicks, Hicks & Mole, 2011). Clinical rules are classified into three tiers -- established knowledge, computational implementation choices, and unvalidated hypotheses. Given a donor and target Element, the tool enumerates all rule-legal candidate pathways with their points and needling sequence, and ranks equally-short candidates by course-based criteria for reliability and comfort. The prototype reproduced a published worked example at the level of pathway and point selection, and its output is further illustrated with a second simulated case. The practitioner retains the final choice among displayed candidates. The tool is not diagnostic and does not claim proven clinical effectiveness.

关键词：五行针灸；经气转化；可解释系统；临床辅助工具；中医信息化

Keywords: Five Element Acupuncture; Qi Transfer; Explainable System; Clinical Support Tool; TCM Informatization

Full Text

(2568 words, excluding references)

1. Background

Five Element Acupuncture derives from the Five Element theory of Chinese medicine and was historically transmitted through oral teaching. In the mid-twentieth century it was systematised by the British acupuncturist J. R. Worsley (1923–2003) and spread throughout Europe and the United States; in recent years it has been reintroduced to China, notably through the efforts of his student Nora Franglen, and a comparatively systematic teaching lineage has since developed there. The clinical core of this tradition is the identification of the patient's Constitutional Factor (CF) — the Element considered to underlie the patient's overall imbalance — through observation of colour, sound, odour and emotion (CSOE) together with pulse diagnosis.

Once major blocks have been cleared and the patient's *qi* flows relatively smoothly, treatment moves into a phase of fine adjustment of the *sheng* and *ke* relationships among the twelve Organs: when pulse diagnosis repeatedly shows one Organ relatively excess and another relatively deficient, the practitioner may use a Transfer of *qi* to draw *qi* along a legal pathway from the donor Organ to the target Organ. Working through this process by hand — judging pathway legality, selecting intermediate Organs, and determining points and needling order — becomes considerably laborious once more than one legal pathway exists.

2. Research Question and Scope

This paper addresses the following question: can the rule-governed reasoning behind *qi* Transfer be formalised into a transparent digital tool that automatically enumerates legal candidate pathways and explains the reasoning behind each, while leaving diagnosis and the final choice of pathway entirely with the practitioner?

The tool is deliberately confined to a single task: it does not diagnose the CF, does not judge which Organs are excess or deficient, and does not claim to improve clinical outcomes. Given a donor and target Element determined by the practitioner through pulse diagnosis, the tool computes the candidate pathways permitted under established rules together with their points and needling order; when multiple legal candidates exist, all are presented and ranked according to criteria drawn from published teaching materials rather than any preference of the tool itself.

3. Methods

3.1 Rule Sources and a Three-Tier Classification

To avoid presenting engineering choices as established clinical doctrine, every rule implemented in the tool was assigned, before coding, to one of three tiers:

(A) Established knowledge — rules directly traceable to published literature or course teaching: the direction of the *sheng* and *ke* cycles; the restriction that *ke*-cycle transfer occurs only between *yin* Officials (Hicks, Hicks & Mole, 2011: 945; The Acupuncture Academy, 2.5.iii); the prohibition on transfer between the two sides of the Fire Element (The Acupuncture Academy, 2.5.iii); the needling order for a transfer — the first needle placed in the deficient target Organ with a slight tonifying turn, subsequent needles placed backward along the pathway, and the target Organ finally given a full tonifying manipulation and removed first (Hicks, Hicks & Mole, 2011: 903–904; The Acupuncture

Academy, 2.5.iii); the use of luo points to transfer *qi* between the paired *yin* and *yang* Organs of a single Element (Hicks, Hicks & Mole, 2011: 949–950); the preference for shorter pathways to reduce the risk of an inaccurately needled point (Hicks, Hicks & Mole, 2011: 903); the principle of minimum intervention characteristic of this style of practice (Hicks, Hicks & Mole, 2011: 897); and the default use of the Pericardium rather than the Heart for Fire-Element transfers, out of respect for the Heart's position among the Organs, with the Heart used only when the practitioner actively chooses it (The Acupuncture Academy, 2.5.iii).

(B) Computational implementation decisions — choices made to render (A) computable, which do not themselves constitute clinical claims: representing the twelve Organs as five Element-level nodes for pathway computation (with *yang*-Official handling implemented separately as a luo-point step); modelling both *sheng* and *ke* relationships as single-step directed edges on a five-node graph and using shortest-path search to enumerate candidates; and the interface decision to display all equally-short candidate pathways rather than a single recommendation.

(C) Unvalidated hypotheses — extensions not directly supported by (A) are flagged and excluded from the current tool. None is currently implemented; any rule that could not be traced to (A) — for example, single-step *ke* transfer without a documented worked example — was left unautomated rather than inferred.

3.2 Simple and Complex Transfers

The simplest form of transfer moves *qi* one step along the *sheng* cycle using tonification and sedation points: the tonification point corresponds to the preceding, “mother”, Element and draws *qi* toward the child; the sedation point corresponds to the following, “child”, Element and draws *qi* onward along the cycle (Hicks, Hicks & Mole, 2011: 941–942). This is the most frequently used form in practice and requires no intermediate carrier point.

When the donor and target Elements are not directly adjacent on the *sheng* cycle, or when the practitioner elects to transfer across the *ke* cycle, a chain of “carrier” needles is placed along the intermediate Organs of the pathway, built backward from the target Organ and retained; once the full chain is established, the needle in the target Organ is given a full tonifying manipulation to draw *qi* through the completed pathway (Hicks, Hicks & Mole, 2011: 902–904). Where an endpoint must be extended to its paired *yang* Organ, an additional luo-point step transfers *qi* within that *yin*–*yang* pairing rather than across Elements.

3.3 Four Needle Technique (Out of Scope)

For *qi* that remains resistant to transfer despite repeated conventional treatment, the course also teaches a more forceful technique, the Four Needle Technique, first described by the seventeenth-century Korean monk Sa Am (Hicks, Hicks & Mole, 2011: 946); it is used only rarely in practice. Because its rules have not yet been fully checked point-by-point against source material, this paper treats it as explicitly out of scope for the present tool: it is not implemented in the prototype and is left for future work.

3.4 Ranking Candidate Pathways

When several equally-short candidate pathways satisfy the *sheng/ke* legality constraints, the tool does not select a single “optimal” route on the practitioner's behalf. Instead, candidates are ranked according to two criteria drawn from published teaching, both concerned with reliability and comfort of execution rather than any claim about differential clinical effectiveness:

First, shorter pathways are preferred over longer ones — not because a shorter pathway is assumed to be clinically superior, but because published guidance recommends the shortest route “to decrease the chances of missing a point” (Hicks, Hicks & Mole, 2011: 903), a concern with needling accuracy rather than treatment outcome; this echoes the principle of minimum intervention characteristic of this style of practice (Hicks, Hicks & Mole, 2011: 897).

Second, among pathways of equal length, points known to be more painful to needle, such as Jing-Well points, are avoided where this does not noticeably compromise comfort otherwise (The Acupuncture Academy, 2.5.iii). The final choice among the displayed candidates remains with the practitioner, who may also weigh other factors such as the current state of an intermediate Element (Hicks, Hicks & Mole, 2011: 903).

4. Prototype Architecture and Explainable Output

The tool is implemented as a single-file web page, requiring no server or database; all computation takes place locally. The interaction flow has four steps.

Step 1: the practitioner selects the donor and target Elements and then specifies the particular Officials involved. Where a *yang* or *yin* Official of the Fire Element is involved, the tool defaults to the Pericardium and switches to the Heart only if the user actively changes this (The Acupuncture Academy, 2.5.iii).

Step 2: core pathway computation. Elements are coded 0–4; with D denoting the donor Element and T the target Element, the tool computes the cyclical distance $\Delta = (T - D) \bmod 5$ and derives all shortest legal pathways on the resulting five-node directed graph. When $\Delta = 3$, both equally-short pathways are computed for subsequent ranking.

Step 3: endpoint extension. Where an endpoint is a *yang* Organ, the tool automatically adds a *luo*-point bridging step beyond the Element-level core pathway (a *yang* donor first bridges through its paired *yin* Official's *luo* point before entering the core transfer; a *yang* target is bridged through its own *luo* point after the core transfer is complete). This extension combines two independent rules from the course material and is explicitly documented as a Tier-B engineering decision in both the interface and this paper.

Step 4: ranking of candidate pathways and presentation of reasoning. When multiple equally-short candidates exist, the tool preferentially displays the pathway that avoids Jing-Well points (or involves fewer of them); every pathway is nonetheless always shown, only its position in the ordering changes. For each pathway the tool provides the Element-level core pathway diagram, the corresponding Official-level operational pathway, the point and its donor-Element source for each step, the suggested needling order, and an explicit flag where a Jing-Well point is involved, so that every conclusion shown to the user can be traced back to its rule source.

The final choice of pathway, whether to proceed with the transfer, and its timing remain entirely the practitioner's, based on pulse diagnosis and clinical experience; the tool makes no recommendation-level claim of an “optimal” solution.

Development note: the tool's code was implemented with the assistance of AI coding tools; the clinical rules on which it relies are all drawn from the literature and course materials cited in Section 3.1 and were not generated or inferred by AI.

5. Simulated Cases

Both cases below are hypothetical demonstrations illustrating how the tool operates; neither involves real patient data.

5.1 Case 1: Spleen (Earth) → Gall Bladder (Wood), $\Delta=3$

Suppose a patient's major blocks have been cleared and pulse diagnosis shows the Spleen relatively excess and the Gall Bladder relatively deficient, with donor Element Earth and target Element Wood, donor Organ Spleen (a *yin* Official) and target Organ Gall Bladder (a *yang* Organ).

$\Delta=(0-2+5) \bmod 5=3$, giving two equally-short Element-level pathways: Earth→Metal→Wood and Earth→Water→Wood, neither involving a Jing-Well point; the tool displays them in default order. Taking Earth→Metal→Wood as an example, the core pathway is Spleen→Lung→Liver, with points Taiyuan (Lu 9), the Earth point of the Lung channel, and Zhongfeng (Liv 4), the Metal point of the Liver channel; because the target Organ is the Gall Bladder (a *yang* Organ), a luo-point bridge is added once the core transfer is complete, using Guangming (GB 37), the Gall Bladder's own luo point.

The needling order for the core transfer is: ① Zhongfeng (Liv 4) and ② Taiyuan (Lu 9), inserted with even technique and retained; ③ return to Zhongfeng, give a full tonifying manipulation and remove; ④ finally remove Taiyuan gently. The donor Organ itself is not needed. Once the core transfer is complete, Guangming (GB 37) is separately tonified to draw *qi* onward from the Liver into the Gall Bladder, completing the *yang*-Organ bridge.

The three points involved in this pathway — GB 37, Liv 4 and Lu 9 — and their corresponding Element properties are identical to the worked example given by Hicks, Hicks & Mole (2011: 902–903). However, the tool treats the *yang*-Organ luo bridge as a separate closing step performed after the core transfer, so the specific order of needle insertion differs from the sequence described in the original text; this is a Tier-B engineering decision documented in Section 3.1, rather than a step-by-step reproduction of the original needling protocol.

1. Choose donor and target

Donor Element

Earth

Target Element

Wood

Donor Official

Spleen (SP)

Target Official

Gallbladder (GB)

Calculate pathway and points

The model uses a Yin-Official core pathway plus endpoint luo bridges. A Yang donor first bridges to its paired Yin Official; a Yang target is reached after the core transfer through the target Yang Official's luo point. If two shortest routes have equal length, the route with fewer Jing-Well points is shown first. A longer route is never chosen merely to avoid a Jing-Well point.

2. Result

Δ

3

Core steps

2

Luo steps

1

Jing-Well

0

Shortest routes

2

Route 1

Sheng Ke Luo bridge $\times 1$ No Jing-Well

Element core pathway

Earth $\rightarrow$ Metal $\rightarrow$ Wood

Operational Official pathway

Spleen (SP) $\rightarrow$ Lung (LU) $\rightarrow$ Liver (LIV) $\rightarrow$ Gallbladder (GB)

- Target point:** Liver (LIV) receives qi from Metal: Zhongfeng (LIV4)
- Carrier point:** Lung (LU) receives qi from Earth: Taiyuan (LU9)
- Target-side luo:** After the core transfer, tonify Guangming (GB37), the luo point on Gallbladder (GB), to pull qi from Liver (LIV) into Gallbladder (GB).

Core needling order: ① Zhongfeng (LIV4), even technique and retain; ② Taiyuan (LU9), even technique and retain; ③ return to Zhongfeng (LIV4), fully tonify and remove; ④ gently remove Taiyuan (LU9). Do not needle the donor Yin Official.

Route 2

Ke Sheng Luo bridge $\times 1$ No Jing-Well

Element core pathway

Earth $\rightarrow$ Water $\rightarrow$ Wood

Operational Official pathway

Spleen (SP) $\rightarrow$ Kidney (KI) $\rightarrow$ Liver (LIV) $\rightarrow$ Gallbladder (GB)

- Target point:** Liver (LIV) receives qi from Water: Ququan (LIV8)
- Carrier point:** Kidney (KI) receives qi from Earth: Taixi (KI3)
- Target-side luo:** After the core transfer, tonify Guangming (GB37), the luo point on Gallbladder (GB), to pull qi from Liver (LIV) into Gallbladder (GB).

Figure 1. Tool interface: result for Spleen (Earth) $\rightarrow$ Gall Bladder (Wood), Route 1 (Earth $\rightarrow$ Metal $\rightarrow$ Wood).

5.2 Case 2: Lung (Metal) $\rightarrow$ Pericardium (Fire), $\Delta=3$

Suppose another patient's pulse diagnosis shows the Lung relatively excess and the Pericardium relatively deficient, with donor Element Metal, target Element Fire, and the Fire Element defaulting to the Pericardium.

$\Delta=(1-3+5) \bmod 5=3$, again giving two equally-short pathways: Metal $\rightarrow$ Water $\rightarrow$ Fire and Metal $\rightarrow$ Wood $\rightarrow$ Fire. The former's core points are Fuliu (Ki 7), the Metal point of the Kidney channel, and Quze (Pc 3), the Water point of the Pericardium channel, with needling order ① Quze then ② Fuliu, and no Jing-Well point involved; the latter's core points are Zhongfeng (Liv 4), the Metal point of the Liver channel, and Zhongchong (Pc 9), the Wood point of the Pericardium channel — Zhongchong being a Jing-Well point. The tool accordingly displays the former pathway first, flags the latter as “involves a Jing-Well point,” and presents both pathways in full.

1. Choose donor and target

Donor Element

Metal

Target Element

Fire

Donor Official

Lung (LU)

Target Official

Pericardium (PC, Outer F)

Calculate pathway and points

The model uses a Yin-Official core pathway plus endpoint luo bridges. A Yang donor first bridges to its paired Yin Official; a Yang target is reached after the core transfer through the target Yang Official's luo point. If two shortest routes have equal length, the route with fewer Jing-Well points is shown first. A longer route is never chosen merely to avoid a Jing-Well point.

2. Result

Δ

3

Core steps

2

Luo steps

0

Jing-Well

0

Shortest routes

2

Route 1

Sheng Ke Preferred route No Jing-Well

Element core pathway

Metal → Water → Fire

Operational Official pathway

Lung (LU) → Kidney (KI) → Pericardium (PC, Outer Fire)

- Target point: Pericardium (PC, Outer Fire) receives qi from Water: Quze (PC3)
- Carrier point: Kidney (KI) receives qi from Metal: Fuliu (KI7)

Core needling order: ① Quze (PC3), even technique and retain; ② Fuliu (KI7), even technique and retain; ③ return to Quze (PC3), fully tonify and remove; ④ gently remove Fuliu (KI7). Do not needle the donor Yin Official.

Route 2

Ke Sheng Uses Jing-Well × 1

Element core pathway

Metal → Wood → Fire

Operational Official pathway

Lung (LU) → Liver (LV) → Pericardium (PC, Outer Fire)

- Target point: Pericardium (PC, Outer Fire) receives qi from Wood: Zhongchong (PC9) Jing-Well
- Carrier point: Liver (LV) receives qi from Metal: Zhongfeng (LV4)

Core needling order: ① Zhongchong (PC9), even technique and retain; ② Zhongfeng (LV4), even technique and retain; ③ return to Zhongchong (PC9), fully tonify and remove; ④ gently remove Zhongfeng (LV4). Do not needle the donor Yin Official.

Two equally short routes exist. The route with fewer Jing-Well points is displayed first; the alternative is retained for clinical comparison.

Figure 2. Tool interface: result for Lung (Metal) → Pericardium (Fire), comparing two candidate routes.

This case illustrates how the tool applies the established course criteria concerning point comfort (The Acupuncture Academy, 2.5.iii) to rank candidate pathways, rather than judging for itself which pathway is “clinically superior.”

6. Discussion

Clinical utility. By pre-computing calculations otherwise scattered across multiple rules within *qi* Transfer, the tool could in principle reduce the cognitive burden of pathway reasoning and documentation on the practitioner, and help reduce the risk of overlooking a legal pathway or selecting the wrong point during manual reasoning. This remains a design-level inference at present, unsupported by real clinical-use data.

Educational utility. By making multi-step reasoning that would otherwise be carried out mentally explicit, the tool may help students understand the structure of *sheng/ke* pathways; this potential value likewise awaits further verification and is not overstated here.

Documentation utility. The pathways, points and reasoning the tool outputs are structured in form, offering one possible route toward the structured accumulation of clinical records in future.

Limitations. First, the tool is presently only an author-verified prototype demonstration, with no practitioner usability testing. Second, the ranking criteria (shortest pathway, avoidance of Jing-Well points) are drawn from published guidance on reliability and comfort of execution, not from evidence of differential clinical effectiveness; “shortest” or “Jing-Well-avoiding” does not imply “clinically superior,” and this distinction is deliberately preserved throughout the tool's design and this paper. Third, the tool's scope is strictly limited to routine Element-level *qi* Transfer and its *yang*-Organ luo bridging; the Four Needle Technique and donor-side dispersal methods have not been formalised. Fourth, correctness has so far only been checked by manual comparison against a published worked example; no systematic automated testing has yet been carried out.

Intellectual property and provenance boundary. All clinical rules relied upon in this paper derive from published literature (Hicks, Hicks & Mole, 2011) and the author's course teaching at The Acupuncture Academy; any inference or extension that cannot be traced to these sources is explicitly flagged in the Methods section as an engineering decision or an unvalidated hypothesis, and is not presented as established clinical doctrine.

7. Future Work and Conclusion

Future work may proceed in three directions: formalising the Four Needle Technique and donor-side dispersal methods; conducting small-scale usability testing with practitioners to assess the tool's value in real clinical or teaching settings; and exploring the structured storage of Organ pulse-quantity data recorded by practitioners as part of a Traditional Diagnosis (TD) module, together with a record of the practitioner's final chosen transfer, to provide a foundation for future real-world data collection — while the identification of candidate transfer pairs and the final choice would still rest with the practitioner's overall pulse-diagnostic judgement.

This paper has proposed and implemented a transparent, explainable prototype tool for *qi* Transfer in Five Element Acupuncture, grounded in established course rules and explicitly classified into established knowledge, engineering decisions, and unvalidated hypotheses. Its feasibility is illustrated with two simulated cases, one of which was verified point-by-point against a published worked example. The tool neither diagnoses nor recommends a treatment plan; the practitioner's clinical judgement remains at the centre of the process throughout.

References

Hicks A, Hicks J and Mole P (2011) Five Element Constitutional Acupuncture (2nd edition).
Edinburgh: Churchill Livingstone Elsevier.

Note: course material from The Acupuncture Academy (Lesson 2.5.iii) is unpublished and, per its own referencing guidance, is cited in-text only (The Acupuncture Academy, 2.5.iii) and not included in this reference list.

1. 背景

五行针灸源于中医五行理论，历史上多以口传心授承袭；二十世纪中叶经英国针灸师华思礼（J. R. Worsley, 1923–2003）系统整理并在欧美传播，近年又经其弟子诺娜·弗兰格林（Nora Franglen）等人推动，重新传入中国并形成较为系统的教学体系。这一体系的临床核心，是通过声、色、气味、情志（CSOE）的观察，结合脉诊，判断患者的致病一行（Constitutional Factor, CF）——即被认为主导患者整体失衡状态的那一行。

当主要阻滞清除、经气相对通畅后，治疗进入对十二脏腑生克关系的精细调整阶段：若脉诊显示某脏腑相对有余、另一脏腑相对不足，治疗师可用经气转化（Transfer of Qi），沿生克关系允许的合法路径，把气从供气脏腑引向目标脏腑。手工推演这一过程——判断路径合法性、选择中转脏腑、确定穴位与针刺顺序——一旦存在不止一条合法路径，操作便相当繁琐。

2. 研究问题与边界

本文处理的问题是：经气转化这一有明确规则可循的推理过程，能否形式化为透明的数字工具，自动枚举合法候选路径并解释依据，同时把诊断和最终选择权完整保留给治疗师？

工具被限定在单一任务上：不诊断致病一行，不判断脏腑虚实，不宣称改善临床结果。给定治疗师通过脉诊确定的供气行与目标行，工具计算出符合既定规则的候选路径及对应穴位、针刺顺序；存在多条合法候选路径时全部呈现，按已发表教学材料的标准排序，而非工具自身偏好。

3. 方法

3.1 规则来源与三层分类

为避免把工程决策包装成临床规范，工具中每条规则在编码前都被归入以下三层：

（A）已确立知识——可追溯至已出版文献或课程教学：生克循环方向；克循环转化仅限阴官之间（Hicks, Hicks & Mole, 2011: 945; The Acupuncture Academy, 2.5.iii）；火行两侧禁止转化（The Acupuncture Academy, 2.5.iii）；转化针刺顺序——先刺偏虚目标脏腑并轻微补法，沿路径向后依次下针，最后回到目标脏腑充分补法并最先出针（Hicks, Hicks & Mole, 2011: 903–904; The Acupuncture Academy, 2.5.iii）；络穴用于同一五行内阴阳脏腑间转化（Hicks, Hicks & Mole, 2011: 949–950）；倾向选择更短路径以降低漏针风险（Hicks, Hicks & Mole, 2011: 903）；最小干预原则（Hicks, Hicks & Mole, 2011: 897）；以及火行转化默认优先心包官而非心，仅治疗师主动选择时才用心官（The Acupuncture Academy, 2.5.iii）。

（B）工程实现决策——为使（A）可计算而做出、本身不构成临床主张的选择：将十二脏腑表示为五个五行节点（阳腑处理另设络穴步骤）；将生、克关系均建模为单步有向边并用最短路径搜索枚举候选；界面上同时展示所有等长候选路径而非单一推荐。

（C）待验证假设——无法追溯至（A）的扩展一律标记并排除在外，目前无一条被实现：例如缺乏完整 worked example 支持的单步克转化，保持未自动化状态。

3.2 简单转化与复杂转化

最简单的转化是用补穴、泻穴沿生的关系移动一步气：补穴对应“母”行、把气引向子行；泻穴对应“子”行、把气沿循环引出（Hicks, Hicks & Mole, 2011: 941–942），临床最常用，不需中转穴位。

当供气行与目标行不直接相邻，或需跨克循环转化时，则在中转脏腑上依次布下“中转针”（自目标脏腑向后回溯建立并留针），待整条通路建立完毕后，再对目标脏腑充分补法引气通过（Hicks, Hicks & Mole, 2011: 902–904）。若端点需延伸至配对阳腑，则额外用一步络穴转化，在阴阳配对之间转化气，而非跨五行。

3.3 四针法（超出本工具范围）

对反复治疗仍顽固不转化的气，课程另教授力度更强的四针法，最早由 17 世纪朝鲜僧人 Sa Am 所述（Hicks, Hicks & Mole, 2011: 946），临床使用频率很低。因其规则尚未完整逐条核对，本文将其列为超出当前工具范围的技术，不在 prototype 中实现，留待未来工作。

3.4 候选路径的排序标准

当存在多条等长合法候选路径时，工具不替治疗师选出唯一“最优”路径，而按两条来自已发表教学材料、关注操作可靠性与舒适度而非疗效差异的标准排序：

第一，更短路径优先——并非因其临床更优，而是已发表指导建议选择最短路径“以降低漏针可能性”（Hicks, Hicks & Mole, 2011: 903），呼应该流派最小干预原则（Hicks, Hicks & Mole, 2011: 897）。

第二，长度相同时，在不明显牺牲舒适度前提下优先避开痛感更明显的穴位如井穴（The Acupuncture Academy, 2.5.iii）。最终选择仍属治疗师，也可能权衡中转五行当下状态等其他因素（Hicks, Hicks & Mole, 2011: 903）。

4. 原型架构与可解释输出

工具以单文件网页实现，无需服务器或数据库，全部计算在本地完成，交互流程分四步。

第一步，选择供气行与目标行，并进一步指定具体脏腑；若涉及火行阳腑或阴官，默认采用心包，仅用户主动更改才切换为心（The Acupuncture Academy, 2.5.iii）。

第二步，核心路径计算：五行编码为 0–4，D 为供气行、T 为目标行，依 $\Delta = (T - D) \bmod 5$ 计算循环距离，在五节点有向图上得出所有最短合法路径； $\Delta = 3$ 时两条等长路径均被计算，供排序展示。

第三步，端点扩展：若端点为阳腑，工具自动补充一步络穴桥接（供气端先经配对阴官络穴引入核心转化；目标端在核心转化后经自身络穴引出）。此扩展组合课程中两条独立规则，属 B 类工程决策，界面与文中均有标注。

第四步，候选路径排序与推理呈现：多条等长候选路径优先展示不涉及井穴（或更少）的路径，但全部路径始终显示，只是顺序不同；每条路径均给出核心路径图示、脏腑操作路径、穴位来源、针刺顺序及井穴提示，确保每一结论均可追溯至具体规则来源。

最终路径选择、是否转化及时机，仍完全由治疗师依脉诊与临床经验判断，工具不作推荐意义上的“最优解”声明。

开发说明：工具代码实现使用了 AI 辅助编程；文中临床规则均来自 3.1 节所述文献与课程材料，未由 AI 生成或推断。

5. 模拟病例

以下两案例均为假设性演示，说明工具运行方式，不涉及真实患者数据。

5.1 案例一：脾（土）→胆（木）， $\Delta=3$

假设患者主要阻滞已清除，脉诊显示脾相对有余、胆相对不足，供气行为土，目标行为木，供气脏腑为脾（阴官），目标脏腑为胆（阳腑）。

$\Delta=(0-2+5) \bmod 5=3$ ，存在两条等长核心路径：土→金→木、土→水→木，均不涉及井穴，按默认顺序展示。以土→金→木为例，核心路径为脾→肺→肝，对应穴位为肺经土穴太渊（Lu 9）、肝经金穴中封（Liv 4）；因目标脏腑为胆（阳腑），核心转化后追加络穴桥接，用胆经自身络穴光明（GB 37）。

核心转化针刺顺序为：①中封（Liv 4）②太渊（Lu 9）平补平泻留针，③回到中封施以充分补法并出针，④最后轻柔拔除太渊；供气脏腑不下针。核心转化完成后，另用光明（GB 37）施补法，从肝进一步拉气至胆，完成阳腑桥接。

该路径涉及的三个穴位（GB 37、Liv 4、Lu 9）及其对应五行属性，与 Hicks, Hicks & Mole (2011: 902–903)所给 worked example 完全一致；但工具将阳腑络穴桥接作为核心转化完成后的独立收尾步骤处理，插针的具体先后顺序与原书描述的操作流程存在差异，这属于 3.1 节所述的 B 类工程实现决策，而非对原书针刺程序的逐步复现。

1. 选择供气端与目标端

供气行

目标行

土

木

供气脏腑

目标脏腑

脾 (SP)

胆 (GB)

计算路径、络穴与五行穴

模型采用“阴言核心路径 + 络穴络穴桥接”，阳供气端先通过配对阴言络穴进入阴言层面；阳目标端在核心转化完成后，通过目标阳络穴拉入。若存在两条等长最短路径，则优先并穴更少的路线；不会为了避开并穴而选择更长路径。

2. 计算结果

Δ

核心步数

络穴步数

并穴数

最短路线

3

2

1

0

2

路线 1

生 克 络穴桥接 × 1 无并穴

五行核心路径

土 → 金 → 木

脏腑操作路径

脾 (SP) → 肺 (LU) → 肝 (LIV) → 胆 (GB)

- 目标穴：肝 (LIV) 从金接受气：中封 (LIV4)
- 中转穴：肺 (LU) 从土接受气：太渊 (LU9)
- 目标端络穴：核心转化完成后，用 光明 (GB37) (胆 (GB) 的络穴) 施补法，从肝 (LIV) 进一步拉气至胆 (GB)。

核心针刺顺序：① 中封 (LIV4) 平补平泻留针；② 太渊 (LU9) 平补平泻留针；③ 回到 中封 (LIV4) 充分补法并出针；④ 最后轻柔拔除 太渊 (LU9)。供气阴官本身不下针。

路线 2

克 生 络穴桥接 × 1 无并穴

五行核心路径

土 → 水 → 木

脏腑操作路径

脾 (SP) → 肾 (KI) → 肝 (LIV) → 胆 (GB)

- 目标穴：肝 (LIV) 从水接受气：曲泉 (LIV8)
- 中转穴：肾 (KI) 从土接受气：太溪 (KI3)
- 目标端络穴：核心转化完成后，用 光明 (GB37) (胆 (GB) 的络穴) 施补法，从肝 (LIV) 进一步拉气至胆 (GB)。

核心针刺顺序：① 曲泉 (LIV8) 平补平泻留针；② 太溪 (KI3) 平补平泻留针；③ 回到 曲泉 (LIV8) 充分补法并出针；④ 最后轻柔拔除 太溪 (KI3)。供气阴官本身不下针。

存在两条等长最短路径，但两条路线涉及并穴的数量相同，因此不因并穴因素区分优先级。

图1. 工具界面：脾（土）→胆（木）计算结果，路线1（土→金→木）

5.2 案例二：肺（金）→心包（火），Δ=3

假设另一患者脉诊显示肺相对有余、心包相对不足，供气行为金，目标行为火，火行按默认选择心包。

$\Delta=(1-3+5) \bmod 5=3$ ，存在两条等长路径：金→水→火、金→木→火。前者核心穴位为肾经金穴复溜（Ki 7）与心包经水穴曲泽（Pc 3），插针顺序①曲泽②复溜，不涉及并穴；后者核心穴位为肝经金穴中封（Liv 4）与心包经木穴中冲（Pc 9），中冲为并穴。工具据此优先展示前者，并在后者旁标注“涉及并穴”，两条路径均完整呈现。

此案例展示工具应用课程中关于穴位舒适度的既定标准（The Acupuncture Academy, 2.5.iii）排序候选路径，而非自行判断哪条“临床更优”。

1. 选择供气端与目标端

供气行

金

目标行

火

供气脏腑

肺 (LU)

目标脏腑

心包 (PC, 相火)

计算路径、络穴与五行穴

模型采用“阴食核心路径 + 端点络穴桥接”。阳供气端先通过配对阴食络穴进入阴食层面；阳目标端在核心转化完成后，通过目标阳腑络穴拉入。若存在两条等长最短路径，则优先并穴更少的路线；不会为了避开并穴而选择更长路径。

2. 计算结果

Δ	核心步数	络穴步数	并穴数	最短路线
3	2	0	0	2

路线 1

生 克 供先路径 无并穴

五行核心路径

金 → 水 → 火

脏腑操作路径

肺 (LU) → 肾 (KI) → 心包 (PC, 相火)

- 目标穴：心包 (PC, 相火) 从水接受气：曲泽 (PC3)
- 中转穴：肾 (KI) 从金接受气：复溜 (KI7)

核心针刺顺序：① 曲泽 (PC3) 平补平泻留针；② 复溜 (KI7) 平补平泻留针；③ 回到 曲泽 (PC3) 充分补法并出针；④ 最后轻柔拔除 复溜 (KI7)。供气阴官本身不下针。

路线 2

克 生 涉及并穴 × 1

五行核心路径

金 → 木 → 火

脏腑操作路径

肺 (LU) → 肝 (LV) → 心包 (PC, 相火)

- 目标穴：心包 (PC, 相火) 从木接受气：中冲 (PC9) 并穴
- 中转穴：肝 (LV) 从金接受气：中封 (LV4)

核心针刺顺序：① 中冲 (PC9) 平补平泻留针；② 中封 (LV4) 平补平泻留针；③ 回到 中冲 (PC9) 充分补法并出针；④ 最后轻柔拔除 中封 (LV4)。供气阴官本身不下针。

存在两条等长最短路径。已优先显示并穴更少的路线；另一条仍保留供临床比较。

火行路径已固定在同一侧。默认使用 PC；只有用户主动选择 HT/SI 时才使用君火。

图2. 工具界面：肺（金）→心包（火）计算结果，两条候选路径对比

6. 讨论

临床价值。工具将经气转化中散落于多条规则的计算前置完成，理论上可降低治疗师推演与记录的认知负担、减少遗漏路径或选错穴位的风险，但目前仅为设计层面推论，尚无真实临床数据支持。

教学价值。工具将原本需在脑中完成的多步推理显式呈现，可能有助于学生理解生克路径结构，但这一价值同样有待验证，本文不作过度宣称。

病历记录价值。工具输出的路径、穴位与推理依据具有结构化特征，为未来病历结构化积累提供了一种可能路径。

局限。第一，工具仅为作者自证的原型演示，未经治疗师使用测试或可用性验证。第二，排序标准（最短路径、避开并穴）依据的是操作可靠性与舒适度建议，而非疗效证明——“最短”或“避开并穴”不等同于“临床更优”，这一区分被有意保留。第三，工具范围严格限于五行层面常规转化及阳腑络穴桥接，四针法等更复杂转化未被形式化。第四，目前仅通过与已发表 worked example 的手工比对进行有限验证，尚无系统自动化测试。

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为工程决策或待验证假设，不作为既定临床规范呈现。

7. 未来工作与结论

未来工作包括三个方向：其一，扩展形式化四针法及供气端泻法等更复杂转化；其二，开展小规模治疗师可用性测试；其三，探索将治疗师记录的脏腑脉量数据结构化存储，作为传统诊断（TD）模块的一部分，并记录治疗师最终选择的转化方案，为未来真实世界数据积累提供基础，但候选对的判断与最终选择仍由治疗师基于综合脉诊做出。

本文提出并实现了一个基于既定课程规则的、透明可解释的经气转化辅助工具原型，将规则来源划分为已确立知识、工程实现决策与待验证假设三层，并以两个模拟案例（其一经与已发表教材逐穴验证）展示其可行性。工具不诊断、不推荐治疗方案，治疗师的临床判断始终保留在流程核心位置。

参考文献

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说明：The Acupuncture Academy 的课程讲义（Lesson 2.5.iii）按其自身指引作为未公开发表材料，仅于正文中标注引用（The Acupuncture Academy, 2.5.iii），不列入本参考文献表。