



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Clinical Aromatherapy



Ashley J. Farrar, BSN, RN^a, Francisca C. Farrar, EdD, MSN, RN^{b,*}

KEYWORDS

- Clinical aromatherapy • Clinical management • Best practice model • History
- Theoretic frameworks • Plant sources • Safety case reports • Pathologic response

KEY POINTS

- Aromatherapy is an alternative medicine or integrative therapy that works with conventional medicine treatment.
- The Food and Drug Administration of the United States guidelines classify essential oils as cosmetics because they are not drugs for treating or prevention of disease.
- Essential oils come from seeds, stems, leaves, needles, petals, flowers, rinds and fruits, woods and resins, roots and rhizomes, and grasses.
- Case reports are presented for considerations regarding flammability, elder and child safety, dermatitis, phototoxicity, oral toxicity, and eye safety, including critical analysis and intervention.
- Clinical aromatherapy can be beneficial for symptom management for pain, nausea, vomiting, preoperative anxiety, critical care, well-being, anxiety, depression, stress, insomnia, respiratory, dementia, and oncology.

INTRODUCTION

The Western perspective on health care has been focused on medications for treatment of health care conditions. It was common for pain to be treated with various levels of opioids and receiving prescriptions for medications with each physician visit. Sadly, over time, opioids and anti-anxiety medications were abused, with the result of these medications purchased from drug dealers, overdosing, and death. The federal government and states stepped in, passing laws monitoring prescriptions written for opioids; therefore, a search for alternative medicine began. Alternative methods were found in the Eastern perspective on health care. Yoga, Pilates, mindfulness meditation, acupuncture, and scented oils were used with massage. Westerners found many alternative methods to treat medical conditions, such as pain, anxiety, depression, and insomnia, with scented oils from various plant sources. The pendulum began to swing from Western medication to an Eastern holistic approach. Aromatherapy emerged and was embraced as an alternative medicine for many medical

^a Mayo Clinic Hospital, Apheresis Department, 5777E Mayo Boulevard, Phoenix, AZ 85054, USA; ^b Austin Peay State University, School of Nursing, McCord Building, Clarksville, TN 37043, USA

* Corresponding author.

E-mail address: farrarf@apsu.edu

conditions. This article investigates the use of clinical aromatherapy. Credibility is seen in the historical evolution and nursing theorist support. Aromatherapy regulation of guidelines, plant sources for aromatic oils, and safe use of essential oils in symptom management in clinical aromatherapy is reviewed. Suggestions are recommended for a best practice model for clinical aromatherapy.

CLINICAL AROMATHERAPY

Aromatherapy is a fast-growing complementary therapy worldwide. According to the National Institutes of Health National Center for Complementary and Integrative Health, Americans spend more than \$30.2 billion annually on this therapy.¹ It is predicted the global market will grow in spending to \$5 trillion by 2050.² Aromatherapy also is called integrative medicine.³ It is especially important for frontline nurses to understand the difference between alternative therapy and integrative therapy. In alternative medicine, the therapy works as an addition to conventional medical treatment, whereas integrative therapy is solo and replaces any conventional medical care. The National Institutes of Health National Center for Complementary and Integrative Health developed categories for these therapies—mind-body therapy, biologically based practices, manipulative and body-based practices, energy medicine, and whole medical systems, such as Ayurvedic medicine and traditional Chinese medicine.^{3,4} Nursing health care aromatherapy falls into the category of mind-body therapy. Nursing health care uses essential oils to complement therapeutic interventions, decrease anxiety. It is expected that the plant-based essential oil applications can be measured, such as a preanxiety symptoms, interventions with essential oil, and postanxiety symptoms. The outcome from the administration of essential oil can be measured with a pre anxiety level and post level of anxiety to determine if the essential oil is effective.^{4,5}

WORLDWIDE HISTORICAL EVOLUTION OF AROMATHERAPY

Aromatherapy has been used for thousands of years. Hippocrates, father of modern medicine, advocated the use of aromatherapy due to his belief that aromatic baths and scented massage were key to good health. Essential oils leaders emerged, supporting aromatherapy as a credible therapy for mind, body, and spirit. **Table 1** summarizes major historical timelines of countries and cultural influences, validating aromatherapy as medical, clinical, and holistic.

NURSING THEORISTS SUPPORT FOR HEALTH CARE AROMATHERAPY

Historical evolution of medical, clinical, and holistic uses of essential oils is embraced by 8 major nursing theorists. Their theoretic frameworks and concepts reflect the use of clinical aromatherapy as a patient-centered and holistic approach for balancing physical health, spiritual needs and well-being. The 8 theorists' embracement confirms health care aromatherapy is a credible alternative method (**Table 2**).

REGULATION GUIDELINES FOR ESSENTIAL OILS

The Food and Drug Administration (FDA) of the United States guidelines classify essential oils for aromatherapy as cosmetics, because they are not drugs for treating or prevention of a disease.¹⁰ Therefore, aromatherapy essential oils are not regulated by the FDA. The US Consumer Product Safety Commission (CPSC) monitors unsafe products.¹¹ The CPSC enforces federal laws to protect consumers against unreasonable injury and death from products.¹² The following are examples of how these 2 federal organizations monitor essential oils.

Table 1 Historical evolution	
Country	Cultural Therapy
Egyptian culture	Resins, balms, and fragrant oils Papyrus Ebers wrote a famous manuscript about aromatic medicine. This is believed to be around 2800 BC.
Iraq	A skeleton was found 30,000 years ago with concentration of extracted plant essential oils.
India	The Ayurveda natural system of medicine was based on disease due to an imbalance of stress in a person's consciousness. Need to regain balance by internal purifications followed by special diet, herbal remedies, massage therapy, yoga, and meditation
China	Shen Nung's manuscript listed 350 plants in 2800 BC. Ayurvedic physicians are called holy men. Indian shamans are known as perfumeros, from scents of plants. Chinese culture still embraces herbal medicine. Traditional Chinese medicine Based on harmony energy of yin-yang Opposites balance is key to health. Imbalance have illness Acupuncture, cupping, herbal teas, powders from plants, meditation, and herbal burning near skin
Greece	Theophrastus inherited the botanic garden from Aristotle. He wrote a book about specific uses and formulas for aromatics. Kyphi formula contained 16 plants and was used for sleep and anxiety, to soothe the skin, and as an antidote for snake bite. He became the father of botany. Hippocrates wrote about aromatic baths and antibacterial properties and urged people to carry aromatic plants for protection. Pedanius Dioscorides wrote <i>De Materia Medica</i> covering 700 plants, including aromatics. Pre-Christian era emerged with the belief that essential oils were pagan. In response, Pope Gregory the Great passed a law banning all aromatics. Works of Galen and Hippocrates were smuggled to Syria for safekeeping.
Arabia	Ibn Sina, an Arabic physician, used aromatics, such as senna, camphor, and cloves, for medical treatment. Inhaled henbane was used as anesthetic. Topical sugar was used to stop bleeding. Rose or orange blossom was used as flavor to medicine. This led to the manufacturing of medicine. Medical aromatherapy emerged in the third century. The first private apothecary shop opened in Baghdad. with dispensing medicines. such as tinctures, suppositories, inhalants, and pills.
German	Hieronymus Braunschweig a surgeon and botanist, wrote a book on distillation of oils from plants that included 25 oils
France	In 1919, Gattefossé, a famous chemist, was burned in an explosion in his laboratory. The wounds became infected. Wound rinsing with essential oils eradicated the infection. He coined the term, aromatherapy, and was known for the medical use of essential oils with their antibacterial and healing properties of essential oils. Jean Valnet, an army physician, wrote the first aromatherapy book by a doctor. Shirley Price authored <i>Aromatherapy for Healthcare Professionals</i> . She is known for clinical use of essential oils. In 1961, Marguerite Maury, a nurse, published <i>Le Capital "Jeunesse"</i> . This book classified clinical departments' use of essential oils, such as surgery and spa treatment. Maury won 2 international awards for her research.

Table from Refs.⁴⁻⁹

Table 2	
Nursing theoretic frameworks for health care aromatherapy	
Theorist Name	Application to Clinical Practice
Florence Nightingale Environmental	Cleanliness, rest, and relaxation properties
Myra Estrin Levine Holistic	Transformation process preventing stress
Hildegard Peplau Interpersonal relations	Supports interpersonal relations; promotes personal growth
Martha Rogers Unitary human beings and their environment are one	Interrelationship between people and plants
Sister Callista Roy Adaptation	Assist coping and adaptation
Wanda de Aguilar Horta Basic human needs	Restore balance, thereby decreasing depression and stress
	Promote holistic patient comfort
Jean Watson Transpersonal care	Holistic harmony caring interactive healing relationship such as massage and talk

Table from Ref.⁴

1. Aromatherapy waterless vaporizers and diffusers were recalled due to a defective heater causing a fire multiple times with consumers. The CPSC had the authority to cease the sale of the products and refund consumers.¹¹
2. The FDA protects consumers from false claims and mislabeled products that mislead the public. Surveillance found Quinessence Aromatherapy Ltd posted on their website advertisement that essential oils protect against and cure coronavirus disease-2019. (COVID-19). This false statement triggered a FDA letter warning to the owner to take the information off their website within 48 hours and cease the sale of essential oil for prevention and cure of COVID-19. These 48 hours included developing a plan to be approved by the COVID-19 Task Force. The company was located in Europe with essential oils sold in the United States. The owner ignored the warning. Due to the fraudulent statement describing essential oils as a curing drug for COVID -19, a second joint letter was sent to the owner by the FDA, CPSC, the secretary of Health and Human Services, and the U.S. Public Health Services ordered the owner of the company to immediately take down the website and cease the sell of essential oils as a curing drug. The company's website was also put on the federal surveillance website list.

Administrators were ordered to cease sale and remove from the Web site immediately. This incidence of a false claim has brought awareness that currently essential oils are complementary therapy and do not treat and/or prevent a disease. Sellers need to be aware of descriptions of aromatherapy and consumers need to know that aromatherapy is complementary.¹²

NURSE AWARENESS OF ESSENTIAL OILS PLANT SOURCES AND USES

Essential oils are used every day for their aromatic scents—for example, perfumes, candles, essential oil plug-ins, scented aerosol sprays for the home, fabric softeners

for clothes, hair shampoos, and spices to add flavor to food. Essential oils also are used in over-the-counter herbs and added to medications to add a pleasant flavor to bitter medications. These aromatic essential oils are growing in popularity, with nurses needing to learn about essential oils, their benefits, and safety measures. Essential oils come from seeds, stems, leaves, needles, petals, flowers, rinds and fruits, woods and resins, roots and rhizomes, and grasses. Oil is extracted from the plant by distillation by steam or mechanical cold press. Cher Kaufman, a certified aromatherapist, wrote a book with a series of chapters on plant sources for aromatic essential oils—seeds, petals and flowers, rinds and fruits, woods and resins, roots and rhizomes, and grass. The following is a summary of the plant sources of each category, with examples that could be significant to health care nurses.

Seeds

Three common examples of essential oils that come from seeds from plants are

1. Cardamom (*Ellettaria cardamomum*)—the essential oil is from the plant family Zingiberaceae. Uses for this seed oil include an antibacterial, antifungal, antispasmodic, aphrodisiac, digestive stimulant, expectorant, parasympathetic nervous system stimulant, and stimulant, tonic.
2. Black pepper (*Piper nigrum*) is from the plant family Piperaceae. Uses for this oil include an analgesic, antiseptic, antispasmodic, antitoxic, aphrodisiac, digestive, and circulatory tonic; reducing fever reducing pain; as a rubefacient; and for stimulating.
3. Sweet fennel (*Foeniculum vulgare var. dulce*) is from the plant family Apiaceae. Uses for this oil include an anti-inflammatory, antibacterial, antifungal, antispasmodic, detoxifier, and digestive and for relieving gas.¹³

Stems, Leaves, and Needles

There are 7 common examples of essential oils derived from stems, leaves, and needles.

1. Cistus (*Cistus ladanifer*) is from the plant family Cistaceae. This essential oil comes from stems, twigs, dried leaves, and dried flowers. Uses for this oil include as a cic-trisant or for cell regeneration; as an antibacterial, anti-infectious, antimicrobial, astringent, and antiviral agent; as an immunity booster and regulator; as a tonic and support for parasympathetic and central nervous systems; and for wound healing.
2. Eucalyptus is a tree from the plant family Myrtaceae. It also is referred to by many names, such eucalyptus oil, blue gum oil, blue mallee oil, and gully gum oil. The leaves and twigs are used for burns, wounds, nasal congestion, lowering blood glucose, nasal congestion, and asthma and as a tick repellent. It also is used in medications and supplements.
3. Laurel (*Laurus nobilis*) is from the plant family Lauraceae. This aromatic evergreen scrub is known for its aromatic dark green, glossy leaves. Dried and fresh leaves oil is used as an analgesic, antibacterial, antimicrobial, antiseptic, antispasmodic, and antiviral; for boosting the immune system and calming the nervous system; and as an expectorant and fungicide.
4. Patchouli (*Pogostemon cablin*) comes from the plant family Lamiaceae that is commonly called the mint or dead needle busy herb. Oil from leaves are used as an antidepressant, anti-inflammatory, antimicrobial, antiviral, aphrodisiac, astringent, deodorant, and digestive; for relieving gas soothing the nervous system; and as a stimulant and tonic.

5. Peppermint (*Mentha x piperita* L) comes from the plant family Lamiaceae in the mint family. Peppermint essential oil is a common flavoring agent in pharmaceuticals, soaps, cosmetics, food, and beverages. This essential is used as an analgesic, antibacterial, anti-inflammatory, antispasmodic, antimicrobial, decongestive, digestive, and expectorant and relieves coughs.
6. Pine (*Pinus sylvestris*)—*pinus edulis* is from the plant family Lamiaceae and from the mint family. Pine essential oil is derived from the needles on the pine tree. The scent is known for the uplifting and positive impact on the mood. It is known for treatment of postsurgery nausea and vomiting. Essential pine oil is used as an analgesic, antibacterial, antibiotic, anti-infectious, anti-inflammatory, antifungal, and antimicrobial agent; assisting in opening lungs and air pathways; as an expectorant; and for soothing nerves.
7. Rosemary (*Rosmarinus officinalis*) is from the plant family Lamiaceae. This aromatic evergreen shrub's essential oil is derived from leaves, flowers, and stems. This essential oil is known for folk medicine, flavoring food, and herbal tea. Rosemary has been known as a sacred oil. Uses for this essential oil are as an analgesic, anti-inflammatory, anti-infectious, antiseptic, and antispasmodic agent; for breaking up mucus; as a cognitive stimulant, decongestant, expectorant, muscle relaxant (cineole), stimulant, and tonic; and for wound healing (verbenone).¹⁴

Petal and Flowers

There are 8 common essential oils derived from petal and flowers.

1. Clary sage (*Salvia sclarea*) is an herbaceous perennial in the plant family Lamiaceae with a history of petal and flowers used as an herb. The essential oil of clary sage is used in perfumes and muscatel flavoring in wines and liqueur. This essential oil is used as an antidepressant, antifungal, anti-inflammatory, antispasmodic, and aphrodisiac and for calming the nervous system, relaxing the uterus, and stimulating the blood flow.
2. Chamomile (*Matricaria chamomilla* [*Anthemis nobilis*]) is in the plant family Asteraceae and is a common name for several daisy-like flowers. Chamomile essential oil from flowers is used in herbal tea and is a popular night herbal tea due to the sedative affect. This essential oil is used for support for the nervous system, inflammation, insomnia, menstrual issues, headaches, and skin concerns.
3. Geranium (*Pelargonium x asperum*) and rose (*Pelargonium graveolent*)—this essential oil comes from the plant family Geraniaceae. This perennial plant has a sweet floral scent with uses in high-end perfumes and skin products with essentials oils resulting in young radiant skin. Essential oil from the flowers are used for reducing anxiety, as a sedative, for stimulating relaxation, as aids in symptoms from menstruation, as an anti-inflammatory, and for supporting healthy lymph drainage.
4. Jasmine (*Jasminum sambac*; *Jasminum grandiflorum*)—this essential oil is from the plant family Oleaceae. Jasmine is a genus of shrubs and vines in the olive family. Flowers of this bushy strong-scented perennial plant are used for scent and in tea as a base for green and white teas. As an essential oil, jasmine is used as an antidepressant and aphrodisiac, for calming the nervous system, and as a sexual tonic and stimulant.
5. Lavender (*Lavandula angustifolia*) —this essential oil is in the plant family of Lamiaceae and is a bushy strong-scented perennial plant. Lavender is a popular house décor and frequently used with dried flowers as a complement in weddings. The popular scent is used in balms, salves, and cosmetics. As an essential oil, lavender is used as analgesic, anti-inflammatory, antifungal, and antispasmodic; for calming

the nervous system, lowering blood pressure, and reducing anxiety and sensations of pain; as a sedative; and for wound healing.

6. Neroli (*Citrus aurantium* var. *amara*)—this essential oil is in the plant family Rutaceae and is from the bitter orange tree. This essential oil from flowers has a rich floral scent and is known as orange blossom oil. Neroli is used in scented products, such as perfumes and lotions. This essential oil is used as an antidepressant, antifungal, anti-inflammatory, antimicrobial, antioxidant, antiparasitic, antiseptic, and aphrodisiac; for calming; and as a digestive, nervous system stimulant, sedative, and tonic.
7. Rose (*Rosa damascena*; *R. damascena* var. *alba*)—this essential is from the plant family Lamiaceae and is a flowering shrub known as a rosebush. Rose oil is a powerful rich sweet smell. It is used commonly in perfumery. This essential oil is used as an antibacterial, antidepressant, anti-infectious, anti-inflammatory, antiseptic, antiviral, aphrodisiac, and astringent agent; for calming the nervous system and reducing anxiety; as a sedative; as a sexual, general, and uterine tonic; and for wound healing.
8. Ylang-ylang (*Cananga odorata*)—this essential oil is from the plant family Annonaceae, or custard apple family. This tropical flower is a yellow-shaped flower that grows on the cananga tree. Oil from ylang-ylang is used in cologne, lotion, food flavoring, and soap. This essential oil elevates the mood. Ylang-ylang essential oil is used as an antidepressant, anti-inflammatory, antiparasitic, antispasmodic, and aphrodisiac; for calming the nervous system and lowering blood pressure; and as a sexual tonic.¹⁵

Rinds and Fruits

1. Bergamot (*Citrus bergamia*) is from the plant family Rutaceae. This yellow or green fruit is a hybrid of lemon and bitter orange and has a bitter taste that is more than grapefruit but less than a lemon. The essential oil from the peel or zest of the fruit can cause photosensitivity, with sun exposure causing damage to sun-exposed skin. The essential oil has a citrus fruit smell, with uses in oil perfumes, cosmetics, and scenting food. This essential oil is used as an air purifier, antibacterial, antidepressant, antifungal, anti-inflammatory, and antiviral; for calming; as a deodorant; for digestive regulating (undereating or overeating); for reducing anxiety; as a sedative and tonic; and for wound healing.
2. Lemon (*Citrus limonum*)—this essential oil is fruit from a small evergreen tree. This oil is from the Rutaceae plant family, with the peel of the fruit and pulp used in culinary and nonculinary from lemon essential oil, lemon pie for culinary to cleaning products. The distinct sour taste of lemon is a popular essential oil. The essential oil from lemon is used as an antibacterial, anticoagulant, antidepressant, anti-infectious, anti-inflammatory, antiseptic, antiviral, astringent, antioxidant, and antimicrobial agent; as a digestive stimulant, immunity booster, and lymphatic; and for reducing anxiety.
3. Mandarin (*Citrus reticulata*)—this essential oil is from the Rutaceae plant family. This small citrus tree grows mandarin oranges that are smaller than oranges. A hybrid of the mandarin orange is the tangerine. The mandarin essential oil from peel and rind is sweeter and can be dried for seasoning and used in various food. This essential oil is used as an analgesic, antidepressant, antiseptic, central nervous system tonic, deodorant, digestive tonic, and immunity booster; for reducing anxiety and fevers; and as a sedative.
4. Sweet orange (*Citrus sinensis*)—this essential oil is from the plant family Rutaceae. This sweet citrusy greenish orange fruit oil is from the peel and zest. This oil is used

in top perfumes. The leaves are photosensitive but not the fruit. The sweet orange essential oil is used as an analgesic, antidepressant, antibacterial antifungal, antiseptic, antiviral, deodorant, and digestive tonic; for reducing anxiety; as a sedative; for soothing the nervous system; and as a stimulant.

5. Juniper berry (*Juniperus communis*)—this purple-black berry is a female evergreen cone. This essential oil is from the plant family Cupressaceae, derived from conifers, and often is used as a spice. The essential oil is used as an analgesic, antiseptic, antiseborrheic, anti-inflammatory, antifungal, antiviral, decongestant, and detoxifier and for increasing circulation and reducing fever.¹⁶

Woods and Resins

1. Cedarwood (*Cedrus atlantica*)—cedarwood is from the plant family Pinaceae and the needles, leaves, bark, and wood are for extracting the essential oil. The evergreen conifers have a soothing woody scent. The essential oil is used as an antifungal, antiseptic, and astringent; for breaking up mucus; and as a calmative, insect repellent, lymphatic decongestant, and general tonic.
2. Frankincense (*Boswellia carteri*)—this essential oil is in the plant family of Burseraceae and is from a Boswellia tree. Resin that is a hardened gumlike material is used in aromatic incense and perfumes. The essential oil is used as an analgesic, antibacterial, antidepressant, anti-infectious, antimicrobial, and astringent agent; for immunity tonic; for reducing anxiety; as a sedative; and for soothing the nervous system and wound healing.
3. Sandalwood (*Santalum album*)—this essential oil is from the plant family Santalaceae. The oil is extracted from wood, heartwood of the trunk, and sawdust. The essential oil from sandalwood is used in medications, skin beauty treatment, incense sticks, perfumes, mouthwashes, deodorants, and antiseptics. As an essential oil, it is used as an antibacterial, antidepressant, anti-inflammatory, antimicrobial, antiviral, aphrodisiac, and sedative; for soothing the soothes nervous system; and as a general tonic.¹⁷

Roots and Rhizomes

1. Ginger (*Zingiber officinale*) is distilled from the rhizome or underground stem of a root of the herb zingiber. Ginger also is known as the oil of empowerment for the feeling of confidence. Ginger root oil is a frequently used spice. In addition, this dried and ugly root is used as an analgesic, antibacterial, antispasmodic, digestive support, immunity harmonizer, and rubefacient.
2. Vetiver (*Vetiveria zizanoides*) is derived from the aromatic roots and also called khus oil. It is derived from the vetiver plant that is a clumpy, green grass that can grow 5 feet or more. This essential oil is used as an antiseptic, antispasmodic, anti-inflammatory, digestive stimulant, immunity booster, and sedative, and for skin support and soothing the nervous system.¹⁸

Grass

1. Lemongrass (*Cymbopogon citratus*) is an essential oil that comes from the leaves and stalk of the lemongrass plant. This grassy plant is used in cooking and herbal tea. The oil from the grass has a lemony powerful scent and is bright or pale yellow. This essential oil is used as an analgesic, antidepressant, antiviral, immunity booster, and general tonic.
2. Palmarosa (*Cymbopogon martinii* var. *motia*) is an essential oil that comes from a tall herbaceous grass and can be called Indian geranium or rose oil. The oil has a sweet citrus lemony scent that has a yellow color.¹⁹

ADMINISTRATION OF ESSENTIAL OILS

There are 4 basic methods for administration of essential oils. Nursing commonly uses topical skin application of essential oil for administration. If a facility has an integrative medicine department, massage therapy usually includes an essential oil. The following is an overview of the 4 methods by which essential oils are absorbed.

1. Topical application with skin absorption of the essential oil. Examples include massage, scented bath, cosmetics, and perfumes.
2. Absorption of the essential oil by inhaling in nostrils. Examples include direct inhalation via diffuser with steam, aroma stones, and oil-scented strip of cloth. Indirect absorption examples include scented room spray and heated candle wax, detergent, and bathroom and floor cleaners.
3. Oral absorption of the essential oil. Examples include gelatin capsules and safe dose of essential oil diluted.
4. Internal absorption of essential oil. Examples include scented mouthwash and scented suppository or vagina douche. Essential oil used for flavor in prescription medications and herbal medicines.²⁰⁻²²

PATHOPHYSIOLOGIC RESPONSE TO HEALTH CARE AROMATHERAPY

When essential oil in aromatherapy is inhaled, molecules activate the olfactory, respiratory, gastrointestinal, and/or integumentary systems based on the pathway of activation. These molecules are capable of releasing neurotransmitters, such as endorphins, to trigger a sense of well-being and an analgesic effect.^{20,21} There are 2 common pathways triggering a pathophysiologic response to aromatherapy molecules. The most common pathway is inhalation, such as by a diffuser. Activation of olfactory stimulation produces immediate change in parameters for blood pressure, pulse rate, muscle tension, pupil dilation, body temperature, and blood flow.^{20,21} The following summarizes this pathway:

- The olfactory stimulation by aromatherapy travels via nostrils to the olfactory bulb.
- The stimulus then travels to the brain for processing, where the amygdala triggers an emotional response and the hippocampus retrieves and/or forms memories.
- The limbic system interacts with the cerebral cortex, activating thoughts and feelings.
- The inhaled aromatherapy molecules travel to the upper respiratory tract and then to the lower respiratory tract.
- Molecules then travel to the pulmonary blood vessels to the blood stream then to organs and tissues.^{20,21}
- In summary, the inhaled aromatherapy molecules affect mind, body, and spirit.

The second common pathway is through the skin, such as by a massage, in which molecules are absorbed through the skin. The pathway is summarized:

- The molecules travel to the upper respiratory track and then the lower respiratory tract.
- Molecules then travel to the pulmonary blood vessels, to the blood stream, and then to organs and tissues.^{20,21}
- The skin pathway can activate olfactory stimulation and also activates application of scented oil to the skin pathway triggering a mental and physiological response.

- The skin pathway absorption of essential oils can reduce a patient's perceived stress, enhance healing, and increase communication.²⁰

SAFE USE OF ESSENTIAL OILS

Coming home from a long challenging day of work to the aromatic smell of a favorite essential oil can immediately decrease the stress from a busy and challenging day. Relaxing in a scented uplifting bubble bath can make someone feel like a new person. On the flip side, aromatic essential oils can be toxic, causing chemical burns and even death. Aromatherapy is growing in usage and can be extremely dangerous if not used safely because of a knowledge deficit. Two ethical principles apply to nurses when administering essential oils. The first is beneficence, in which the nurse takes positive steps to prevent harm. The second ethical principle is nonmaleficence, which means having an obligation to do no harm to a patient. Legal consequences could result if harm to a patient occurs due to negligence from administering of aromatherapy. Therefore, the bottom line is the need for nurses to learn about aromatherapy essential oils and their potential harms, such as poison and lethal complication. The following case reports portray safety considerations, complications, and interventions.

Combustion Reaction Safety

TF is a 54-year-old man who lives in Phoenix, Arizona; he is an advocate of essential oils and frequently uses them for anxiety and to promote sleep. On his day off, TF has several errands, including his monthly supply of essential oils. His first errand was to purchase essential oils. During his last errand, TF heard his name being called by an old friend. TF sat down to visit with his friend for a few minutes; the visit lasted 45 minutes. When TF returned to his car, he found black smoke in the car and a large burnt hole in his backseat where his purchased essential oils were placed. TF called the police to file a report.

Critical analysis revealed the large supply of essential oils were stored in the back seat. TF left the oils in the car for 45 minutes with the outside temperature of 112°F, with the potential increase in the temperature in the car increasing to 160°F. The essential oils caught on fire, resulting in the smoke and burnt hole in the backseat of the car.

Intervention for this unsafe use of essential oil is education that these oils are flammable and need to be stored in a cool dark place in the original bottle, which is colored to prevent direct sunlight penetrating to the essential oil. Unsafe storage by leaving essential oils in a hot car can cause a combustion reaction, triggering flames and a fire.

Elder and Child Safety

CF, a 66-year-old woman, was admitted for inpatient treatment of sepsis from an acute urinary infection. At night she can become agitated and screamed that snakes were crawling up her wall. The provider ordered aromatherapy and increased lighting in the room. Turning on a bed alarm and increased rounding also were ordered. The nurse brought the aromatherapy essential oil to the room and left to get a steam diffuser. When the nurse returned, CF appeared drunk. The nurse found the bottle open on the bedside table. The nurse called for assistance.

Critical analysis revealed the nurse left the bottle of essential oil on the nightstand unattended when she left the room. The patient was able to open the bottle and drink a small amount of the essential oil, causing the drunken behavior.

Intervention for essential oil left attended with a confused elderly patient was administration of milk to dilute the essential oil. The provider was called for further orders and

an incident report was completed. The elderly and children are vulnerable to adverse effects from inappropriate use of essential oils. Early recognition is appearing drunk. Essential oils should be locked in a container in a hospital and kept away from elders and children. An essential oil bottle should not be left unattended, especially with this confused patient with delusions. The diffuser with the essential oil needs to be prepared outside of the patient's room.¹¹

Allergic Contact Dermatitis and Primary Contact Dermatitis

TA, a 30-year-old woman, works at a massage therapist and is extremely popular. Bookings must be in advance because her schedule stays full. Each day she works 8 hours to 9 hours, with mostly 1.5-hour massages. She uses a lotion with an aromatic essential oil. After 3 months, she developed a bright red rash on her hands and lower arms. She used a steroid cream on the rash without resolving the rash. Over the next month, the rash got worse. TA scheduled an appointment with a dermatologist.

Critical analysis evaluated allergic contact dermatitis versus primary contact dermatitis. In allergic contact dermatitis, the allergy occurs over a period whereas primary contact dermatitis occurs the first time the essential oil is used. In allergic contact dermatitis, the symptoms are a bright red rash that worsens with time whereas the primary contact dermatitis presents as a red wheal or burn.^{20,23}

Intervention was based on treating allergic contact dermatitis based on symptomatology and length of time. Patch testing revealed the specific essential oil to stop using, allowing her to continue as a massage therapist. If TA had primary contact dermatitis, the red wheal or burn area from the toxic oil would be diluted with vegetable oil or milk then washed with unscented soap.²³

Essential Oil Phototoxicity

AJ is a 34-year-old woman who loves the sun. She lives in an apartment with a swimming pool. The average summer temperature is 102°F. On weekends she can be found at the swimming pool for 4 hours per weekend day. AJ's pool relaxing is 4 hours to 5 hours per day. She sets an alarm hourly to turn from back to stomach. AJ says the sunrays lift her up and gives her a beautiful brown tan with sunscreen oil. Due to the shutdown of her state due to COVID-19 and stores closed, AJ decided to shop online for home delivery of essential oils. AJ found a Web site with a sale on essential oils that had a pop-up advertisement declaring breaking news that essential oils prevent and cure the COVID-19 virus. AJ purchased several citrus fruit essential oils. AJ applied a mandarin essential oil to her neck and chest to ward off the COVID-19 virus. AJ left the pool early because of a burning sensation on her neck and chest. She took a shower and noticed several burned areas. The next day, the red burned areas turned to a brown skin damage appearance unlike any sunburn she ever experienced. AJ scheduled a dermatologist appointment due to the discoloration and discomfort not resolving.^{16,20,23}

Critical analysis revealed that AJ was scammed by a fraudulent online statement to sell essential oils in a pandemic COVID-19 fearful time. The mandarin essential oil was not diluted when applied to the skin, increasing the risk for dermal toxicity. The pure mandarin essential oil was phototoxic and inflicted damage to the skin, resulting in dark pigmented skin that could be permanent.^{16,23} Dermal toxicity also occurred with the essential oil not being diluted. The regular sunburn resulted in redness and blisters on her skin. AJ scheduled an urgent dermatology appointment. She used an over-the-counter steroid cream for pain relief.

The intervention to stop using the phototoxic essential oil and seek a specialist, which AJ did, with scheduling the dermatology appointment. The essential oil label

always should be read for safety instructions. If a photosensitivity essential oil is used, wait a minimum of 12 hours before exposure to sun ultraviolet radiation. AJ should consult a qualified aromatherapist who has training for aromatherapy, not a seller of essential oils, to prevent harm from essential oils. A registry database for trained aromatherapists who have passed the core level of aromatherapy examination can be found at https://www.aromatherapycouncil.org.uk/about_us¹⁰ Essential oils always should be diluted in a carrier oil. A carrier oil prevents irritation to the skin and side effects of the essential oil. Examples of carrier oils include coconut oil, coconut oil, aloe vera gel, unscented lotion, vegetable oil, and avocado oil. Because oil and water do not mix, milk is used to remove the oil and calm the skin followed by washing of the skin by unscented soap.²³

Phototoxic essential oil contains constituents that triggers a chemical process that changes the skin DNA, making the skin susceptible to sun ultraviolet radiation. This chemical change in the skin is called photosensitivity and the primary constituent is coumarins that causes phototoxic reaction. Exposure of the applied photosensitivity essential oil to ultraviolet radiation from the sun inflicts skin damage with darkly pigmented skin that can be permanent due to the long period of exposure to sun ultraviolet radiation.²³ It is extremely important to determine if an essential oil is phototoxic. AJ should find this warning on the label of the essential oil. Essential oils are not regulated by the FDA but the FDA monitors Web sites for fraudulent postings. AJ should report the online site and harm to her skin to the FDA for investigation.¹¹

Oral Toxicity

LM, a 110-pounds 20-year-old woman who lived with her mother, was told by an essential oil seller that she heard essential oils could prevent and cure COVID-19. LM was terrified that she could contract the virus with a resurgence of COVID-19 later in the year. LM was extremely excited about this information and asked which essential oil she should use orally to protect herself from this deadly pandemic COVID-19 virus. The seller recommended a safe dose for eucalyptus essential oil twice weekly orally. After a week LM decided to increase the oral dose to ward off the COVID-19 virus. She decided to drink half of an 8 oz glass of eucalyptus essential oil. Within 10 minutes she experienced burning in her throat, mouth, and stomach.²³ LM yelled for her mother to come quickly. The mother found the daughter vomiting, staggering, and with slurred speech. The mother found the eucalyptus essential oil bottle and a glass indicating she had drunk eucalyptus essential oil. The mother called 911 with the dispatcher sending an ambulance and notifying the Poison Control Center for eucalyptus poisoning.

Critical analysis of oral toxicity of eucalyptus revealed LM had drunk an unsafe dose causing poisoning with central nervous system depression and a chemical burn in her mouth, throat, and stomach. LM was admitted to the intensive care unit.

Intervention was police investigation of the fraudulent information that eucalyptus could prevent and cure COVID-19 information by the seller of the essential oil with unintentional poisoning LM. A qualified aromatherapist that is certified or completed aromatherapy curriculum. Don't take advise from a seller of essential oils without expertise. Seek consultation for safe use of essential oils.¹¹ Even with a safe oral dose of eucalyptus can cause harm. Safe use of essential oils is to not take essential oils internally. It is extremely important that induced vomiting is not done for this toxicity.

Oral toxicity symptoms are rapid decline with complaint of burning in the mouth and throat and abdominal pain. Central nervous symptoms are ataxia and respiratory

depression, and, with a higher dose, possible nasal intubation is needed for mechanical ventilation and deep coma. Death can occur with a toxic dose.^{20,23}

Eye Safety

MF accidentally splashed essential oil in an eye when she was preparing essential oil for a diffuser. Her eye was burning and painful and her vision blurred in the eye.

Critical analysis reveals essential oils are toxic to eyes and can result in a chemical burn. The eye should be rapidly irrigated with milk or a vegetable oil carrier. A washcloth or cotton ball can help with the irrigation. After treatment flush the eye with water. Do not flush the eye with water initially due to oil and water not mixing.

AROMATHERAPY CLINICAL MANAGEMENT

Clinical nursing aromatherapy is patient symptom management with measuring the outcome in a clinical setting. When aromatherapy is ordered by a provider for symptom management, a nurse needs to perform a history assessment, obtain vital signs, identify the symptom, educate the patient, measure symptom management, evaluate the effectiveness, and document the plan of care.^{1,6,7,24} The following is an overview of clinical management of the essential oil:

- Allergy—inhalant, skin, food, and medication allergy or sensitivity. Consider the need for a patch test.
- Chronic conditions—assess condition that could be impacted by aromatherapy, such as plant source triggering asthma attack or cancer that is fed by estrogen, with a few essential oils having estrogenic activity.
- Obtain vital signs—assess if there is a problem proceeding with essential oil administration.
- Symptoms needing to be managed—such as anxiety, depression, insomnia, nausea, and pain
- Educate the patient about the essential oil, procedure, safety, symptom management, patient-centered selection of the essential oil, and consent for implementation.
- Outcome measurement of symptom relief—select a tool for measuring the symptom, such as pain. The pain tool could be measurement of pain from 1 to 10 or visual picture rating of pain; or, a nonverbal patient's pain could be measured with a visual picture range, and pain in a patient unable to communicate could be measured with physiologic changes, such as vital signs, guarding of the area, and facial grimaces from discomfort. After selection of the pain measurement tool, rate the presymptom range, and post-implementation, measure at end of post symptom score for a change in outcome findings.
- Evaluate the effectiveness of the essential oil on the symptom. The outcome goals are decrease in the symptom and increased well-being and quality of life. Patient-centered symptom management and presence of a nurse could increase patient satisfaction.
- Document the procedure and incorporate into the plan of care.
- Examples of clinical conditions and settings that can benefit in the management of symptoms in the inpatient and outpatient settings are pain, nausea and vomiting, preoperative anxiety, critical care, general well-being, anxiety, depression, stress, insomnia, respiratory, dementia, oncology, palliative care, hospice, and end of life.^{1,6,7,24}

BEST PRACTICE MODEL FOR CLINICAL SYMPTOM MANAGEMENT

Aromatherapy is used as an alternative medicine and complement to traditional care. Aromatherapy is rising in popularity and is a cost-effective symptom manager. The following are suggested steps for guidance and triggers for brainstorming to develop a customized patient-centered symptom management program using essential oils in an inpatient or outpatient setting.

1. Buy-in from major stakeholders. Develop a committee that includes interprofessional members. Input from all stakeholders, including frontline nurses, needs to be embraced; and, commit, by a recorded vote, to proceeding with the aromatherapy program.
2. Develop a policy and procedure manual. Search the literature for best practice aromatherapy models. If possible, contact the facility for assistance with the startup of the program. For example, a best practice model is at the Mayo Clinic in Phoenix Arizona. This research and education facility uses aromatherapy for alternative medicine and has integrative medicine.
3. Upon approval, establish guidelines for safe and effective implementation, including infection control, safe storage, and disposal of the chemical oil.
4. Identify common symptoms that could occur in the facility, such as pain, anxiety, depression, nausea, and insomnia.
5. Identify nursing considerations, such as assessment, chronic illness, administration, and safety.
6. Identify preoutcome and postoutcome measurements and best tools for measurement. For example, anxiety is a symptom: identify a pretest and post-test to measure anxiety that is a short tool.
7. Identify and educate aromatherapy champions to lead the new program by supervising and mentoring nurses, for example, a classroom course for hospital nurses and a certified clinical aromatherapy practitioner course.
8. Evaluate the data from the pre-intervention and post-intervention of aromatherapy. Interpret the findings and refine if needed.
9. Data analysis to justify aromatherapy is an effective intervention for symptom management.
10. Seek a provider standing order for aromatherapy for sustainability.^{1,24}

SUMMARY

Aromatic scents and oils used in clinical aromatherapy can be beneficial for symptom management such as pain, nausea, vomiting, anxiety, depression, stress, insomnia, agitation with dementia, cancer pain, and end of life symptoms. Clinical aromatherapy has been found beneficial in the inpatient and outpatient settings especially critical care, oncology, palliative care, hospice, and surgical. On the flip side, aromatic essential oils can be dangerous and toxic due to certain oils being flammable, causing skin dermatitis, or being phototoxic, with risks of chemical burn, oral toxicity, and even death. Therefore, it is important that nurses learn about essential oils. If a facility has a clinical aromatherapy program, it is critical that frontline nurses be educated with a classroom course on essential oils. Champions need to be selected for a clinical aromatherapy practitioner course. These certified aromatherapists can lead the program, serve as consultants, and mentor nurses.

DISCLOSURE

A.J. Farrar and F.C. Farrar have no commercial or financial conflicts of interest or any funding sources.

REFERENCES

1. Pace S. Essential Oils in Hospitals: The Ethics, Safety, Cost and Application of Clinical Aromatherapy. Available at: <https://www.tisserandinstitute.org/essential-oils-in-hospitals/>. Accessed March 30, 2020.
2. Swamy MK, Akgtar MS, Sinniah UR. Antimicrobial properties of plant essential oils against human pathogens and their mode of action: an updated review. evidence based complementary and alternative medicine. 2016. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206475/>. Accessed July 30, 2019.
3. National Center for Complementary and Integrative Health. Complementary, Alternative, or Integrative Health: What's in a Name? NCCIH Pub NO.: D347. Available at: <http://www.nccih.nih.gov>. Accessed April 4, 2020.
4. Gnatta JR, Kurebayashi LFS, Turrini RNT, et al. Aromatherapy and nursing: historical and theoretical conception. *Rev Esc Enferm USP* 2016;50(1):127–33.
5. Alliance of International Aromatherapists. AIA Journal. Aromatherapy. Available at: <https://www.alliance-aromatherapists.org/history-basics>. Accessed March 30, 2020.
6. PDQ Integrative, Alternatives, and Complementary Therapies Editorial Board. Aromatherapy with Essential Oils (PDQ)-Health Professional Version. Bethesda, MD: National Cancer Institute. Available at: <https://www.cancer.gov/about-cancer/treatment/cam/hp/aromatherapy-pdq>. Accessed March 30, 2020.
7. Aromatherapy HL, Lindquest R, Tracy MR, et al, editors. *Complementary and alternative therapies in nursing*. 8th edition. New York: Springer Publishing Company; 2018. p. 319–38.
8. Libster MM. Evolution of aromatherapy. In: Buckle J, editor. *Clinical aromatherapy essential oils in healthcare*. 3rd edition. St Louis (MO): Elsevier; 2015. p. 2–14.
9. National Association of Holistic Aromatherapists. What is Aroma Therapy? Available at: <https://www.aromaweb.com/articles/wharoma.asp>. Accessed March 30, 2020.
10. U.S. Food & Drug Administration. Aromatherapy. Available at: <https://www.fda.gov/cosmetics/cosmetic-products/aromatherapy#essentialoil>. Accessed March 30, 2020.
11. Consumer Product Safety Commission. Regulations, Laws & Standards. Available at: <https://www.cpsc.gov/Regulations-Laws-Standards>. Accessed April 20, 2020.
12. Federal Trade Commission. Quinessence Aromatherapy LTD. Available at: <https://www.ftc.gov/warning-letters/quinessence-aromatherapy-ltd>. Accessed March 30, 2020.
13. Kaufmann C. Chapter 8. Seeds. In: *Nature's essential oils: aromatic alchemy for well-being*. New York: The Country Man Press; 2018. p. 119–28.
14. Kaufmann C. Chapter 9. Stems, leaves, & needles in nature's essential oils: aromatic alchemy for well-being. New York: The Country Man Press; 2018. p. 129–50.
15. Kaufmann C. Chapter 10. Petals & flowers. In: *Nature's essential oils: aromatic alchemy for well-being*. New York: The Country Man Press; 2018. p. 151–76.

16. Kaufmann C. Chapter 11. Rinds & fruits in nature's essential oils: aromatic alchemy for well-being. New York: The Country Man Press; 2018. p. 177–94.
17. Kaufmann C. Chapter 12. Woods & resins. In: Nature's essential oils: aromatic alchemy for well-being. New York: The Country Man Press; 2018. p. 195–206.
18. Kaufmann C. Chapter 13. Roots & rhizomes. In: Nature's essential oils: aromatic alchemy for well-being. New York: The Country Man Press; 2018. p. 207–12.
19. Kaufmann C. Chapter 14. Grass. In: Nature's essential oils: aromatic alchemy for well-being. New York: The Country Man Press; 2018. p. 213–8.
20. National Association Holistic Aromatherapy. Exploring Aromatherapy. Available at: <https://naha.org/explore-aromatherapy/about-aromatherapy/what-is-aromatherapy/>. Accessed March 30, 2020.
21. Libster MM. How essentials work. In: Buckle J, editor. Clinical aromatherapy essential oils in healthcare. 3rd edition. St Louis (MO): Elsevier; 2015. p. 15–36.
22. International Federation of Aromatherapists What is Aromatherapy. Available at: https://ifaroma.org/en_GB/home/explore_aromatherapy/about-aromatherapy. Accessed March 30, 2020.
23. Libster MM. Toxicity & contraindications. In: Buckle J, editor. Clinical aromatherapy essential oils in healthcare. 3rd edition. St Louis (MO): Elsevier; 2015. p. 73–94.
24. Libster MM. Aromatherapy in integrative healthcare. In: Buckle J, editor. Clinical aromatherapy essential oils in healthcare. 3rd edition. St Louis (MO): Elsevier; 2015. p. 95–116.