



THERAPEUTIC POTENTIAL OF TRIMAD ACROSS VARIOUS SROTAS: A CLASSICAL AND MODERN PHARMACOLOGICAL REVIEW WITH SPECIAL REFERENCE TO METABOLIC DISORDERS

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ABSTRACT

Trimad is a classical Ayurvedic polyherbal formulation of Vidanga (*Embelia ribes*), Musta (*Cyperus rotundus*), and Citraka (*Plumbago zeylanica*), traditionally indicated in Sthaulya (obesity), Agnimandya, and Medo-dushti for its Deepana, Pachana, Lekhana, Medohara, and Krimighna properties. This review integrates classical sources (Charaka Samhita, Sushruta Samhita, Bhavaprakasha Nighantu, Bhaishajya Ratnavali) with modern pharmacological evidence to evaluate Trimad's multi-system action across Srotas. Characterized by Katu-Tikta Rasa, Laghu-Ruksha Guna, Ushna Virya, and Katu Vipaka, Trimad corrects Annavaha, Rasavaha, Raktavaha, Medovaha, and Purishavaha Srotas. Its phytoconstituents – plumbagin, cyperene, and embelin – show anti-obesity, hypolipidemic, antioxidant, anti-inflammatory, insulin-sensitizing, and gut-microbiota-modulating effects, supporting Trimad as a multi-target intervention for obesity, metabolic syndrome, and type 2 diabetes, while highlighting the need for standardization and clinical trials.

KEYWORDS: Trimad, Musta, Vidanga, Chitraka, Sthaulya, Medohara, Srotas, anti-obesity, anti-diabetic, antioxidant

INTRODUCTION

In Ayurveda, health is maintained through the equilibrium of Dosha, Agni, Dhatu, and Mala^[1]. Among these, Agni is considered the central factor governing digestion and metabolism; its impairment (Agnimandya) leads to the formation of Ama, which obstructs the Srotas and initiates disease processes, particularly in chronic metabolic disorders.^[2]

To manage such conditions, Ayurveda describes several formulations that enhance Agni and remove Srotorodha. Trimad is one such classical polyherbal formulation mentioned in Bhaishajya Ratnavali.

मुस्तं चित्रं विडङ्गं च त्रिमदः समुदाहृतः ॥ (भै.र. 4.16)^[3]

Trimad combines Vidanga, Musta, and Citraka, exhibiting Deepana, Pachana, Lekhana, Medohara, and Krimighna actions^[4], useful where Kapha-Meda accumulates. Modern metabolic disorders like obesity, dyslipidemia, NAFLD, and type 2 diabetes correlate with Medovaha Srotodushti, marked by excess Meda and impaired Dhatu nourishment^[5]. While individual Trimad constituents are well studied, the combined formulation lacks comprehensive review; this article addresses that gap by correlating classical concepts with contemporary pharmacological evidence.

MATERIALS & METHODS

- **Classical review:** Trimad references collected from Charaka Samhita, Sushruta Samhita, and Bhavaprakasha Nighantu.
- **Pharmacological review:** Experimental and review literature on Vidanga, Musta, and Citraka analysed from electronic databases.
- **Clinical review:** Observational data from a Pune-based survey of Ayurvedic physicians on Trimad's anti-obesity use.

- **Comparative analysis:** Classical Rasapanchaka of Trimad correlated with modern pharmacology to infer probable Srotas-wise effects.

COMPOSITION OF TRIMAD

Trimada comprises three dravyas - Vidanga (fruits of *Embelia ribes*), Musta (tubers of *Cyperus rotundus*), and Chitraka (roots of *Plumbago zeylanica*). Excessive intake may cause mada (mental intoxication), hence the name Trimada.^[4]

Sr. no	Drug	Botanical name	Family
1	Vidanga	<i>Embelia ribes</i>	Myrsinaceae
2	Musta	<i>Cyperus rotundus</i> L.	Cyperaceae
3	Chitrak	<i>Plumbago zeylanica</i> Linn	Plumbaginaceae

PHARMACODYNAMIC PROPERTIES OF TRIMAD^[4]

- **Rasa:** Katu, Tikta
- **Guna:** Laghu, Ruksha, Tikshna
- **Virya:** Ushna
- **Vipaka:** Katu
- **Dosha Karma:** Kapha-Vata Shamaka, Pitta Prakopaka
- **Main Actions (Karma):** Dipana, Pachana, Lekhana, Medohara, Krimighna, Shoolaghna, Arshoghna, Gulmaghna
- **Therapeutic Indications:** Ajirna, Aruchi, Medoroga, Krimi, Arsha, Gulma, Sthaulya

INDIVIDUAL DRUG REVIEW

CHITRAKA :

Chitraka (*Plumbago zeylanica* Linn.) Belongs to Plumbaginaceae is a perennial herb, stems 0.6 -1.5 long somewhat woody, spreading, terete, striate, glabrous. leaves -



thin 3.8- 7.5 by 2.2- 3.8 cm ovate, subacute, entire glabrous, somewhat glaucous beneath reticulately veined, shortly and abruptly attenuated into a short petiole. Petiole- Narrow, amplexicaul at the base and there often didated into stipule like auricles. flower - in elongate spikes rhachis glandular, striate, bracteoles ovate, acyminate, shorter that calyx, glandular or not. Capsule-Enclosed Within the persistent calyx, oblong, pointed. Seed- Oblong. Flowering and fruiting time –winter season and onwards.^[6]

Citraka, metaphorically associated with fire, is pungent (*Katu*) after digestion (*Vipaka*), kindles digestive fire (*Deepana*), promotes digestion (*Pachana*), and is light (*Laghu*) in action. It is dry (*Ruksha*), hot (*Ushna*), and alleviates *Vata-Kapha* disorders.^[7,8]

Classification according to Ayurveda

Charak: Dipanya, Shoolaprasmana, Arshoghna, Lekhaniya.

Susruta: Pippalayadi, Mustadi, Amalakyadi.

Vagbhata: Pippalayadi, Mustadi, Varunadi, Aragwadhadi.^[9]

Therapeutic Actions and Clinical Indications

Dipana, Pachana, Lekana, Grahi, Krimighna, Garbhashay sankochaka, Swedjana, Rasayana, Rochaka. Krimighna, Kushtahara, Raktapittaprakopaka, Kaphaghna, Kanthya, Garbhasravakara, Garbhashaya Sankochak, Swedajanana, Jwaraghna, Shool, Shothahara, Lekhana, Vajikarana, Visphotajanana, Uttejaka, Madak, Katupaushtika, Rasayana, Triptighna, Stanyasodhak, Sukra sodhaka.^[10]

Chitraka is useful in disease.^[11]

Arsha- Chitrakamool churna paste with Takra.

Atisar- Chitrakamool churna paste with Takra.

Grahani - Chitrakadya gutika Chitraka ghruta.

Siktameha - Chitrakamoola kwath is useful. Pandu - Balamool and Chitraka 10gm to be taken with warm water.

Medorog - Chitrakamool churna with honey.

Shlipad - Chitrakamool with Devdaru lepa.

Vranashoth - Chitrakamool lepa.

Kushtha -Chitrakamool churna with water.

Switra kushtha - Chitraka and Trikatu are mixed with honey and cow urine should be kept in a jar coated with ghee for a night and take orally.

Rasayana- Chitrakamool churna With Ghruta or Honey or Milk for 1 month.

PHYTOCHEMISTRY AND RESEARCH UPDATES

Phytochemical Constituents: Chitraka contains plumbagin, free glucose and fructose and enzymes Protase, and Invertase, Chitranone. 3-Chloroblumbagin, Droserone. Elliptinone, Isozeylinone Isozellan-one, Zeylanone and Zeylinone, Maritone, Plumbagic acid, Dihydrosterone, B-sistosterol etc.^[12]

RESEARCH UPDATE^[13]

- Antibacterial:** Root extracts and plumbagin exhibited significant antibacterial activity against pneumonia-causing pathogens, comparable to tetracycline.
- Anticancer:** Plumbagin showed potent anticancer activity by inducing ROS-mediated apoptosis and reducing tumor volume by 64.49% in leukemia models.
- Antiviral:** Methanolic extract demonstrated inhibitory effects against Coxsackievirus B3 and HSV-1.

- Antiplasmodial:** Ethanol extract showed notable in vitro activity against Plasmodium falciparum.
- Antioxidant:** Root extract exhibited strong antioxidant potential in the FTC assay.
- Antiarthritic:** Root fraction showed dose-dependent suppression of arthritis along with immunomodulatory effects.
- Wound Healing:** Ethanolic extract demonstrated moderate wound healing activity in experimental studies.
- Anti-inflammatory:** Significant reduction in edema and exudate was observed, with effects comparable to aspirin.
- Hypolipidemic:** Marked reduction in total cholesterol, LDL, and triglycerides with improvement in HDL levels was reported.
- Blood Coagulation:** No significant changes in clotting parameters were observed, though platelet adhesion was reduced.

MUSTAKA

Musta (*Cyperus rotundus* L.) also known as Nutgrass or Motha of family Cyperaceae. The nut-grass is an erect, perennial glabrous herb 10-75cm long, bearing hard, black, fragrant tubers. The tubers measure around 1 to 3.5cm in length and are white and succulent when young, later turning brown and hard clothed with flexuous hairs. The leaves originate from the base of the plant and are arranged on the stem in groups of three, 10-18cm long, narrowly linear, smooth, shiny and dark green, with a grooved upper surface and a sharp tip. The flowers are borne in clusters at the ends of the stems. The inflorescence consists of around three to nine stalks of varying lengths which are reddish-brown to purple (spikelets). The nutgrass produces a dry, single-seeded fruit, which is 1.6mm long and broadly obovoid, trigonous and grayish black. Fruiting occurs throughout the year, but chiefly during rainy season.^[14]

मुस्ता संग्राहकदीपनीयपाचनीयानाम् । - (च.सू. 25/40)^[15]

Charaka calls Musta the best Grahi, Deepana, and Pachana drug. Rasapanchaka of Musta Rasa Tikta-Katu-Kashaya, Guna Laghu-Ruksha, Virya Sheeta, Vipaka Katu, Kapha-Pitta Shamaka^[16]

Classification according to Ayurveda

- Charaka Samhita: Triptighna, Trishnanigrahana, Lekhaniya, Kandughna, Stanyashodhana, Mutravirechaniya, Madhura skandha, Tikta skandha.^[17]
- Sushruta Samhita: Mustadi, Vachadi^[18]
- Ashtanga Hridaya: Mustadi, Vachadi, Rodhradi, Eladi^[19]

Therapeutic Actions and Clinical Indications of Musta^[14]

Musta is considered a highly potent drug in Ayurveda and is described in classical texts with properties such as Atisaraghna, Balya, Dahanashini, Deepana, Grahi, Jwaraghna, Kaphaghna, Krimighna, Lekhana, Medhya, Mootrala, Pachana, Raktaprasadana, Sangrahaka, Shothahara, Stanyajanana, Stanyashodhana, Sthoulyahara, Trishnanigrahana, Tvakdosahara, Vishaghna, and Vranaghna. Owing to these actions, it is widely used in various systemic disorders. Pharmacologically, Musta possesses carminative, diaphoretic, diuretic, demulcent, emmenagogue, galactagogue, stimulant, stomachic, tonic, and vermifuge properties, which further support its broad therapeutic utility.



Modern Research Updates^[20]

1. **Anti-inflammatory & Analgesic:** Tuber extracts showed significant anti-inflammatory activity in carrageenan-induced paw edema, with ethanolic extract being the most effective.
2. **Antioxidant:** Both aqueous and ethanolic extracts exhibited antioxidant activity; alcoholic extract had higher polyphenol content, while aqueous extract showed higher flavonoid levels.
3. **Antidiarrheal:** Methanolic rhizome extract (250–500 mg/kg) demonstrated significant activity in castor oil-induced diarrhea; petroleum ether and residual methanol fractions were also effective.
4. **Antiulcer:** Tuber extract reduced histamine- and aspirin-induced ulcers, showing efficacy comparable to Ranitidine.
5. **Hepatoprotective:** Ethyl acetate extract protected against carbon tetrachloride-induced liver damage by reducing liver enzymes and bilirubin levels.
6. **Cardioprotective & Hypolipidemic:** Methanolic rhizome extract reduced cardiac marker enzymes, cholesterol, triglycerides, and restored antioxidant levels in myocardial infarction models.
7. **Anti-allergic:** Sesquiterpenes such as valencene and nootkatone inhibited leukotriene production and allergic mediator release.
8. **Antidiabetic:** Hydroalcoholic rhizome extract significantly reduced blood glucose in alloxan-induced diabetic rats, with effects comparable to Metformin.
9. **Wound Healing:** Alcoholic tuber extract ointment enhanced wound contraction, reduced closure time, and improved tensile strength in wound models.
10. **Anti-obesity:** Tuber powder and extracts showed lipolytic action; clinical studies in obese individuals reported reductions in body weight, cholesterol, and triglycerides.
11. **Cytoprotective:** Rhizome decoction showed dose-dependent ulcer inhibition against ethanol-induced gastric damage, indicating gastric protective activity.

VIDANG :

Embelia ribes Burm. is a woody shrub from the family Myrsinaceae, commonly known as Vidanga, and it has been used in traditional medicine due to several observed effects, including analgesic, anthelmintic, antioxidant, antibacterial, antidiabetic, anticancer, antihyperlipidemic, wound healing, and anti-spermatogenic activity, etc.^{[21] [22]}

A large scandent shrub, branches long, slender, flexible, with long inter nodes, the bark studded with lenticels. Leaves coriaceous, 5-9 by 2-4cm, elliptic or elliptic lanceolate, shortly and obtusely acuminate, entire, glabrous on both surfaces. Shining above, paler, and somewhat silvery beneath, the whole surface covered with scattered minute reddish sunken glands, base rounded or acute, main nerves numerous, petioles 6-15mm long, more or less marginate, glabrous. Flowers 5 - merous, numerous, small, in lax panicle racemes which are terminal and form the upper axis, branches of the panicle often 8-10cm long with more or less glandularpubescent rachises, pedicels 1.5-2mm long, glandularpubescent, bracts minute, setaceous, deciduous. Calyx about 2mm long, sepals connate about 1/3 of the way up, teeth 5, broadly triangular-ovate,

ciliate, petals 5, greenish-yellow free, 4mm long. Elliptic sub-obtuse, pubescent on both sides. Stems 5, shorter than the petals, erect, filaments inserted a little below the middle of the petals. Fruit globose, 3-4mm in diameter, smooth, succulent, black when ripe, like a pepper-corn when dried, tipped with the persistent style enclosing a single seed covered with membrane. Flowering season: February-April.^[23]

विडङ्गं कृमिघ्नानाम् । (च.सू. 25:40)

Charaka has mentioned it in *Krimighna*, *Kushthaghna*, *Sirovirecanopagani* and *Truptighna mahakshaya*.^[24]

Vidanga has Katu-Kashaya Rasa, Laghu-Ruksha-Tikshna Guna, Ushna Virya, and Katu Vipaka, and pacifies Kapha-Vata.^[4]

Sushruta Samhita mentioned Earliest reference is of the use of Vidanga for gharshana when pracchanakarma fails in bloodletting (S.Su.14/35).^[25] Vidanga, Pippali, Madhu, and Ghrta have been advocated for use after one year i.e. Puraṇa. All other drugs are suggested for use in fresh condition (S.Su.36/7-8).^[26] Oil extracted from its fruit is effective in Krmi, Kustha, Prameha and Siroroga (S.Su.45/115).^[27]

Therapeutic Usages & Clinical Indications

Krimi, Agnimandya, Ajirna, Udarashula, Adhmana, Vibandha, Aruchi, Medoroga, Prameha, Vaivarnya and Kushtha.^[28]

1. **Krimi:** *Viḍaṅga* is the *Agrya* (definitive) drug for parasitic infestations; administered via *Pāna* (drinks), *Āhāra* (food), *Dhūpana* (fumigation), and *Pradeha* (paste).

2. **Kushtha & Meha:** A combined *Cūrṇa* of *Viḍaṅga*, *Triphalā*, and *Kṛṣṇā* taken with *Mākṣika* (honey) cures *Kushtha* (skin diseases), *Krimi*, *Meha* (diabetes), *Nāḍivraṇa* (sinus tract), and *Bhagandhara* (fistula).

3. **Rasāyana:** Consuming *Viḍaṅga*, *Bhallātaka*, and *Nāgara* with *Sarpī* (ghee) and *Madhu* (honey) acts as a potent *Rasāyana* to arrest *Jarā* (aging) and *Roga* (disease).

RECENT RESEARCH WORK ON VIDANGA^[29]

1. **Wound healing:** Ethanol leaf extract and embelin showed significant wound contraction and enhanced collagen synthesis in albino rats.
2. **Antidiabetic:** Studies in STZ and alloxan-induced diabetic rats confirmed antihyperglycemic, hypolipidemic, and antioxidant effects.
3. **Anti-obesity:** In HFD-induced obese rats, Vidanga reduced body weight, visceral fat, and oxidative stress markers.
4. **Cardioprotective:** In isoproterenol-induced myocardial infarction models, it improved cardiac markers and antioxidant status.
5. **Antioxidant:** *In vitro* and pulse radiolysis studies demonstrated potent free radical scavenging and inhibition of lipid peroxidation.
6. **Neuroprotective:** Studies in amnesia and cerebral ischemia models showed improved memory and reduced oxidative neuronal damage.
7. **Anxiolytic:** Animal models (EPM and OFT) demonstrated reduced anxiety behavior and increased exploratory activity.
8. **Antidepressant:** TST and FST models in mice showed significant antidepressant-like activity.



9. **Antipsychotic:** Studies against apomorphine-induced stereotypy in rodents showed reduction in abnormal behaviour.
10. **Anticonvulsant:** Demonstrated protective effects in electroshock and PTZ-induced seizure models.
11. **Antimicrobial:** *In vitro* studies confirmed antibacterial and antifungal activity against various pathogens.
12. **Anticancer:** Extensive *in vitro* and *in vivo* studies showed apoptosis induction and suppression of tumor growth in various cancers.
13. **Antiviral:** Demonstrated inhibitory activity against influenza and HSV-1 by blocking viral entry and replication.
14. **Hepatoprotective:** In thioacetamide-induced liver injury, it reduced necrosis and promoted liver regeneration.
15. **Anti-aging:** Cell culture studies showed reduced ROS levels and delayed senescence in dermal fibroblasts.

OBSERVATIONS AND RESULTS

Recent Research Findings On Trimad: Recent studies on Trimad and its constituents offer preliminary support for classical indications, though most evidence remains preclinical, observational, or analytical; well-designed clinical trials are still needed.

- **Pharmaco-epidemiology:** ~67% of surveyed Ayurvedic physicians prescribe Trimad, mainly as Churna with warm water, reporting reduced waist/hip circumference and improved digestion^[30].
- **Antioxidant activity:** *In vitro* dose-dependent free-radical scavenging supports a role in oxidative stress reduction^[31].
- **Phytochemical profiling:** UPLC-QTOF-MS identified sesquiterpenes, flavonoids, phenolic acids, benzoquinones, and triterpenes, supporting multi-target action^[32].
- **Safety signals:** Low cytotoxicity in HepG2 cells; Weak inhibitory effects on major CYP450 isoforms (CYP3A4, CYP2D6, CYP2C9, and CYP1A2) indicate a relatively low risk of herb-drug interactions; heavy metals within permissible limits^[32].
- **Pharmaco-technology:** Bhavana processing (Bhavita Trimad Churna) significantly alters organoleptic and physicochemical properties, underscoring the need for standardization^[33].

Probable Mechanism of Action of Trimad in Hyperlipidemia

Hyperlipidemia can be viewed as Medo Dhatu Vikara arising from Rasa Dhatu Dushti, Agnimandya, and Kapha-Meda Sanchaya; impaired Jatharagni and Dhatvagni generates Ama that vitiates Rasa-Meda Dhatu and obstructs Srotas. Trimad's Katu-Tikta Rasa, Laghu-Ruksha Guna, Ushna Virya, and Katu Vipaka exert Agnidipana, Pacana, Bhedana, and Lekhana Karma — digesting Ama, mobilizing Meda, and clearing obstruction. Lekhana reduces lipid deposition while Bhedana breaks down pathological accumulation. Thus, Trimad helps restore normal metabolism, improves lipid assimilation, reduces oxidative stress, and may prevent complications associated with hyperlipidemia such as atherosclerosis and obesity. Classical indications of Trimad in Sthaulya and Medoroga, along with modern pharmacological studies demonstrating its anti-obesity, hypolipidemic, and

antioxidant potential, support this probable mechanism of action.^{[30] [32]}

SROTAS-WISE ACTION OF TRIMAD

Although the exact Srotas-specific mechanism of Trimad is not fully established, its therapeutic action can be understood through the synergistic pharmacological effects of its ingredients. Trimad predominantly acts on Annava, Rasava, Raktava, Medova, and Purishava Srotas through Dipana, Pacana, Lekhana, Medohara, Krimighna, and Kaphahara actions, benefiting Agnimandya, Grahani, Atisara, Sthaulya, Prameha, and Krimi.

1. Annava Srotas (Digestive System)

Enhances Agni and reduces Ama, aiding Ajirna, Aruchi, Grahani, and Atisara; Citraka (Dipana-Pacana), Musta (Atisaraghna, Grahi, Pachana), Vidanga (Krimighna, Anulomana). **Modern correlation:** digestive stimulant, carminative, antidiarrheal, anthelmintic.

2. Rasava Srotas (Nutrition & Immunity)

Improves Rasa Dhatu quality and prevents Ama, exerting a mild Rasayana-like effect via combined Dipana-Pacana action. **Modern correlation:** antioxidant activity and improved metabolic assimilation.

3. Raktava Srotas (Circulatory System)

Acts as Raktashodhaka and Shothaghna in Kushtha and Raktadushti; Vidanga (Krimighna, Kushthaghna), Citraka (Lekhana, Shothahara), Musta (Pitta-Kapha pacifying). **Modern correlation:** anti-inflammatory, antioxidant, blood-purifying.

4. Medova Srotas (Metabolic System)

Medohara and Lekhana actions benefit Sthaulya, Prameha, and dyslipidemia; Citraka (metabolic stimulant, Lekhana), Vidanga (antidiabetic, lipid-modulating), Musta (metabolic regulation). **Modern correlation:** anti-obesity, antihyperlipidemic, antidiabetic.

5. Purishava Srotas (Excretory System)

Regulates bowel movement in constipation, diarrhea, and intestinal infestation — Vidanga (Anulomana, Krimighna), Citraka (Dipana, Pacana), Musta (Atisaraghna, Grahi). **Modern correlation:** anthelmintic, digestive, bowel-regulatory.

INTERPRETATION OF FINDINGS

- Trimad primarily corrects impaired digestion and metabolism via synergistic Dipana-Pacana action, improving Agni and reducing Ama.
- Lekhana and Medohara actions mobilize and regulate excess Meda, supporting its role in obesity and metabolic disorders.
- Krimighna, Grahi, and Anulomana properties jointly enhance gastrointestinal regulation.
- Strongest correlation is seen in Annava, Medova, and Purishava Srotas; effects on Rasava and Raktava appear secondary, mediated via improved digestion and antioxidant/anti-inflammatory activity.
- Individual ingredients are well studied, but robust formulation-level clinical validation remains limited.



Classical Formulations Containing Trimad

- **Navaka Guggulu:** Indicated in Sthaulya, Medoroga, dyslipidemia; Trimad aids metabolic stimulation, fat mobilization, and Ama digestion.
- **Navayasa Loha:** Used in Pandu, Kamala, Kushta, Arsha; Trimad supports digestion and improves bioavailability of Loha.
- **Saptavinshatika Guggulu:** Treats Arsha, Bhagandara, Ashmari, Krimiroga, Kushtha, Nadvirana; via Deepana, Pachana, Krimighna.
- **Medohara Guggulu:** Indicated in Obesity and lipid disorders; via Lekhana and Medohara action.

CONCLUSION

Trimad demonstrates a broad therapeutic profile across multiple Srotas through Dipana, Pacana, Lekhana, Medohara, Krimighna, and bowel-regulatory actions, relevant to Sthaulya, Prameha, hyperlipidemia, indigestion, and intestinal infestation associated with Kapha-Meda Dushti and Agnimandya. Modern evidence on its constituents supports anti-obesity, antidiabetic, antihyperlipidemic, antioxidant, anti-inflammatory, digestive, and anthelmintic effects; recent formulation-level studies add antioxidant potential, diverse phytochemistry, low cytotoxicity, and weak CYP450 inhibition. However, the absence of standardized dosage, limited clinical trials, and variable preparation methods remain key gaps. Trimad is therefore a promising formulation for digestive and metabolic disorders, warranting further standardization, safety profiling, and controlled clinical studies to validate its efficacy in evidence-based practice.

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