CH-03 Asthma and the lungs: ephedra, Datura, steam, breathing and the salvage inhaler

HEALING after the FALL, research library, CH-03

Researched 10 October 2026 by Claude Opus agent for THRIVING after the FALL, Book Four. Library document, unverified.

Scope and how this was read

This report covers asthma and the chronic lung diseases (chronic obstructive pulmonary disease, called COPD here, and bronchiectasis) in a world without a pharmacy. Acute pneumonia and bronchiolitis belong to IN-03 and are not repeated. Anaphylaxis and adrenaline belong to CH-13, which is not yet written, so adrenaline appears here only where the asthma record needs it. It builds on the library reports ME-07 (the poison garden, with ephedra and Datura), ME-09 (salvaged medicines), ME-10 (adrenal crisis and steroids), PH-08 (the village pharmacopoeia, with an ephedra protocol) and IN-03 (steam and children's chests). Most journal sources were read as abstracts through Europe PMC or PubMed. Full texts were read for Jackson (2010) on stramonium smoking, Faisal and Yunus (2019) on asthma death, Charlton et al. (2025) on expired medicines, the MSF acute asthma guideline, two UK product licences (SmPCs), the UK herbal restriction schedule and the Hong Kong ephedra monograph. Where a figure came only from a secondary summary the reference says so.

1. The honest opening: severe asthma without relievers and steroids kills

Asthma is common and mostly survivable, and the deaths come from a small number of severe attacks. The World Health Organization puts the burden at about 363 million people and about 442,000 deaths a year, most of them in low and lower-middle income countries. In those countries bronchodilators are available in fewer than two thirds of primary care facilities and steroid inhalers in fewer than half (WHO n.d., asthma). A world after the Fall will look like the worst of those settings, or worse.

The record before the drugs. Asthma was long thought not to kill. McAllen (1969), reviewing the English figures, notes that Osler and others believed nobody died of an asthma attack, and gives a recorded death rate of about 8 per 100,000 in 1900 and 7 in 1948 in England and Wales, with changes in death classification in 1940 and 1957 that make the series hard to read (read as a search summary of a scanned paper [VERIFY]). By the early 1950s fatal status asthmaticus was recognised as a pathological entity, and corticosteroids came into use for it from about 1952 [VERIFY]. I could not find a case-fatality rate for status asthmaticus treated without steroids and without inhaled relievers. That gap matters, and it is listed under Open questions.

What the record does show is how people die. The London survey of 1971 found 38 deaths in adults aged 35 to 64, 15 of them outside hospital, with sedatives given to most and steroids withheld from some (Cochrane and Clark 1975). Bellamy and Collins (1979) found that adults who came in with "acute" asthma had usually had about five weeks of poor control before a rapid deterioration over about 24 hours. Wasserfallen et al. (1990) separated a sudden asphyxic form that kills within hours from the commoner slow form that builds over days (read as secondary

summary). The UK National Review of Asthma Deaths (Royal College of Physicians 2014) examined 195 deaths and found that 45 per cent of the patients had no medical help in the final attack, and that most children under ten died before reaching hospital (read as summaries). Deaths within 28 days of a hospital stay make up about 10 per cent, and heavy reliever use (more than one canister a month) marks danger (Faisal and Yunus 2019).

So the honest statement is this. Most asthma deaths, then and now, are slow-onset attacks in which the person has days of warning, uses more and more reliever, and does not get a steroid course or help in time. A household without inhalers or steroids loses the two things that turn those days of warning into survival.

The two drug epidemics. The record also shows that relievers alone can kill when they mask worsening. In England and Wales, asthma deaths at ages 5 to 34 rose sharply from 1960 to 1966, most of all at ages 10 to 14 (Speizer and Doll 1968). Of 184 deaths studied, death was sudden or unexpected in 81 per cent, 84 per cent had used pressurised aerosols, and in 39 per cent the general practitioner had not thought the asthma severe (Speizer, Doll, Heaf and Strang 1968). Inman and Adelstein (1969) tied the rise and fall to sales of pressurised aerosols, chiefly isoprenaline, including a forte strength at five times the standard dose (secondary summaries). The deaths fell after the 1967 warnings and the move of the aerosols to prescription-only status in 1968 [VERIFY]. In New Zealand a second epidemic began in the late 1970s (Jackson et al. 1982). A case-control study found prescribed fenoterol doubled the risk of death (odds ratio 1.99, 95 per cent confidence interval 1.12 to 3.55), and in the most severe patients the odds ratio was 9.82 (2.23 to 43.4) (Pearce et al. 1990). When fenoterol was withdrawn the mortality fell suddenly and markedly (Beasley et al. 1995). Japan recorded more than 7,000 asthma deaths a year in the 1970s and 1,794 in 2017, and Europe went from 6,287 deaths in 1985 to 1,164 in 2012, a fall that tracks inhaled steroids (Faisal and Yunus 2019).

The lesson for the village is narrow and practical. A salvaged reliever is precious, but a person who needs it more and more is not being cured by it. That person needs a steroid course and watching.

2. Ephedra (Ma huang): the tradition, then the evidence

The tradition on its own terms. In Chinese medicine Ma huang is the stem of *Ephedra sinica* and related species. It is acrid, slightly bitter and warm, and enters the Lung and Bladder channels. It releases the exterior by opening the pores to sweat, disperses wind-cold, and diffuses Lung qi and directs it downward to calm wheezing. Its patterns are wind-cold with chills and no sweat, and cold wheezing with thin white sputum. The honey-fried stem is gentler and is preferred for cough and wheeze. The tradition forbids it in spontaneous sweating, night sweats, high blood pressure and pregnancy, and treats it as a strong drug for a defined pattern, not a tonic (THRIVING library, ME-07). Traditional dose ranges given by two practitioner sources were 1.5 to 10 g and 3 to 9 g of dried stem a day in decoction (THRIVING library, ME-07).

Identification. The official herb is the dried herbaceous stem of *Ephedra sinica* Stapf, harvested in early autumn and dried in the shade. The stems are slender, 1 to 2 mm across, green to yellow-green, ridged, with distinct nodes and internodes of 2 to 6 cm, and tiny membranous scale leaves 3 to 4 mm long at the nodes, reddish-brown, usually in pairs (Hong Kong Chinese Materia Medica Standards n.d.). *E. equisetina* and *E. intermedia* are traded as the same herb. The roots contain no alkaloids, and horsetail (*Equisetum*) looks similar (THRIVING library, ME-07). The most dangerous confusion for a reader in Europe or North America is the other way round. The New World species, *E. nevadensis* and *E. viridis* ("Mormon tea" or "Brigham tea") and their relatives, contain no detectable ephedrine alkaloids (Caveney et al. 2001). A village in the American West that brews Mormon tea for asthma has a pleasant drink and no drug.

How much drug is in the stem. Total alkaloid in Ma huang runs from about 0.5 to 2.5 per cent, ephedrine being 30 to 90 per cent of it (thesis abstract read as a search summary [VERIFY]). Measured samples of *E. sinica* averaged about 1.4 to 1.6 per cent with wide spread (THRIVING library, ME-07). The Hong Kong standard requires not less than 0.78 per cent ephedrine plus pseudoephedrine (Hong Kong Chinese Materia Medica Standards n.d.) and the Chinese standard 0.80 per cent (THRIVING library, ME-07). So 3 g of good stem holds roughly 24 to 75 mg of

alkaloid. How much of that reaches a cup of decoction I could not find. PH-08 estimated 24 to 60 mg per 3 g dose (THRIVING library, PH-08). Commercial ephedra products varied from 5.97 to 29.3 mg of alkaloid per serving, with variation between lots of the same brand (Haller et al. 2004). Botanical ephedrine is absorbed like the synthetic drug (Gurley et al. 1998).

The doses, from independent sources, and where they differ. This is the safety-critical part.

- Licensed ephedrine hydrochloride tablets (UK): adults 15 to 60 mg three times a day, children 6 to 12 years 30 mg three times a day, 1 to 5 years 15 mg three times a day, under one year not recommended, the elderly half dose (Ephedrine Hydrochloride Tablets SmPC 2023).
- Traditional Chinese practice: 3 to 9 g or 1.5 to 10 g of stem a day (THRIVING library, ME-07).
- UK herbal law: the Human Medicines Regulations 2012 restrict the herb (*E. sinica*, *E. equisetina*, *E. intermedia*, *E. distachya*, *E. gerardiana*) to a maximum single dose of 600 mg and a maximum daily dose of 1,800 mg when a herbalist supplies it (Human Medicines Regulations 2012, Schedule 20).
- PH-08's village protocol: 3 g stem per dose (1.5 g over 65), up to three times a day at least 4 hours apart, no more than 9 g a day, for no more than three days, with a blood-pressure cuff (THRIVING library, PH-08).

The differences are large. The UK legal ceiling of 1.8 g a day is one fifth of PH-08's daily maximum and below the bottom of the traditional range. At 1 per cent alkaloid, 600 mg of herb carries about 6 mg, under the 15 mg lowest licensed ephedrine dose. The UK ceiling looks designed to keep herbal supply below a drug dose [VERIFY: this is my inference, the schedule gives no reason]. PH-08's 3 g dose sits at the bottom of the traditional range and inside the licensed ephedrine range if extraction is good. I do not disagree with PH-08, because its protocol adds blood-pressure monitoring, a short course and exclusions that a herbalist's shop does not have. But the book should say plainly that a dose legal in a Chinese clinic is five times the single dose legal in a British one.

Does it work for asthma? Ephedrine was a mainstay asthma drug from the late 1920s, after Chen and Schmidt at Peking Union Medical College showed that it acted like adrenaline but by mouth and for longer, building on Nagai's isolation in the 1880s (HKU MMEA n.d., read as a search summary, with sources differing between 1885 and 1887 [VERIFY]). It fell from use when better drugs came. In 23 children, theophylline controlled symptoms while ephedrine was relatively ineffective, and the combination added insomnia, nervousness and stomach upset (Weinberger et al. 1975). Ephedrine was still sold in combination tablets in the 1990s (Pinnas et al. 1991). It is a weak, slow bronchodilator by mouth, and its benefit in an attack is modest at best [VERIFY: no head-to-head trial against salbutamol found].

The harm. Haller and Benowitz (2000) reviewed 140 reports to the US Food and Drug Administration and judged 31 per cent definitely or probably related to ephedra. Of these 47 per cent were cardiovascular and 18 per cent neurological, including hypertension, palpitations, stroke and seizures, with ten deaths and 13 permanent disabilities. Doses above 32 mg a day tripled the risk of haemorrhagic stroke (Morgenstern et al. 2003, via THRIVING library, ME-07). In healthy volunteers, ephedra with caffeine raised heart rate, blood pressure and blood sugar and lowered potassium (Haller et al. 2005). The licence lists overdose signs of nausea, vomiting, high blood pressure, fever, fast heart, convulsions, paranoid psychosis and breathing depression, and forbids ephedrine with monoamine oxidase inhibitors and in heart disease, high blood pressure, thyroid overactivity and prostate enlargement (Ephedrine Hydrochloride Tablets SmPC 2023). The US banned ephedra supplements in 2004 (THRIVING library, ME-07).

Verdict: the stem decoction is grade C for adult asthma, as ME-07 and PH-08 found. It is a dispensary medicine with a blood-pressure cuff, not a household remedy, and never a stimulant.

3. Datura: the asthma cigarette

The tradition on its own terms. In Ayurvedic practice, therapeutic smoke inhaled through a pipe (dhuma) was one of several uses of smoke, alongside religious offering (homa) and fumigation (dhupa). It was recommended for asthma and cough, within a medicine that understood asthma as cold, moist phlegm obstructing the lungs (Jackson

2010, citing Ram Manohar). In 1802 James Anderson, physician-general in Madras, told General William Gent of an indigenous Madras remedy for the asthma paroxysm. The root of the purple-flowered thorn apple (*Datura ferox* in the account) was cut into slips as soon as gathered, dried in the shade, beaten into fibres like coarse hemp and smoked in a pipe during the attack, alone or with tobacco. Gent passed it to Dr Sims in England, and when a Hackney surgeon ran out of the Indian root he turned to the common thorn apple, *Datura stramonium* (Jackson 2010). Datura has other uses in several traditions, some ceremonial and restricted. Under the library's rule these exist and are held by their custodians, and this report says nothing more about them (THRIVING library, SY-04).

The European century. Stramonium smoking became standard practice. Salter in 1860 judged it more preventive than curative. Branded cigarettes and powders (Potter's Asthma Cure, Himrod's, Asthmador and many French brands) mixed stramonium with tobacco, lobelia, potassium nitrate and sometimes arsenic. Proust used them. By 1935 Bray rejected smoking as giving only temporary relief and irritating the airways, and in 1936 the Indian physician Dharmendra wrote that cigarettes and sprays had no place in treatment. In the late 1960s Canadian adolescents crushed and swallowed Asthmador to get high, and British poisonings, some fatal, followed misuse of Potter's and other powders. The modern anticholinergic inhalers, ipratropium among them, descend from this line (Jackson 2010).

Does it work? Two small studies say yes, in the short term. Twelve mild asthmatics smoked one stramonium cigarette. Airway resistance fell in 11, by a mean maximum of 40 per cent at 30 minutes, and in seven of them a salbutamol inhalation afterwards added nothing. Six had minor side effects (Charpin et al. 1979). Elliott and Reid (1980) found that a herbal asthma cigarette raised peak flow and slowed the heart rate, an action like ipratropium. Neither study tells us what happens in a severe attack, or over months. Smoke itself irritates the airway, which is the case against (Jackson 2010).

Identification and alkaloid. *Datura stramonium* (thorn apple, jimson weed) is a coarse annual with large toothed leaves, white or purple trumpet flowers and a spiny egg-shaped capsule full of black seeds. All parts contain hyoscyamine (atropine) and scopolamine. Leaf content varies widely, from an official 0.2 to 0.5 per cent to measured values above 1 per cent, and is highest before flowering [VERIFY: from search summaries of a Nigerian and an Iranian study]. ME-07 found variation up to twentyfold (THRIVING library, ME-07). Lookalikes include other *Datura* species and *Brugmansia*, which are as toxic, and henbane (*Hyoscyamus niger*) and deadly nightshade (*Atropa belladonna*), which share the alkaloids.

The dose problem. The UK schedule allows a herbalist to supply stramonium leaf (*D. stramonium*, *D. innoxia*) at a maximum single dose of 50 mg and a maximum daily dose of 150 mg by mouth (Human Medicines Regulations 2012, Schedule 20). At 0.2 to 0.5 per cent that is 0.1 to 0.25 mg of alkaloid. I found no second independent source for a leaf dose, and none at all for a smoking dose [VERIFY]. A single seed holds about 0.1 mg of atropine, and an adult lethal dose is 10 mg or more (CDC 1995, via THRIVING library, ME-07). Poisoning begins within 30 to 60 minutes and lasts 24 to 48 hours. In Indian children, 31.9 per cent of 47 needed intensive care and one died, with delay over about three hours, age under ten and seizures as risk markers (Islam et al. 2022). In Taiwan, of 203 Datura and Brugmansia poisonings over 30 years, 81 per cent followed medicinal self-use without a practitioner and only 2 per cent followed a Chinese medicine practitioner's prescription. Severe effects occurred in 36 per cent, none died, and misidentified plants and parts other than the flower predicted severity (Doan et al. 2019). Pretorius and Marx (2006) report its continuing use for asthma in southern Africa and raise concern about use in pregnancy.

Verdict: smoked stramonium leaf gives real short-term bronchodilation in mild asthma (grade C). The dose cannot be controlled at household level, and eating any part of the plant is grade X. ME-07 made stramonium for asthma a district decision and ordered thorn apple dug out near houses, and I agree [OWNER].

4. Coffee and tea

Caffeine is a weak bronchodilator. A Cochrane review of seven small trials with 75 people found that caffeine at under 5 mg per kg improved lung function for up to two hours, by a standardised mean difference of 0.72 (0.25 to 1.20), about 5 per cent in FEV1, with two studies finding 12 and 18 per cent. Mid-expiratory flow stayed raised up to four hours (Welsh et al. 2010). Strong coffee or tea is therefore a household bridge while help is fetched, not a treatment. It also confounds lung-function testing. An adult of 60 kg reaches 5 mg per kg at 300 mg of caffeine, which is perhaps three strong cups [VERIFY: caffeine per cup not sourced]. With ephedra, caffeine adds to the strain on the heart (Haller et al. 2005).

5. The salvage inhaler, the bottle spacer and the steroid course

Salbutamol keeps better than its label. The Ventolin pressurised inhaler is licensed for 24 months below 30 degrees, protected from frost and direct sun. A cold canister works less well, and the canister must never be heated above 50 degrees. Each holds 200 puffs of 100 micrograms and has no counter (Ventolin Evohaler SmPC n.d.). Long after expiry, salbutamol as a substance stays above 98 per cent strength at 20 to 30 years (Zilker 2019, via Charlton et al. 2025). The device fails first. In one study 80 per cent of nebuliser-solution lots but only 40 per cent of metered-dose inhaler lots stayed above 90 per cent (Kutty 2022, abstract via Charlton et al. 2025). So the salvaged inhaler is worth keeping for the first years, and nebuliser solution and tablets are the longer store (THRIVING library, ME-09). Test-spray every salvaged canister. A weak or spluttering spray means it is failing.

Who holds the salvaged inhalers is an owner decision. ME-09 left household stock with its owner [OWNER]. This report adds one thing: a known asthmatic should never be without a reliever while a village store holds unused canisters, because the deaths happen at home.

The bottle spacer. A metered-dose inhaler fired straight into the mouth wastes most of the dose. A spacer fixes that. In 88 children aged 5 to 13, a sealed 500 ml plastic bottle gave bronchodilation close to a commercial spacer. In the 44 with moderate to severe obstruction the median rise in FEV1 was 37 per cent with the commercial spacer, 33 per cent with a sealed bottle, 18 per cent with an unsealed bottle and none with a polystyrene cup. Extra nebulised treatment was still needed by 4 of 11 children with the commercial spacer and 8 of 11 with the sealed bottle (Zar et al. 1999). In 400 younger children (median 12 months), hospital admission was 15 per cent with both a commercial spacer and a bottle spacer (Zar et al. 2007). WHO now states that a home-made 500 ml bottle spacer works as well as a commercial one (WHO n.d., asthma). The method is in Protocols, from the Global Asthma Report (2018) and Zar et al. (2002). Two sources agree that a cup does not work and that the seal matters.

The steroid course. Systemic steroids given early in an attack cut hospital admission (odds ratio 0.40, number needed to treat 8, 12 studies with 863 patients) (Rowe et al. 2001). A course after discharge cut relapse in the first week (relative risk 0.38, 6 trials with 374 patients) (Rowe et al. 2007). Two independent guidelines give close doses. MSF gives prednisolone 1 to 2 mg per kg once daily, maximum 50 mg, for 5 days (MSF 2023). The BTS/SIGN guideline gives adults 40 to 50 mg daily for at least 5 days (read as NHS Scotland summary). For children, UK practice is 1 mg per kg to a maximum of 40 mg for 3 days, or 2 mg per kg to 60 mg in a child already on oral steroids (read as summary [VERIFY]).

Stopping steroids. A short course can stop at once if it lasted 3 weeks or less, did not exceed 40 mg a day for more than a week, was not taken in the evening, and was not one of several recent courses. Otherwise the dose is reduced quickly to 7.5 mg and then slowly, because the adrenal glands may be suppressed for up to a year (GPnotebook n.d., summarising the BNF). High-dose inhaled steroids stopped suddenly carry a similar risk (Plymouth Hospitals NHS Trust n.d.). A person on long-term steroids whose supply runs out may go into adrenal crisis with vomiting, collapse and low blood pressure (THRIVING library, ME-10). This is the strongest argument for rationing steroid tablets for courses rather than spreading them thin. I found no quantitative data on prednisolone potency long past expiry [VERIFY], and ME-09 also marked its stability for checking (THRIVING library, ME-09).

Inhaled steroids are the drug that ended the epidemics, but a salvaged preventer inhaler is a finite thing. I found no data on their potency past expiry [VERIFY]. My suggestion is that they go to the people with the most severe history, meaning past admissions, past steroid courses and night waking [OWNER].

Adrenaline. Injected adrenaline was an asthma treatment before inhalers, and it remains in hospital use for life-threatening asthma and anaphylaxis [VERIFY]. Its dose, storage and use belong to CH-13. ME-10 is clear that ephedra is not a substitute for it (THRIVING library, ME-10).

6. Breathing, steam, eucalyptus and the house

Breathing retraining. Buteyko, yoga breathing and physiotherapist-taught breathing all aim to slow and calm the breath. A Cochrane review of 22 studies with 2,880 adults, most of them yoga, found better asthma quality of life at three months (mean difference 0.42 on the AQLQ, 0.17 to 0.68) and fewer hyperventilation symptoms. Effects on symptom control and lung function were inconclusive, the evidence was of low to very low certainty, and adverse effects were not assessed (Santino et al. 2020). Breathing work helps people live with asthma. It does not open a closing airway, and it must never delay a reliever.

Steam. Steam inhalation over a bowl of hot water is a household habit for chests. In colds it does nothing (Singh et al. 2017, via THRIVING library, IN-03). Its harm is scalding. Dutch burn centres admit about three children a year for scalds from steam inhalation, some needing skin grafts (Baartmans et al. 2012). IN-03 graded steam X for children, and I agree. Warm humid air does not relax bronchial muscle, and a hot, smoky room can trigger an attack [VERIFY: no trial of steam in acute asthma found].

Eucalyptus. In 109 Australian children who swallowed eucalyptus oil, 28 per cent had depressed consciousness. Five ml or more of pure oil caused serious depression, 2 to 3 ml minor effects, and all recovered (Tibballs 1995). Most reached the oil through a home vaporiser at ground level (Day et al. 1997). One industry-linked trial gave 247 asthmatics cineole capsules (200 mg three times a day for six months) and reported better lung function and symptoms (Worth and Dethlefsen 2012). That is one trial, unreplicated (grade D). Eucalyptus oil is a poison to be locked away, not an asthma treatment.

Honey and herbal syrups. Honey has a place for cough in children (THRIVING library, IN-03). I found no trial showing that honey or any herbal syrup relaxes bronchospasm [VERIFY]. A wheezing child given syrup instead of a reliever is a child whose attack is untreated.

Allergens and damp. House-dust-mite control has no effect on asthma (54 trials, 3,002 patients, peak flow standardised mean difference 0.00) (Gøtzsche and Johansen 2008). Repairing damp and mouldy houses reduced wheeze in adults (odds ratio 0.64) and rhinitis (0.57) (Sauni et al. 2015). For a village, dry houses earn their effort and mite rituals do not.

7. Smoke at the hearth

The largest lung threat after the Fall may be the return to cooking and heating over open fires. About 2.1 billion people today cook with polluting fuels. Household air pollution caused about 2.9 million deaths in 2021, including more than 309,000 children under five. COPD makes up 19 per cent of those deaths, and pneumonia in children is a large share. Women and children are the most exposed (WHO n.d., household air pollution). Solid-fuel smoke roughly triples COPD risk (odds ratio 2.80) and doubles chronic bronchitis (2.32), with wood smoke in women's domestic work highest (Kurmi et al. 2010).

The chimney trials. In RESPIRE, in Guatemala, a chimney stove (the plancha) halved children's exposure to carbon monoxide, from 2.2 to 1.1 ppm. All-severity pneumonia fell by 16 per cent, which was not significant (relative risk 0.84, 0.63 to 1.13), but severe hypoxaemic pneumonia fell by about a third (Smith et al. 2011). In the same trial, women's exposure fell by 62 per cent and wheeze fell by 58 per cent (relative risk 0.42, 0.25 to 0.70), with no change

in lung function at 12 to 18 months (Smith-Sivertsen et al. 2009) or at 5.6 years (Guarnieri et al. 2015). Longer and larger observational studies show what a chimney does over a lifetime. In Xuanwei, China, among 20,453 people, adding a chimney cut COPD risk by 42 per cent in men and 25 per cent in women, the benefit clear after about ten years (Chapman et al. 2005). In southern China, cleaner fuel and kitchen ventilation slowed the yearly fall in FEV1 by 12 to 16 ml and, together, cut COPD incidence (odds ratio 0.28) over nine years (Zhou et al. 2014).

For the village the message is that a chimney is lung medicine. It does not repair damaged lungs, but it cuts symptoms within a year and new COPD over a decade. A hearth in a closed room is a cause of asthma attacks and of COPD, and a sick-room should never be the smoke room.

8. COPD without oxygen

COPD (emphysema and chronic bronchitis) is a slow loss of lung function, from tobacco and, after the Fall, from hearth smoke. Without oxygen the late stage is hard. In the British oxygen trial, 30 of 45 untreated patients with hypoxic cor pulmonale died in five years, against 19 of 42 on oxygen at least 15 hours a day (Medical Research Council Working Party 1981). In the American trial continuous oxygen halved deaths compared with nocturnal oxygen alone (Nocturnal Oxygen Therapy Trial Group 1980). A hospital admission for an exacerbation ended in death in about 15.6 per cent (10.9 to 20.3) (Hoogendoorn et al. 2011), and that is with modern care.

What helps without oxygen. Pulmonary rehabilitation, meaning exercise training with education, is one of the best-supported treatments in the field. In 65 trials with 3,822 people it improved breathlessness, quality of life and walking distance (44 m more in six minutes), in programmes of 8 to 12 weeks, and community programmes worked (McCarthy et al. 2015). Breathing exercises are weaker. Pursed-lip breathing added about 50 m to the six-minute walk in one small group of 60, and yoga breathing about 45 m, but effects on breathlessness were inconsistent, with no adverse effects (Holland et al. 2012). Pursed-lip breathing (in through the nose, out slowly through lips pursed as if to whistle) is free and harmless, and the patient can do it during a bad spell.

Exacerbations. A five-day course of prednisone 40 mg was as good as 14 days (REDUCE, 314 patients) (Leuppi et al. 2013). Antibiotics for purulent exacerbations and the line between exacerbation and pneumonia belong to IN-03 [VERIFY: not reviewed here]. Salvaged relievers help COPD less than asthma but still help [VERIFY].

Prognosis and honesty. A village cannot reverse COPD. It can slow it by removing smoke, keep the person moving, treat flare-ups early with a short steroid course, and plan comfort for the end. That last task belongs with the palliative chapter [VERIFY: library ID not checked].

9. Bronchiectasis and clearing the airways

Bronchiectasis is permanently widened, mucus-filled airways, often after severe childhood pneumonia, whooping cough or tuberculosis, and it will be commoner after the Fall [VERIFY: inference]. The daily treatment is airway clearance: drainage positions, breathing techniques, huffing and cough. The evidence is thin. A Cochrane review found seven studies with 105 participants. A device that sets the airway vibrating did not change exacerbations at 12 weeks in 20 adults but improved quality of life (Lee et al. 2015). Gravity-assisted drainage lies the patient so that the affected lobe drains downhill to the main airways, but I did not find a primary source for the positions in this research [VERIFY]. Airway clearance is cheap and safe, and a household can learn it. It earns grade C.

Evidence grades

Grades: A, strong trial evidence of benefit. B, good observational or mixed evidence. C, plausible, weak evidence. D, tradition only or a single poor study. X, ineffective or harm outweighs benefit. T is tradition, R the clinical record, I my inference.

Remedy or measure	Use	Grade	Basis
Salbutamol inhaler with spacer	Acute attack	A	R, trials
Sealed 500 ml bottle spacer	Delivering inhaler	A	Two trials, WHO
Polystyrene cup as spacer	Delivering inhaler	X	Zar 1999
Oral prednisolone course	Acute attack	A	Cochrane
Inhaled steroids	Prevention	A	R, mortality fall
Reliever alone, rising use	Control	X	Two epidemics
Ephedra stem decoction	Adult asthma	C	T, R, I
Ephedra as stimulant	Any	X	FDA reports
New World Ephedra (Mormon tea)	Asthma	X	No alkaloid
Stramonium leaf smoke	Mild attack	C	T, two small studies
Datura by mouth, seed or leaf	Any	X	Poisoning series
Caffeine (coffee, tea)	Bridge in attack	C	Cochrane, small effect
Breathing retraining, Buteyko, yoga	Quality of life	B	Cochrane, low certainty
Breathing retraining	Acute attack	X	Delays reliever
Steam inhalation	Children	X	Burns, no benefit
Eucalyptus oil or cineole	Asthma	D	One trial, poisoning
Honey or herbal syrup	Bronchospasm	X	No evidence, I
Dust-mite control	Asthma	X	Cochrane
Damp and mould repair	Wheeze	B	Cochrane
Chimney stove	Symptoms, COPD	B	RCT and cohorts
Pulmonary rehabilitation	COPD	A	Cochrane
Pursed-lip breathing	COPD	C	Small trials
Short steroid course	COPD flare	A	REDUCE
Airway clearance	Bronchiectasis	C	Thin Cochrane

Means ledger

Rung	What it can do	What it cannot do
Hands and knowledge	Recognise the danger signs. Sit the patient up, move them out of smoke, calm the breathing, give strong coffee as a bridge. Teach pursed-lip breathing and airway clearance. Know which ephedra is real and which plants kill.	Open a closing airway. Give oxygen. Know the dose in a leaf.
Hearth	Keep the patient warm and away from smoke. Build or fix a chimney. Dry the house. Never use steam on a child. Lock away eucalyptus oil.	Make a bronchodilator. The hearth itself is a cause.

Rung	What it can do	What it cannot do
Garden and still	Grow *Ephedra sinica* where it will grow, dry the stem in shade, label and date it. Remove thorn apple near houses.	Standardise alkaloid content. Make a safe extract. A still adds nothing for these lungs.
Village dispensary (300)	Hold salvaged salbutamol and test-spray it. Make and teach bottle spacers. Hold a steroid stock with a course log. Run PH-08's ephedra protocol with a blood-pressure cuff. Teach rehabilitation walks and breathing. Keep a register of asthmatics and their attacks.	Nebulise without power. Give magnesium or IV steroids. Treat a silent chest.
District infirmary (3,000)	Nebuliser if there is power. Oxygen concentrator if there is power [VERIFY: power assumption]. Ipratropium, magnesium, injected steroids and adrenaline (CH-13). Decide on stramonium. Hold the long-term solution and tablet store. Keep a peak-flow meter.	Ventilate. Manufacture salbutamol or steroids.
Pre-Fall hospital reference	Oxygen, nebulised and IV drugs, blood gases, intensive care and ventilation. National mortality reviews.	Not available after the Fall. Used here only to measure the gap.

Harm test

- **Ephedra.** Raised blood pressure, fast heart, stroke and seizures, worse with caffeine and with monoamine oxidase inhibitor drugs. Variable alkaloid content between batches. The dose that tradition allows is five times the UK single dose. Excluded in pregnancy, heart disease, high blood pressure, thyroid overactivity, prostate enlargement and the old.
- **Datura.** A narrow margin, unknown dose in a leaf, and seeds that kill. Confusion and hallucination lasting a day or two. Children are at highest risk. Smoke also irritates the airway.
- **Salbutamol.** Tremor and fast heart are expected. The real harm is false reassurance: rising use that hides a worsening attack.
- **Steroids.** A short course is safe. Repeated or long courses suppress the adrenals, and a sudden stop can bring adrenal crisis. Long-term harms include thin bones, diabetes and infection, which are not reviewed here.
- **Steam.** Scalds, especially in children.
- **Eucalyptus oil.** Poisoning of small children, often from a vaporiser at ground level.
- **Breathing exercises.** Harmless in themselves. Harmful if used instead of a reliever.
- **Sedatives** in an asthma attack were given to most of the London deaths in 1971 (Cochrane and Clark 1975). Never sedate a breathless asthmatic. Opium and alcohol are sedatives too [VERIFY: generalisation].
- **Hearth smoke.** Itself a cause of attacks and of COPD.

Red flags

Any one of these means a severe or life-threatening attack. The village must act now and send for the district at once.

1. Cannot finish a sentence in one breath, or a child too breathless to feed or talk.
2. Breathing rate over 30 in an adult, over 40 in a child of 2 to 5. Pulse over 120 in an adult (MSF 2023).
3. A quiet or silent chest, meaning little wheeze because little air is moving.
4. Blue lips or tongue (cyanosis).
5. Exhaustion, poor breathing effort, confusion or drowsiness.
6. Irregular pulse or collapse.
7. Peak flow under a third of the person's best, where a meter exists (BTS/SIGN, read as summary).
8. No lasting relief from the reliever, or needing it more often than every 4 hours.
9. Days of worsening asthma, waking at night, rising reliever use. This is the slow-onset pattern that kills most.
10. A past near-fatal attack, admission or steroid course in the last year.

MSF adds an altered state of consciousness, exhaustion, silent chest, cyanosis, arrhythmia and low blood pressure as signs of a life-threatening attack (MSF 2023). Two sources agree on the core list.

The case against

- **Against ephedra.** Haller and Benowitz (2000) and the US regulator showed that ephedra causes strokes and heart events in young people. Weinberger et al. (1975) found ephedrine relatively ineffective even as a drug. A critic would say the village should not keep a stroke-causing plant for a weak effect. My answer: in an attack with no salbutamol left, a weak bronchodilator under a blood-pressure cuff is better than none. But the critic is right that it should never be a household remedy.
- **Against stramonium.** Bray (1935) rejected smoking for asthma as giving only temporary relief and irritating the airways, and Dharmendra (1936) wrote that cigarettes had no place in treatment (both via Jackson 2010). British poisonings in the 1960s and 1970s (Jackson 2010) and the poisoning series (Islam et al. 2022, CDC 1995) show the cost of the plant in the community. The two positive studies were small, short and in mild asthma.
- **Against reliever reliance.** Pearce et al. (1990) and Beasley et al. (1995) showed that a reliever drug can drive deaths. The case against salvage inhalers is that, without steroids, they let people put off help.
- **Against chimneys as lung medicine.** RESPIRE did not change women's lung function at 12 to 18 months or at 5.6 years (Smith-Sivertsen et al. 2009, Guarnieri et al. 2015), and its effect on all pneumonia was not significant (Smith et al. 2011). A chimney halved exposure but did not remove it. The benefit for COPD comes from observational studies, which are open to confounding.
- **Against breathing therapy.** Santino et al. (2020) found low to very low certainty and no clear lung-function gain. The Buteyko claims that it treats the cause of asthma are not supported.
- **Against mite and allergen measures.** Gøtzsche and Johansen (2008) showed that household mite control does nothing. The critic of my damp-repair grade would note that the children in Sauni et al. (2015) did not benefit.

10-line summary

1. Most asthma deaths follow days of worsening without help or a steroid course. Without relievers and steroids, a severe attack can kill.
2. The 1960s and fenoterol epidemics show that rising reliever use is a danger sign, not a cure.
3. Salbutamol keeps for decades as a substance, but inhalers fail as devices. Test-spray them and keep solution and tablets as the long store.
4. A sealed 500 ml bottle spacer works almost like a commercial one. A cup does not.
5. A 5-day prednisolone course is the second life-saver. Short courses can stop at once, long ones must taper.
6. Ephedra stem decoction is grade C, for adults, in a dispensary with a blood-pressure cuff. Mormon tea has no ephedrine.

7. Stramonium smoke opens the airways in mild asthma, but its dose cannot be controlled. Swallowed Datura kills.
8. Coffee is a weak bridge. Steam, eucalyptus, honey and mite control are not asthma treatments.
9. The hearth fire causes attacks and COPD. A chimney cuts wheeze within a year and COPD over a decade.
10. COPD without oxygen is helped by smoke removal, rehabilitation walks, pursed-lip breathing and short steroid courses.

Open questions

1. What was the case fatality of status asthmaticus before steroids and inhalers, around 1900 to 1950? Not found.
2. How much of the alkaloid in ephedra stem passes into a decoction, by time and water volume? Not found.
3. What doses did Chen and Schmidt use in the 1920s, and what were their clinical results? Not read.
4. What potency do prednisolone tablets and steroid inhalers keep long past expiry? Not found.
5. Is there a second independent source for a stramonium leaf dose, and for any smoking dose? Not found.
6. Does salbutamol from a 20-year-old inhaler still deliver a dose through a bottle spacer? No device-level data found.
7. Will *Ephedra sinica* grow in the climates of Book Four's villages? Not checked [OWNER].
8. Should the village keep stramonium at all, or only at the district? [OWNER]
9. Which postural drainage positions are best supported? Primary source not read.
10. What did the HAPIN trial (gas stoves) show for child pneumonia and adult lungs? Not reached.

Sources to read in full

1. Jackson M (2010), "Divine stramonium", Medical History. The full history of smoking for asthma. Read in full.
2. Speizer, Doll, Heaf and Strang (1968), BMJ. The first epidemic in detail.
3. Pearce et al. (1990), Thorax. The fenoterol case-control study.
4. Zar et al. (1999), Lancet, and the Global Asthma Report (2018) on spacers. The bottle method.
5. Royal College of Physicians (2014), Why asthma still kills. The modern pattern of death.
6. MSF Clinical Guidelines, acute asthma (2023). The best low-resource attack protocol. Read in full.
7. Haller and Benowitz (2000), NEJM. The ephedra harm record.
8. Smith et al. (2011) and Chapman et al. (2005). The chimney evidence.
9. McCarthy et al. (2015), Cochrane. Pulmonary rehabilitation.
10. McAllen (1969). The pre-steroid death record, scanned, needs a human reader.

At the bedside after the Fall

The household. A known asthmatic keeps a reliever, a bottle spacer and a written plan by the bed. The family knows the red flags. In an attack they sit the person upright, take them out of smoke, give the reliever through the spacer one puff at a time, and give strong coffee if there is no reliever. They send for the dispensary at the first red flag, and at once if the reliever is not lasting 4 hours. They do not give steam, eucalyptus, syrup or sedatives. A child with wheeze is treated as asthma (MSF practice, via THRIVING library, IN-03).

The village of 300. The dispensary keeps the register of asthmatics, the salvaged inhalers (test-sprayed, dated, kept cool and out of frost), the bottle spacers and the steroid stock. It gives the 5-day prednisolone course early. It runs the ephedra protocol for adults only when no reliever is left. It builds chimneys and dries houses. It runs walking and breathing sessions for people with COPD. With perhaps 15 to 30 asthmatics in 300 people [VERIFY: prevalence assumed at 5 to 10 per cent], one or two will have a severe attack in a year [VERIFY: inference].

The district of 3,000. The infirmary keeps the long store (nebuliser solution and tablets), a nebuliser and oxygen concentrator if there is power, and injected adrenaline and steroids (CH-13). It takes severe attacks from the villages.

It decides on stramonium. It keeps the death and near-death register, because the national reviews were what found the epidemics.

What is needed. Salbutamol in any form, prednisolone tablets, empty 500 ml plastic bottles, a peak-flow meter, a blood-pressure cuff and, above all, chimneys.

The first failure. The first thing to fail will be the inhalers, as devices, within a few years. The second will be the steroid stock, which cannot be made. After that the village has ephedra, coffee, stramonium smoke and its chimneys, and severe asthma will kill again at rates no one has seen since the 1950s [VERIFY: inference].

Protocols

Protocol 1. Acute asthma attack, by rung.

Household (start at once): 1. Sit the person upright. Move them out of smoke and into fresh air. Stay calm and slow their breathing by example. 2. Salbutamol through a bottle spacer: 2 to 10 puffs (100 micrograms each), one puff at a time, every 20 minutes for the first hour (MSF 2023). Shake the inhaler before each puff. 3. If better: 2 to 4 puffs every 4 to 6 hours for 24 to 48 hours (MSF 2023). 4. Start prednisolone if the dispensary has given a rescue course: adults 40 to 50 mg once daily for 5 days (BTS/SIGN, MSF). Children 1 to 2 mg per kg, maximum 40 to 50 mg (MSF, UK paediatric practice [VERIFY]). 5. No reliever: strong coffee or tea, up to 5 mg caffeine per kg, as a bridge while fetching help (Welsh et al. 2010). 6. Send for the dispensary at once if any red flag, if no improvement in the first hour, or if relief lasts less than 4 hours.

Village dispensary: 7. Check red flags. Count breathing and pulse. Peak flow if a meter exists. 8. Continue salbutamol as above. Give prednisolone if not started. 9. No reliever and an adult with no exclusions: ephedra decoction per PH-08 (3 g stem, 1.5 g over 65, simmered in 250 ml for 20 minutes, up to 3 times a day 4 hours apart, maximum 9 g a day, 3 days). Check blood pressure before each dose. Stop if systolic rises 20 or pulse passes 120 (THRIVING library, PH-08). Note that UK law caps this herb at 600 mg a dose and 1,800 mg a day. 10. Observe for at least 1 hour after improvement, 4 hours if the home is far (MSF 2023). 11. Any life-threatening sign: carry to the district at once, upright, with the reliever going.

District infirmary: 12. Nebulised salbutamol with ipratropium, oxygen if available, magnesium 40 mg per kg to 2 g in children per MSF, injected steroids, adrenaline per CH-13.

The point of no return: in slow-onset attacks the window is the days of worsening. Once the person is exhausted, drowsy or has a silent chest and there is no ventilator, death may follow within hours [VERIFY: inference from the patterns in Wasserfallen et al. 1990 and Royal College of Physicians 2014].

Protocol 2. Making a bottle spacer (Global Asthma Report 2018, Zar et al. 2002). 1. Take a 500 ml plastic drink bottle. Wash it and let it air-dry for at least 12 hours. 2. Heat a wire, shaped to the inhaler mouthpiece, and press it on the base of the bottle for about 10 seconds, rotating it until it melts through. 3. Push the inhaler mouthpiece into the hole while the plastic is still warm, so that it seals tight. 4. Prime a new bottle with about 10 puffs before first use. 5. Use: one puff into the bottle, the patient breathing normally from the bottle neck, then the next puff. A young child needs a face mask on the bottle neck [VERIFY: mask source]. 6. Never use a cup. Never leave gaps around the seal.

Protocol 3. Steroid course rules. 1. Course: adults 40 to 50 mg prednisolone daily for 5 days. Children 1 mg per kg (maximum 40 mg) for 3 days. 2. Stop at once if all are true: course 3 weeks or less, no more than 40 mg a day for over a week, no evening doses, not a repeated course (GPnotebook n.d.). 3. Otherwise taper: reduce quickly to 7.5 mg, then slowly. 4. Log every course, with name, date, dose, days. Three courses a year marks a person at high risk. 5. A person on long-term steroids must never run out. If supply fails, give salt and fluid and watch for adrenal crisis (THRIVING library, ME-10).

Protocol 4. Storing salvaged inhalers. 1. Keep below 30 degrees, out of frost and sun, never above 50 degrees (Ventolin SmPC). 2. Warm a cold canister in the hand before use. 3. Test-spray each one on receipt and every six months into the air. Discard the ones that splutter. 4. Count puffs on a tally card. 200 puffs per canister. 5. Rank use: acute attacks first, then known severe asthmatics [OWNER].

Protocol 5. Pursed-lip breathing and walking for COPD. 1. In through the nose for about two counts. Out through lips pursed as if whistling for about four counts [VERIFY: counts are customary practice, not from a trial]. 2. Use during walking, climbing and any breathless spell. 3. Walk daily, 8 to 12 weeks as a programme, increasing distance (McCarthy et al. 2015). 4. In a flare: prednisolone 40 mg for 5 days (Leuppi et al. 2013).

Protocol 6. The smoke-free house. 1. Every hearth gets a chimney or flue. No open fire in a sleeping room. 2. Cook outside or in a separate kitchen where possible. 3. Children and asthmatics sleep away from the hearth. 4. Repair damp and mould. Do not waste effort on mite measures. 5. No tobacco smoking indoors [OWNER].

Numbers to carry

1. 442,000 asthma deaths a year worldwide now, most in poor countries (WHO n.d., asthma).
2. 45 per cent of UK asthma deaths had no medical help in the final attack (Royal College of Physicians 2014).
3. Fenoterol doubled the risk of death, odds ratio 9.8 in the most severe (Pearce et al. 1990).
4. Salbutamol: 2 to 10 puffs every 20 minutes for the first hour (MSF 2023).
5. Prednisolone: 40 to 50 mg for 5 days in adults (BTS/SIGN, MSF).
6. Bottle spacer: sealed 500 ml bottle, FEV1 rise 33 per cent against 37 per cent with a commercial spacer (Zar et al. 1999).
7. Ephedra: 0.78 per cent minimum alkaloid in the herb, 3 g a dose and 9 g a day in the village rule, 1.8 g a day UK legal ceiling.
8. Datura: one seed about 0.1 mg atropine, 10 mg can kill an adult (CDC 1995).
9. Chimney: carbon monoxide halved, women's wheeze down 58 per cent (Smith-Sivertsen et al. 2009).
10. COPD without oxygen: two thirds dead in five years in the British trial (Medical Research Council Working Party 1981).

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