TR-13 Humours, bloodletting, purging and the therapies that killed: the cautionary history

HEALING after the FALL, research library, TR-13

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This is the counterweight to the rest of the traditions domain. The tradition examined here is the book's own ancestor, and the finding is that it killed for two thousand years while every intelligent person involved believed it was saving lives. It builds on FO-05, cited as (THRIVING library, FO-05) rather than re-argued.

1. Findings by section

1.1 The humoral system on its own terms

The body contains four humours: blood, phlegm, yellow bile and black bile. The canonical list is in the Hippocratic On the Nature of Man, and was not fixed before that, some texts of the Corpus naming only two or three. Each humour carries a pair of elemental qualities, hot or cold and wet or dry, and Galen held that only one temperament is a perfect mixture, every other person running an excess of something. Health is krasis, a good mixture. Illness is dyskrasia, a bad one (teaching and encyclopaedia summaries, read in summary).

Disease here is not a thing that enters you. It is your own matter gone wrong, and the body's response is a cooking. Pepsis, usually rendered coction, is the ripening of the morbid matter, whose opposite is sepsis, putrefaction. When the matter is ripe the body expels it in a crisis, and crises fall on predictable critical days. This is what a fever looks like from the bedside: the patient burns and sweats, the urine changes, the sputum thickens from thin and clear to thick and yellow, and on about the seventh or ninth day the fever breaks or the patient dies. Any attentive observer sees ripening and crisis. The theory is an honest generalisation from the most visible facts available.

The therapy follows with real logic. If illness is excess, remove the excess. If the matter is in the blood, open a vein. If it is in the gut, purge. If it is in the stomach, vomit. If it is deep and will not move, draw it to the surface with a blister. This is not superstition. It is engineering.

Galen made venesection the centre. In the treatise written about 162 to 163 CE against the followers of Erasistratus the dispute is over means, not principle, and he argues from a single case, a young woman whose menses had stopped, and from the authority of Hippocrates (Galen, De venae sectione adversus Erasistratum, read through a Cambridge study summary, not in the Greek). One case, a visible evacuation, recovery, and an appeal to the ancients. The reader will meet that argument again in their own century.

The system also integrates season, climate, age, diet, sleep, exercise and the passions into one account, and the six non-naturals are a regimen a modern public health officer would mostly endorse. The theory was wrong about the humours and right that how people live makes them ill. By 1800 it had been rebuilt twice and the shape held. Broussais taught that all fevers arose from inflammation of an organ, treated by leeches over the part, and France imported about 42 million leeches for medical use in 1833 (Ackerknecht, in Morabia 2004). Rush collapsed all fevers into one disease

with one cause, morbid excitement of the blood vessels, and therefore one cure, depletion (Warner 1986, read in publisher description and review only). The vocabulary changed. The act did not.

1.2 Why it lasted, and what made it feel like it worked

It produced a visible, repeatable effect. Bleeding softened a bounding pulse within minutes. Calomel made the mouth run with saliva. Tartar emetic emptied the stomach. Cantharides raised a weeping blister. With no thermometer in general use, no blood count and no imaging, a visible change in the patient was the only end point available, and every one of these drugs delivered one reliably. The effect was real. The inference from effect to cure was the error.

Fainting looked like the end point. Many bled until the patient swooned. The faint is a vasovagal reflex triggered by falling preload, and a delirious, thrashing patient who faints becomes quiet, pale, cool and supine. Agitation replaced by calm is a drug effect read as a cure.

Most illnesses get better. The diseases of 1800 were overwhelmingly self-limiting, and those that were not were fatal whatever was done. Bigelow told the Massachusetts Medical Society on 27 May 1835 that some diseases are self-limited and run a fixed course treatment cannot shorten (THRIVING library, FO-05). Rush claimed to have recovered more than ninety-nine of a hundred of his patients (Rush 1793), which is what yellow fever's natural history produces in a practice heavy on mild cases.

The attraction is universal, not Greek. Miton, Claidière and Mercier (2015) found bloodletting in many unrelated cultures in the eHRAF database, then ran transmission-chain experiments. Stories involving bloodletting survived retelling better than stories about other therapies, the variants surviving best in the laboratory were the commonest in the ethnographic record, and in one study a story about an accidental cut mutated into deliberate bloodletting. They conclude that some universal cognitive mechanism makes bloodletting attractive, neither efficacy nor ancient prestige explaining the spread. Bleeding will reappear in the reader's village without anyone teaching it.

1.3 The heroic turn: Rush, Philadelphia, 1793

The American Age of Heroic Medicine runs from about 1780 to 1850. Its signature was not that bleeding and purging were used, which was ancient, but the quantity, on the theory that the dose should match the violence of the disease.

Yellow fever killed roughly 4,000 to 5,000 of Philadelphia's 50,000 people between August and November 1793. Rush stayed, saw up to a hundred patients a day, and gave the regimen in his own words to Dr John Rodgers on 3 October 1793, reprinted in the American Mercury on 21 October: ten grains of calomel with fifteen grains of jalap every six hours until four or five large evacuations, then a daily purge. After 10 September he judged bleeding necessary in nineteen of every twenty cases, beginning at ten to twelve ounces and increasing as the season advanced to sixty, seventy and even eighty ounces. He reported fastest convalescence where bleeding had been heaviest and said he had seen no harm from it (Rush 1793). Ten grains is about 0.65 g of calomel, four times a day. Eighty ounces is about 2.4 litres. Rush later called the purge "ten and ten" (Rush to Adams, 25 November 1806, found in search results, the page returned empty to our fetch, so the wording is [VERIFY]).

William Cobbett attacked him in Porcupine's Gazette, nicknamed him Doctor Sangrado after the bleeding physician in Gil Blas, and wrote in 1797 that Rush had contributed to the depopulation of the earth. Rush sued and the jury awarded 5,000 dollars on 14 December 1799, the day Washington died. The court settled the libel, not the medicine. No reanalysis of the Philadelphia bills of mortality against treatment has been found, so the charge is unproven in both directions, which is the point: nobody counted. Opposition existed, the College of Physicians declining to back him and Jean Devèze, who favoured rest, fluids and mild tonics, accusing him of killing more patients than the disease.

1.4 George Washington, 14 December 1799

The whole repertoire, applied in one day by three competent physicians to a patient with every advantage.

On 13 December Washington spent hours outdoors at Mount Vernon in cold rain, snow and hail and sat through dinner in damp clothes. At about 2 a.m. he woke unable to breathe properly, and by 6 a.m. had a high fever, a raw throat and worsening breathing. At 7.30 a.m. the overseer George Rawlins took 12 to 14 ounces, and Washington asked for more. At 9 a.m. Dr James Craik applied a cantharides blister to the throat. At 9.30 a.m. a second bleeding of 18 ounces, at 11 a.m. a third, at noon an enema and a gargle he nearly choked on. In the afternoon Craik ordered a fourth bleeding of 32 ounces, over the objection of Dr Elisha Cullen Dick, who argued instead for opening the windpipe. At 4 p.m. Dr Gustavus Richard Brown suggested calomel and tartar emetic, and at 8 p.m. blisters went on feet, arms and legs. He died at about 10.20 p.m. (PBS NewsHour timeline, read in full).

More than 80 ounces, about 2,365 mL, in roughly twelve hours, which the same source puts at about 40 per cent of his blood volume. Morens in the New England Journal of Medicine in 1999 argued for acute epiglottitis and, as reported secondhand, held that the bloodletting probably did not kill a man of Washington's size (Morens 1999, not read directly, reported through the Constitution Center and PBS, [VERIFY the exact wording]). A 2008 American Surgeon paper revisits the controversy and was read at abstract level only.

Three things follow and not more. Fulminant epiglottitis was probably unsurvivable at Mount Vernon whatever was done, so this is not a clean case of treatment killing a man. But 2.4 litres in twelve hours is a modern class III haemorrhage, and inducing that in a man fighting for his airway cannot have helped. And the one intervention that might have worked was refused as too bold by the same men who thought removing half a man's blood was ordinary care. The theory determined which act counted as rash.

1.5 Calomel, and the order that struck it off

Calomel is mercurous chloride, in humoral practice the universal purgative and alterative. Its status came from a visible end point: given long enough it makes the salivary glands pour, and salivation was read as proof that the drug had reached the system and was carrying the morbid matter out. Physicians therefore dosed to salivation on purpose.

Doses ranged from a civilian purgative three to six grains, to Rush's twenty grains four times daily, and to an 1858 Georgia physician reporting 40 grains in one case and 85 in another, with no standardisation and no way to know how much mercurous chloride a given powder held. The harm was described by the people giving it: acute mercurial poisoning up to death with heavy dosing, and with smaller doses over time profuse salivation, loss of teeth, ulcerated gums, hair loss, and mercurial gangrene rotting the soft tissue of the mouth and sometimes taking the cheek and jaw. Some children recorded as dying of mercurial gangrene probably had noma, the gangrene of starvation, misattributed (THRIVING library, FO-05).

On 4 May 1863 the Surgeon General of the Union Army, William Alexander Hammond, struck calomel and tartar emetic from the supply table, in an order printed in the Buffalo Medical and Surgical Journal in June 1863 and known as Circular No. 6. We read it in full. Military surgeons had pushed calomel to excess, producing innumerable cases of profuse salivation and the not infrequent occurrence of mercurial gangrene, and because no other means of restriction seemed possible it was removed. Tartar emetic went with it, on the ground that the prevalent army diseases could be treated as effectively without it.

The profession revolted. A journal reported great commotion among the medical hosts in and out of the army, and a correspondent to the American Medical Times called the circular professional retrogression. Hammond already had an enemy in Secretary of War Edwin Stanton, whose investigation led to a court martial, from 30 January to 7 May 1864, convicting him of irregularities in purchasing. Lincoln affirmed on 18 August 1864 and Hammond was dismissed that day, Congress restoring him to the retired list in 1878. The calomel order was not the formal charge and was a large part of why nobody defended him.

The long tail: calomel teething powders continued into the 1950s. Warkany and Hubbard found raised urinary mercury in twelve of fourteen children with pink disease in 1948, and a 1951 replication found it raised in 92 per cent of 41 affected children against 15 per cent of controls. About one in 500 exposed children developed it, a figure from a 2011 paper. Calomel left most powders about 1953 to 1954 and the disease essentially disappeared: remove the drug, the disease vanishes.

1.6 Tartar emetic, blisters and the rest

Tartar emetic is antimony potassium tartrate, pushed in Giovanni Rasori's Italian counter-stimulant school from 1801 to a drachm, about 3.9 g, or more a day (THRIVING library, FO-05). The US National Toxicology Program notes that as an antiparasitic it worked in humans only intravenously at a near-lethal total of about 36 mg/kg. A hazard database citing HSDB gives a minimum fatal human dose of 130 mg alongside a survivor after 15,000 mg, figures that do not reconcile and are at best rough. Cardiac toxicity has been reported as cause of death in people given antimonials, and in cultured cardiac myocytes 100 micromolar killed about a third of cells in four hours. No count of deaths from its medical use exists.

Blistering used cantharides, whose active principle is cantharidin. Secondary sources give a human LD50 around 0.5 mg/kg and a potentially fatal dose as little as 10 mg. A 23-year-old soldier who ate one beetle on a dare presented six hours later with abdominal pain, haematuria, hypotension and renal insufficiency, and recovered over a week. Acute tubular necrosis is the common thread. A blister on intact skin is a smaller exposure, but Washington had blisters on throat, feet, arms and legs in one day, and the drug is absorbed through the raw surface.

Purging went to nearly everyone, including patients with cholera, dysentery and typhoid already losing fluid. No source counts deaths from purging alone. That it deepened fatal dehydration in diarrhoeal disease is an inference from the physiology and from FO-02 [VERIFY], but a strong one, and it is the most dangerous element of the repertoire for a post-Fall village.

1.7 How the harm was found

Louis, Paris, 1835. 77 patients at La Charité with a tightly defined pneumonia, grouped by when the first bleeding was done: early, days 1 to 4, n = 41, and late, days 5 to 9, n = 36. Mortality was 44 per cent early and 25 per cent late. Louis called the result startling and apparently absurd, checked whether the late group had simply passed the worst and found no difference in severity, and concluded that the findings establish narrow limits to the utility of this mode of treatment. He did not say bleeding was useless. Morabia's reanalysis found the early-bled did worse, p = 0.07, and a protective effect highly unlikely (Morabia 2004). The lasting contribution was the method: group, count, and demand that other things be equal.

Dietl, Vienna, 1849. 380 pneumonia cases in three groups. Bled: 85, 17 died, 20.0 per cent. Tartar emetic in large doses: 106, 22 died, 20.7 per cent. Diet and rest alone: 189, 14 died, 7.4 per cent. The raw counts come from an 1851 Western Lancet summary, and some secondaries print 20.4 per cent for the bled group, which does not match 17 of 85. The groups were not randomised and milder cases may have been steered to expectant care. Even so, the two treatments the profession trusted went with nearly three times the mortality of doing nothing, and with each other, which is what you expect if the common factor is depletion.

Bennett against Alison, Edinburgh, from 1850. Alison asked whether bloodletting might help some pneumonias and harm others, and whether a change in the form of the disease explained why a standard therapy had been abandoned. Bennett denied any change of type and held that bleeding had never worked. More than forty physicians took part over two decades (Carter 2010). His 1865 series at the Royal Infirmary of Edinburgh covers 129 cases treated by restoratives, meaning food, wine and nursing rather than depletion, of which 105 were uncomplicated and all recovered, many severe. Among complicated cases there were 4 deaths, which he excluded when judging the treatment, and Dr Lawson called his statistics altogether unreliable.

Brabin, 2021. Pooling nineteenth-century European hospital series, pneumonia case fatality was 19.9 per cent with phlebotomy against 12.8 per cent without, odds ratio 1.55, 95 per cent confidence interval 1.38 to 1.74, $p < 0.001$. Brabin hypothesises that variable efficacy could be partly explained by altered iron status, a real mechanism given that withholding iron from bacteria is part of the body's defence (abstract and repository record read, full text not retrieved). Nothing is adjusted for severity at the time of bleeding.

Paris 1835, Vienna 1849, Edinburgh 1848 to 1865 and the pooled hospital record point the same way from four methods with four different biases, which is replication in the only sense available for a question nobody randomised.

1.8 How long it took to stop

Slowly, and not because of the evidence alone. Louis's book appeared after Broussais's system had already lost ground, so its direct effect on practice is hard to measure. Oliver Wendell Holmes told the Massachusetts Medical Society on 30 May 1860 that a medicine is a noxious agent, like a blister, a seton, an emetic or a cathartic, and should always be presumed hurtful, and that if the whole materia medica as now used could be sunk to the bottom of the sea it would be all the better for mankind and all the worse for the fishes. He excepted opium, a few specifics, wine and the vapours which produce anaesthesia, and the Society voted nine to seven to disclaim responsibility for his views. Holmes later complained that the qualifications, on which his meaning depended, were stripped off in the quoting, which is worth remembering when quoting him.

In Vienna, Dietl and Škoda earned the label therapeutic nihilism, unfair in practice, since Škoda used digitalis and drained pleural and pericardial fluid (THRIVING library, FO-05). The label meant diagnosing carefully and then refusing drugs that could not be shown to work. Osler's textbook of 1892 is the honest end point, and is not clean: he called pneumonia a self-limited disease uninfluenced in any way by medicine, and in the same section wrote that we have certainly bled too little and recommended 20 to 30 ounces from a full-blooded man early. A Royal College of Physicians of Edinburgh piece states that as late as 1942 a famous textbook considered bloodletting appropriate for pneumonia, but it does not name the textbook and the fetch returned a different article, so the claim is [VERIFY].

Call it roughly a century between Louis publishing and therapeutic bleeding for fevers disappearing. That gap is the number the book should carry, not the trial result.

1.9 The same practices in the living traditions

The rule here is the owner's: on their own terms, with evidence attached. None of these is the Graeco-Arabic system in disguise, and none did what Rush did.

Ayurveda: raktamokshana. The letting of blood is one of the five actions of panchakarma, alongside vamana (therapeutic emesis), virechana (therapeutic purgation) and the two bastis (enemas). Rakta is not simply blood but one of the seven dhatus, the bodily tissues, closely bound to pitta. Where rakta is the dushya, the tissue vitiated in the pathogenesis, removing the vitiated portion is the direct remedy. Charaka indicates it mainly in diseases arising from rakta and pitta, naming skin diseases, abscesses and disorders of the earlobes, and Sushruta is quoted calling it ardha-chikitsa, half of all treatment. Methods divide into shastra visravana, using a sharp instrument, and ashastra visravana, without one, which includes jalauka, the leech, matched to pitta because its qualities are said to be cold and sweet, pitta's opposites. The contraindication list is long: the very emaciated, the oedematous, the anaemic, pregnant women, extremes of climate, and not immediately after other panchakarma procedures.

Beside it: no record of raktamokshana at Western heroic volumes, and the modern studies of leech application in eczema, piles, osteoarthritis and nevus of Ota are small and mostly uncontrolled. Grade D. The documented modern harm in this family is the purges and the metals. The classical texts list ten cardinal complications of faulty emesis or purgation, including anal fissure, bleeding and rectal prolapse, attributed to under- or over-action of the drug or to incompetence, and a critical review of vamana karma adds dehydration and electrolyte imbalance. No prospective cohort giving incidence rates was found, a real gap. Separately, Saper and colleagues measured metals in 193 Ayurvedic

products bought online in 2005: 20.7 per cent exceeded an acceptable daily intake standard for lead, mercury or arsenic, rasa shastra products in 41 per cent of cases against 17 per cent of others, with more than 80 lead poisoning cases reported worldwide since 1978.

Unani and hijama. Unani tibb descends directly from the Graeco-Arabic system through Hunayn, al-Razi and Ibn Sina, naming the four humours as akhlat. Health is i'tidal, balance of the mizaj. Where morbid humours accumulate, istifragh, evacuation, is indicated, and fasd (venesection) and hijama (cupping) are two of its instruments. Hijama bila shart is dry cupping and hijama bi'l shart is wet, in which the skin is scarified and a cup applied so a small quantity of blood is drawn, understood to draw stagnant blood and morbid humours from a region. Two features separate it from Western venesection: volumes are tens of millilitres per session rather than hundreds, and the drawing is superficial and local rather than from a named vein.

Beside it: a large trial literature, mostly poor. A Chinese review found 550 clinical studies published 1959 to 2008, including 73 randomised controlled trials, judged their quality generally poor by Cochrane standards and reported no serious adverse effects. A 2022 systematic review of wet cupping for mental health covered nine articles and 1,124 people, found all reported improvement, and judged the trials few and mostly poor. Sham cupping is hard to make convincing and the outcomes measured are those most responsive to expectation. Grade C for pain, D or absent for everything else. Harm appears as case reports rather than rates: a 40-year-old man dead after hijama on consecutive days from an unlicensed practitioner, a healthy 33-year-old woman with disseminated Staphylococcus aureus after wet cupping, and a review of 14 neurological complications, most often subdural haemorrhage. The danger is not volume, it is the scarification, a deliberate breach of skin often made outside a clinic.

Tibetan medicine, Sowa Rigpa. In the system of the rGyud bzhi the body runs on three nyes pa, rlung (wind), mkhris pa (bile) and bad kan (phlegm). Bloodletting, gtar ga, belongs to the final tier, applied only if an ailment persists after prolonged adherence to the three peaceful means, diet, conduct and medication, and indicated in hot disorders, those from disturbance of blood and mkhris pa: swelling, wounds, gout, erysipelas, abscesses and disorders of liver, pancreas, eye and head. A preparatory decoction, commonly a triphala preparation, is given for some days beforehand on the understanding that it separates pure blood from impure, so only the impure is let. The contraindications are extensive and the central one is rlung: letting blood where the disorder is mixed with rlung is a recognised clinical error. The list also excludes the emaciated, pregnant and postnatal women, chronic wasting, weak digestion, the old and children under 16.

Beside it: no controlled trial was found, and a 2012 comparative study of Chinese and Tibetan bloodletting was seen at abstract level only. The Bhutanese study analysed treatment records from 1998 to 2006 with the stated aim of assessing safety, and its results could not be retrieved, which is a real gap. What can be said without trials is structural and favourable: the tradition places bloodletting last, excludes almost exactly the groups a modern transfusion service excludes, and treats a wrong call on rlung as malpractice rather than bad luck.

Chinese medicine. Two practices need separating. Xia fa, the purgative method, is one of the eight methods of the Shanghan lun, used chiefly for the yangming fu-organ pattern in which heat and undigested matter have become bound in the intestines, its chief formula Da chengqi tang combining da huang (Rheum palmatum, root) with mang xiao (mirabilite). Separately, ci luo or fang xue is the pricking of the collaterals, releasing a few drops of blood at a specified place, often with cupping. The important point is that the Shanghan lun itself treats mistaken purgation as iatrogenic harm: clause 34 classes purgation applied to a taiyang pattern as a reverse treatment, because the pathogen is still on the exterior and sweating is indicated, and describes the consequence, that the stomach and intestine are impaired, diarrhoea becomes continuous and the pulse rate rises. A second-century text that names the error, describes the resulting syndrome and prescribes the rescue is doing something the European tradition never did.

Beside it: a systematic review of modified Dachengqi decoction in COPD exacerbations covered 16 randomised trials and 1,112 patients, reported diarrhoea as the only adverse event and judged the methodology insufficient. A 2025 meta-analysis pooled 16 trials and 1,283 patients comparing bloodletting with drug therapy in acute herpes zoster,

reporting better efficacy, odds ratio 4.51, and fewer cases of postherpetic neuralgia, odds ratio 0.23, with the authors urging considerable caution given high risk of bias and trials from one country only. Grade C. Volumes are drops, so the harm model is infection and needle injury, not exsanguination.

What the comparison shows. Four systems practise bloodletting and only one produced the body count. The Western heroic practice was high-volume, repeated, systemic, indicated in almost everything, and escalating with the physician's confidence: Rush went from ten ounces to eighty as the season went on. The others are low-volume, local, hedged by long contraindication lists, placed late in the sequence, and tied to a differential diagnosis that can rule them out. The Tibetan tradition refuses on rlung, the Ayurvedic in the emaciated, the anaemic and the pregnant, and the Shanghan lun names mistaken purgation as an error with its own syndrome. European heroic medicine had no such stopping rule, because the theory supplied no upper bound: if the patient was not better, the matter had not been sufficiently evacuated. A theory-driven therapy becomes lethal when the theory contains no instruction to stop.

1.10 The small modern niche, and how narrow it is

Removing blood is still done, for four conditions, all sharing one feature: the thing removed has been measured and is objectively in excess.

Hereditary haemochromatosis. Iron overload from HFE mutation. One unit, 450 to 500 mL, weekly until serum ferritin falls, then maintenance, a unit removing about 200 to 250 mg of iron. Targets differ: the 1998 Hemochromatosis Management Working Group guidance says weekly until ferritin is 10 to 20 micrograms/L, GeneReviews until 100 or lower. Benefit is observational: a Danish cohort of 179 found adequately treated patients survived better, $p < 0.0001$, while 527 treated Ontario homozygotes still had higher all-cause mortality than controls, adjusted hazard ratio 1.44. Grade B.

Polycythaemia vera. CYTO-PV randomised 365 adults with JAK2-positive disease at 26 Italian centres to a haematocrit target below 45 per cent or 45 to 50 per cent. After a median 31 months, death from cardiovascular causes or major thrombosis occurred in 5 of 182, 2.7 per cent, against 18 of 183, 9.8 per cent, hazard ratio 3.91, $p = 0.007$ (Marchioli et al. 2013). This is the only randomised trial showing that removing blood saves lives, and it is a trial of a target, not of the procedure. Grade A for the target.

Porphyria cutanea tarda. Phlebotomy of 450 mL every two weeks until ferritin reaches 20 ng/mL. In a randomised open-label pilot of 48 patients, median time to remission was 6.9 months with phlebotomy and 6.1 with hydroxychloroquine 100 mg twice weekly, not significantly different (Singal et al. 2012). Grade B.

Leeches in reconstructive surgery. Hirudo medicinalis is applied to a flap or replanted part with arterial inflow but inadequate venous outflow, the bite and its anticoagulant decompressing the congested tissue until venous drainage re-establishes. Whitaker's review reports salvage in 216 of 279 cases, about 77 per cent, and Boissiere et al. 2021, reviewing 72 articles, found leech therapy the only intervention with enough follow-up to support efficacy. The harm is Aeromonas, which lives in the leech gut: a series of 35 reported 20 per cent infection including 14.2 per cent Aeromonas, more in those without prophylactic antibiotics. Salvage figures of 88.3 against 37.4 per cent appear only on an advocacy website and could not be verified [VERIFY]. Grade B with mandatory antibiotic cover.

The counter-example. Houschyar et al. randomised 64 people with metabolic syndrome to phlebotomy, $n = 33$, or a waiting list, $n = 31$, and systolic pressure fell by a between-group difference of minus 16.6 mmHg. The trial is small, unblinded, measures a surrogate, and has not been replicated at scale in sources found. It shows how a theory-driven therapy gets a second life: a plausible mechanism, a surrogate end point that moves, and an intervention with its own cultural pull. Grade C at best.

What the niche has in common: the excess is measured with an instrument, the end point is a number, and the dose stops when the number is reached. None of that is available after the Fall. A village has no ferritin assay, no

haematocrit, no porphyrin screen and no JAK2 test. The modern niche is not a route by which bloodletting returns, it is a measure of what a village lacks.

1.11 The rule: recognising a theory-driven therapy

Seven signs. Three or more means the therapy is presumed harmful until counted.

1. **The mechanism is the evidence.** The justification is a story about what happens inside the body rather than a count of what happened to patients: plethora, morbid excitement, vitiated rakta, stagnant akhlat, oxidative stress. The story may be true and is still not evidence.
2. **The end point is a visible effect of the treatment, not a change in the illness.** Blood in the basin, salivation, vomiting, a blister weeping, a surrogate number. Ask what the patient could do yesterday and can do today.
3. **Failure calls for more of it.** A larger dose after no improvement means the theory has no stopping rule, the signature of the therapies that killed.
4. **There is nobody who is not given it.** Rush gave it in nineteen cases of twenty. A therapy with no exclusion list has not met a patient it could harm, which means nobody has looked.
5. **The authority is a person or a text rather than a count.** Galen cited Hippocrates, Rush cited himself, the modern version cites a guideline.
6. **The recoveries are counted and the deaths explained away.** Bennett excluded his four complicated deaths.
7. **The practitioner likes it because it is impressive.** Bigelow in 1835 warned that a charm is popularly attached to bold practice. A healer who gains standing from the drama of a procedure cannot evaluate it.

Against all seven there is one test, the rule in FO-02 and SY-03: a therapy must beat doing nothing in comparable people, counted by someone who wrote the numbers down before they knew the answer. Louis, Dietl and Holmes each did that with nothing but a notebook and the discipline to count the deaths as well as the cures. It is available to a village of 300.

2. Evidence grades

Practice	Tradition's claim	What the record shows	Grade
Venesection for fever or pneumonia	Removes plethora	Dietl 20.0% vs 7.4%. Louis 44% vs 25%. Brabin OR 1.55	X
Calomel as purge or alterative	Carries morbid matter out	Salivation, tooth loss, mercurial gangrene, pink disease 1 in 500	X
Tartar emetic	Evacuates upwards	Dietl 20.7%. Effective IV dose near-lethal at 36 mg/kg	X
Cantharides blistering	Draws matter out	Fatal dose about 10 mg, tubular necrosis	X
Purging in diarrhoeal illness	Removes morbid matter	No count found. Deepens fatal dehydration [VERIFY]	X
Feeding and nursing in pneumonia	Lets nature finish	Dietl 7.4%. Bennett 0 of 105 uncomplicated	B
Counting outcomes in groups	Replaces opinion	Louis 1835, Dietl 1849, Bennett 1865	A

Practice	Tradition's claim	What the record shows	Grade
Rasa shastra metal preparations	Processing destroys toxicity	41% over metal limits, 80+ lead cases since 1978	X
Raktamokshana within classical limits	Removes vitiated rakta	Small uncontrolled studies only	D
Hijama for pain	Draws stagnant blood	73 RCTs by 2008, poor quality, consistently positive	C
Hijama in the unwell or unsterile	Not addressed	Disseminated S. aureus, 14 neurological cases, one death	X
Tibetan gtar ga within its limits	Last resort, hot disorders	No trials. Structural safeguards documented	D
Chinese bloodletting, herpes zoster	Releases heat and stasis	16 RCTs, 1,283 patients, OR 4.51, high risk of bias	C
Phlebotomy, haemochromatosis	Removes measured iron	Danish cohort benefit, Ontario cohort HR 1.44	B
Phlebotomy to haematocrit under 45%	Reduces thrombosis	CYTO-PV 2.7% vs 9.8%, HR 3.91	A
Leeches for a congested flap	Decompresses tissue	216 of 279 salvaged. Infection 20%, Aeromonas 14.2%	B

3. Means ledger

For most rows the right answer at every rung is "do not". What changes is the ability to detect harm, so the ledger for the method runs beside the ledger for the procedure.

Rung	Bleeding and purging	Counting outcomes	What the rung changes
Hands and knowledge	Refuse. Lay flat, raise legs, fluid by mouth, keep warm, count pulse and breaths twice daily	Remember who lived, which is biased to successes	Refusing to bleed a febrile patient is the largest gain available, and costs nothing
At the hearth	Rehydrate with salt and sugar in boiled water instead of purging. Feed	Write every illness and outcome in one book	Oral rehydration reverses the harm purging caused
Garden and still	Can now grow and prepare purgatives and emetics, this rung's danger. Keep no mercury, antimony or cantharides	Record what was given and how much	The first rung that makes the heroic repertoire reproducible. A village that can distil can poison itself
Village dispensary, 300	Healer can recognise anaemia clinically and refuse. No ferritin or haematocrit	Register with name, date, diagnosis, treatment, 30-day outcome	The register is the whole gain. A village that counts learns in two years what Europe took a century to

Rung	Bleeding and purging	Counting outcomes	What the rung changes
District infirmary, 3,000	A spun haematocrit may be possible. Leeches for a congested flap if leeches and antibiotics both exist	Allocation by lot between two accepted treatments, outcome recorded blind	The first rung where a legitimate indication is arguable, and the first that can run a trial
Hospital before the Fall	Ferritin, haematocrit, JAK2, porphyrin screen, apheresis, chelation, licensed leeches with ciprofloxacin	Randomised trial, blinded assessment, meta-analysis	The legitimate niche depends on instruments no rung above has

4. Harm test

How bleeding kills. By haemorrhage. Up to 15 per cent of blood volume, about 750 mL in an adult, usually produces no visible change. 15 to 30 per cent, 750 to 1,500 mL, gives a pulse of 100 to 120, narrowed pulse pressure, breathing 20 to 30 and anxiety, with blood pressure still normal. 30 to 40 per cent, 1,500 to 2,000 mL, is where blood pressure falls, pulse runs 120 to 140 and the patient becomes confused. Over 40 per cent the pulse exceeds 140 and the patient becomes lethargic (ATLS classification, read through secondary tables that differ slightly on the cut-offs). Washington's 2,365 mL in twelve hours is class III going on IV. Bleeding also strips oxygen-carrying capacity from a patient already hypoxic, and introduces infection at the puncture.

The dose that harms. There is no safe therapeutic dose for a febrile illness, because the therapeutic effect is zero. For reference, healthy adults tolerate 450 to 500 mL once in 56 days, with haemoglobin above about 125 g/L in women and 135 g/L in men, and even then vasovagal reactions occur in 0.2 per cent of donations in an Italian series of about 240,000.

Who must never be bled. Anyone febrile, dehydrated, bleeding, breathless, pale, shocked or injured. Pregnant and postpartum women. Infants, children and the old. The emaciated. Anyone with diarrhoea or vomiting. Anyone already anaemic, which after the Fall will include many menstruating women and many children with worms. These exclusions are not modern inventions: the Ayurvedic and Tibetan lists in 1.9 contain most of them.

How purging and the minerals kill. Purging, by dehydration and potassium loss on top of a disease already causing both: a purgative given in appendicitis or obstruction can perforate the bowel, and one given to a child with cholera or dysentery kills the child. Mercury, by cumulative poisoning, with no antidote below a hospital. Antimony, by cardiac toxicity with a window so narrow the effective intravenous dose was near-lethal. Cantharides, by renal tubular necrosis after as little as 10 mg.

Signs it is going wrong, and what to do. Yawning, sweating, pallor, nausea and a slowing pulse mean the patient is about to faint and the procedure must stop. A pulse above 100 with narrowing pulse pressure means significant volume has gone, and confusion with cold hands means class III or worse. Spreading redness, pain increasing after 48 hours or a red streak up the limb means infection at the site. A metallic taste or sore mouth after any mercurial means poisoning, and the drug stops permanently. In every case: stop, lie the patient flat with legs raised, give fluid by mouth, keep warm, and give no more of anything. If the pulse stays above 120 or the patient stays confused, there is no transfusion, and the treatment is fluid, rest, iron-rich food and weeks of time.

5. Red flags

- **Stridor, drooling, sitting forward, unable to swallow saliva, muffled voice.** Upper airway obstruction, Washington's picture. Needs a surgical airway the village cannot safely provide. Do not bleed, blister the throat,

force gargles or lie them flat. Sit them up, keep the room calm, do not instrument the throat, and stay with them.

- **A child with diarrhoea, sunken eyes, no tears, skin that stays pinched.** Severe dehydration. Any purgative will kill them. Oral rehydration solution continuously in small amounts.
- **A pregnant or just-delivered woman who is pale and breathless.** Anaemia or haemorrhage. No blood may be removed from her for any reason.
- **Spreading redness, fever and increasing pain at a cupping or venesection site after 24 to 48 hours.** Invasive infection, the mechanism that kills in the living bloodletting traditions. Needs antibiotics, and drainage if there is pus.
- **Any patient worsening after each round of a treatment who is then given more of it.** The flag is the pattern, not the patient. Stop and watch for three days.
- **When nothing can be done:** say what is true and likely. Keep them however they breathe best. Wet the mouth. Keep the room quiet and someone in it. Give opium if there is any. Do not let the last hours go on procedures that cannot help, the specific error of 14 December 1799.

6. The case against

Hindsight. The heroic physicians were not stupid or indifferent. Rush stayed in Philadelphia when those who could afford to leave left, and bled himself and his own infant. Craik, Dick and Brown sat with Washington all day and did what every textbook they owned told them. Writing them up as butchers teaches the reader nothing, because the reader will not recognise themselves in a butcher. The theory, not the men, was the failure.

Carter, and the possibility that bloodletting worked. K. Codell Carter argued in 2010, and in a 2012 book, that historians of the Edinburgh controversy all side with Bennett, that Alison may have been right, and that bloodletting worked. Only the abstract and the publisher's description were read, not the book, so this summary is [VERIFY] at the level of his reasoning. Alison's point was not foolish. What was called pneumonia in 1830 is not what was called pneumonia in 1870, and the sthenic, full-pulsed presentation the bleeders described may have been commoner then. If disease type changed, a therapy suited to the old type would appear useless against the new, and the decline would be epidemiological rather than epistemic. Brabin's iron hypothesis gives this a modern mechanism.

The book must take this seriously and then decline it, for a reason independent of who was right. Even granting Carter everything, the practice as carried out was not targeted at an identifiable early sthenic infection. It was given in nineteen cases of twenty, in volumes up to 80 ounces, escalating with failure, to pregnant women, infants and the dying. A therapy that might help a narrow group, applied with no means of identifying that group and no stopping rule, is a net killer regardless. That is also the argument against reviving it after the Fall, where the means of identification are entirely absent.

Illich, and the mirror error. The lesson can be turned against all medicine, as in Medical Nemesis, and SY-03 handles that at length. The short answer is that the same two centuries that produced calomel produced the counting that detected it, from inside medicine, by Louis, Dietl, Holmes, Bennett and Hammond. The opposite misreading is that old remedies are dangerous and modern ones are not. The system that killed in quantity was the learned, university-taught one, and the traditions that most resemble it have better stopping rules than it had. The CAST trial of 1989, in which encainide and flecainide given to suppress ventricular ectopy after a heart attack produced 33 arrhythmic deaths and cardiac arrests in 730 patients against 9 in 725 on placebo, is the twentieth century's bloodletting: a plausible mechanism, a surrogate end point moving the right way, and a therapy that killed until somebody randomised it. Thomas Moore's Deadly Medicine put the toll in the thousands and Anderson et al. in 1997 excluded 6,000 to 25,000 a year, so the magnitude is contested and the direction is not.

7. Ten-line summary of robust findings

1. The humoral theory was coherent, observationally grounded and wrong, and dictated a therapy of evacuation with no upper bound and no stopping rule.
2. Bleeding, calomel, tartar emetic and cantharides all produced a dramatic visible effect, mistaken for therapeutic action for two thousand years.
3. Washington lost about 2,365 mL, roughly 40 per cent of his blood, in twelve hours on 14 December 1799, while the one procedure that might have opened his airway was refused as too bold.
4. Rush's 1793 regimen was ten grains of calomel with jalap every six hours, and bleeding rising from ten ounces to eighty, in nineteen of every twenty cases, with no comparison group.
5. Dietl's 380 Vienna cases in 1849: bled 20.0 per cent dead, tartar emetic 20.7 per cent, diet and rest alone 7.4 per cent.
6. Louis's 77 Paris cases in 1835: 44 per cent dead if bled on days 1 to 4, 25 per cent on days 5 to 9.
7. Brabin's pooled nineteenth-century series give pneumonia case fatality of 19.9 per cent bled against 12.8 per cent unbled, odds ratio 1.55.
8. Hammond struck calomel and tartar emetic from the Union army supply table on 4 May 1863 and was court-martialled and dismissed within fifteen months.
9. Ayurveda, Unani, Sowa Rigpa and Chinese medicine all practise some bloodletting, at small volume, locally, late in the sequence and hedged by explicit contraindications, and none carries the Western body count. Their documented harms are infection at the scarification site and the metals in rasa shastra preparations.
10. Removing blood genuinely helps in four modern conditions, and in every one the excess is measured with an instrument no village will have, which is why the exception does not reopen the rule.

8. Open questions

- How many died of therapeutic bleeding, purging and mercury? No credible estimate exists, and the Philadelphia 1793 bills of mortality have not, as far as this search found, been reanalysed against treatment.
- Was Alison right about change of type? Carter's paper and book argue the orthodox account is wrong and we read neither in full. This is the largest unresolved question here.
- What did the Bhutanese study of 1998 to 2006 treatment records find about the safety of gtar ga? Located, results not retrieved. It is the best available source on the real-world safety of a living bloodletting tradition.
- What did the non-elite healer actually do in 1800? Almost all the record comes from physicians who wrote. What midwives, bonesetters and herb-women did is largely invisible, and it is the comparison the book most needs.
- Kerridge and Lowe 1995, named in the brief as a history of bloodletting, could not be located in the BMJ, in the Medical Journal of Australia or in any bibliographic record found here, so it is not used [VERIFY].

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At the bedside after the Fall

A household. Know three sentences. Blood is not a surplus and removing it from a sick person makes them sicker. A remedy that empties the patient, upwards or downwards, is dangerous when the patient is already losing fluid. A visible effect means a medicine is doing something, not that it is helping. To start: a notebook, a way to boil water, salt and sugar. The first failure to expect is that someone frightened by a fever will want something done, and doing nothing will feel like neglect. Have something to do instead: cool cloths, fluid, sitting them up, counting the pulse twice a day and writing it down.

A village of 300. One register, one rule and one forbidden shelf. The register lists every person treated, the date, what was wrong, what was given and the state of things at thirty days, and is read aloud monthly. The rule is that no new remedy enters general use until the register shows it beating those who did not get it. The forbidden shelf is what the dispensary will not stock at any price: mercury in any form, antimony, cantharides, routine purgatives for fever or diarrhoea, and the lancet for anything but draining an abscess. To start: one literate person who will keep the register honestly, including the deaths. The first failure to expect is that the healer's favourite remedy will be the one the register condemns, and that they will exclude the cases that went badly, as Bennett excluded his four.

A district of 3,000. The ability to run Dietl's comparison: two to four hundred cases of a common serious illness, allocated between two accepted managements by lot, outcomes recorded by someone who did not choose the allocation. That is enough to detect a difference of the size between 20 per cent and 7 per cent. To start: agreement between villages on definitions, and someone with authority to stop a treatment when the count says so. The first failure to expect is political: the healer whose practice the count condemns will have patients, standing and allies, as Rush did, and the district must decide in advance that the count outranks the reputation.

Protocols

Protocol 1. The standing prohibition (every rung, from day one)

1. Write and post the forbidden list: no therapeutic bleeding for fever, pain, inflammation, breathlessness, headache, swelling or madness. No mercury by mouth or on the skin. No antimony. No blistering agent. No purgative or emetic for a patient with diarrhoea, vomiting, fever or abdominal pain, in pregnancy, under 5 years or over 70.
2. Read the list aloud at every teaching session, with the Washington timeline as the illustration.
3. Bury any salvaged medicine labelled calomel, mercury, mercurous chloride, antimony, tartar emetic or cantharides, at least 50 m from any well and 1 m deep. Do not store, trade or burn it.
4. Review the list once a year. Removing anything requires a count, not an argument.

Protocol 2. Instead of bleeding a fever (household)

1. Sit or lie the patient however they breathe most easily. Do not force them flat.
2. Count the pulse for a full 60 seconds and the breaths for a full 60 seconds. Write both down with the time.
3. Give fluid by mouth, 100 to 200 mL every 30 minutes while awake. If there is any diarrhoea or vomiting, give oral rehydration solution instead: one litre of boiled and cooled water, six level 5 mL teaspoons of sugar (about 25 to 30 g) and half a level 5 mL teaspoon of salt (about 2.5 to 3 g), stirred until dissolved. It must taste no saltier than tears, or it is discarded and made again, because too much salt harms a dehydrated child. Give 10 mL per kg of body weight after each loose stool, in small amounts continuously, make it fresh every 24 hours and discard the rest, and keep feeding, including breastfeeding, throughout. (Quantities cross-checked against SY-01 and SY-03. Any discrepancy with a printed WHO formulation is resolved in favour of the printed one.)

4. Uncover them. Damp cloth to forehead, neck, armpits and groin. Do not immerse in cold water and do not let them shiver, which raises the temperature.
5. Feed when they will eat, small amounts often, and recount pulse and breaths every 4 hours while awake. A falling pulse and settling breathing over 24 to 48 hours is the course to expect.
6. Escalate to the dispensary for a breathing rate above 30 in an adult or 40 in a child, confusion, inability to drink, or a pulse above 120 that does not settle.
7. Give nothing by mouth intended to purge, vomit or sweat.

Protocol 3. If someone has been bled, cupped or purged and is deteriorating (immediate)

1. Stop. Remove the cups, close the puncture with firm pressure for 5 full minutes by the clock, give nothing further.
2. Lie flat, legs raised about 30 cm on a folded blanket. Keep warm with a blanket over, not under.
3. If conscious and able to swallow: oral rehydration solution, 200 mL in the first 15 minutes, then 100 mL every 15 minutes for the first hour, then as tolerated.
4. Count pulse and breaths every 10 minutes for the first hour, then hourly. Expect improvement within 20 to 60 minutes after moderate loss.
5. If the pulse stays above 120, or the patient is confused, or the nail bed takes more than 3 seconds to re-pink, too much has gone. There is no transfusion. Continue fluid by mouth, rest flat, and plan on weeks of recovery with iron-rich food.
6. Record the estimated volume removed, the time taken and the outcome in the register.

Protocol 4. The village register (dispensary, 15 minutes a day, 1 hour a month)

1. One bound book. One line per patient per episode. Columns: date, name, age, what was wrong in plain words, what was given with the amount, and a column left blank for the outcome.
2. Fill the outcome column at 30 days: recovered, recovered with lasting damage, still ill, died, lost track. Lost track counts as a bad outcome at review, not as a blank.
3. Never fill the outcome column from memory and never in advance.
4. Monthly, read the lines aloud to at least two other people and, for each treatment used more than five times, count each outcome. Where two treatments were used for the same complaint, write both counts side by side. This is Dietl's design and it is enough.
5. A treatment whose column is worse than the column for those who got nothing is stopped at the next review, with no further argument. Write the date it stopped.
6. Any death within 48 hours of a procedure is written up in a paragraph, including what the healer thinks went wrong, and read aloud. The purpose is not blame. It is that Rush never did this.

Numbers to carry

1. **750 mL, 15 per cent, is invisible. 1,500 mL, 30 per cent, drops the blood pressure. Over 2,000 mL, 40 per cent, is lethal territory.**
2. **450 to 500 mL once every 56 days** is what a healthy adult tolerates, and the iron still takes 90 to 180 days to replace.
3. **20.0, 20.7 and 7.4.** Dietl's three percentages: bled, given antimony, left alone.
4. **19.9 against 12.8.** Pooled nineteenth-century pneumonia case fatality, bled against not bled, odds ratio 1.55.
5. **2,365 mL in 12 hours.** Washington, 14 December 1799, about 40 per cent of his blood.
6. **One hundred years.** The gap between Louis publishing in 1835 and the practice actually stopping. Evidence does not change behaviour on its own.
7. **Ten milligrams.** The reported fatal dose of cantharidin, the blistering agent's active principle.

8. **One in 500.** The proportion of infants exposed to calomel teething powders who developed pink disease, which vanished when the powders were withdrawn in 1953 to 1954.
9. **Nineteen in twenty.** The proportion of his yellow fever patients Rush judged to need bleeding. A therapy with no exclusion list is one nobody has examined.
10. **Three of seven.** Three or more of the seven signs in 1.11 means the remedy is presumed harmful until counted.

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