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Introduction

Qualitative studies have identified that cancer-related fatigue (CRF) is consistently reported by patients as one of their most distressing symptoms, negatively impacting their daily routine and quality of life more than any other cancer-related symptom including pain, depression and nausea (Curt et al, 2000). Patients differentiate their fatigue as being more rapid in onset, more debilitating, intense and severe, as well as being unrelenting in nature and duration when compared with the fatigue of healthy individuals (Mustian et al, 2007; Lane, 2005). Their descriptions include, “feeling listless, sluggish, faint, despondent, apathetic, tired, slack, indifferent and having paralysing fatigue” (Ahlberg et al, 2003) which is unrelieved by rest and sleep (Glaus, 1993).

Possible causes of CRF

Despite its prevalence and the wealth of studies investigating fatigue in the general cancer population, the underlying mechanisms remain largely unknown. To date, possible causes of CRF can be categorised as physiological, treatment-related and psychological.

1. Physiological factors

This is arguably the most well-researched area, with an array of associated physiological causes including anaemia, cachexia, tumour burden and the release of cytokines (Ahlberg et al, 2003). Evidence is mounting in support of immune dysfunction, abnormal cortisol levels, increased body mass index and metabolic syndrome as other possible causative factors (Mitchell, 2010).
2. Treatment-related factors

Relationships between CRF and chemotherapy, radiotherapy, biological therapies and combined treatment modalities have been consistently demonstrated (Mustian et al, 2007). Patients receiving chemotherapy report rising levels of fatigue which, on average, peak 4-5 days after completion of a treatment cycle, then gradually decrease over time but never return to the pre-treatment level (Hofman et al, 2007). Fatigue is also reported as the most common and severe symptom of radiotherapy treatment, the intensity of which has been shown to rise steadily over the entire course of treatment (Mustian et al, 2007).

Regardless of which treatment is received, patients anticipate their fatigue will return to pre-diagnostic levels once treatment has ceased. However, there is increasing evidence to the contrary. Hofman et al (2007) cites a large scale study of 763 women who received curative breast cancer treatment, of which 35% reported increased fatigue up to 5 years after treatment completion. Unfortunately, there is still little known about how or why certain treatments induce fatigue or the long-term implications it holds for patients.

3. Psychological factors

The presence of emotional distress and altered mood states including anxiety, depression, insomnia and chronic stress are consistently associated with CRF (Ahlberg et al, 2003). The mental effort required by patients to cope with the emotional impact of a cancer diagnosis, an uncertain future and often, overwhelming amounts of information regarding their illness and related treatment, may impair memory and the ability to concentrate (Cimprich, 1992). Furthermore, its intensity alters significant aspects of a person’s life, impacting role function, family dynamics and their ability to work (Curt et al, 2000), creating a sense of loss and impairing coping abilities (Pearce and Richardson, 1996), as well as causing spiritual distress (Potter, 2004).

CRF is thus multi-factorial, involving complex interactions between and within each of these three causal categories. And yet, in terms of clinical presentation, there is “significant individual variability” among patients (Mitchell, 2010), making it impossible to determine a single intervention which will offer relief for the majority of patients.

Current orthodox interventions

Regardless of the growing interest within healthcare about CRF, patients report that they are seldom asked about their fatigue experience which, as a consequence, remains largely undertreated (Curt et al, 2000). Mitchell (2010) attributes this gap in treatment to both clinicians and patients. Clinicians may not fully appreciate its debilitating effects and consequently do not offer interventions. Conversely, many patients regard fatigue as an unavoidable symptom of their cancer and treatment which may negate any discussion. This is further compounded by the word ‘fatigue’ being unfamiliar terminology to some patients who tend to use metaphors to describe how they feel (Lane, 2003). In addition, patients are often unaware that interventions even exist and for those that do, Mitchell (2010) reports that their preference is for a non-pharmacological approach.

To assist healthcare professionals, the National Comprehensive Cancer Network (NCCN) released guidelines in 2010 to encourage routine screening of patients with cancer for the presence of fatigue. Primarily, orthodox interventions are pharmacological.

Pharmacological interventions for CRF

There are limited pharmacological options available for the specific treatment of CRF. Standard clinical interventions tend to focus on the underlying pathologies such as anaemia and infection or associated physiological dysfunction of major systems including endocrine, cardiopulmonary, liver, renal and neurological (Mustian et al, 2007). Concurrent symptoms such as pain, nausea, depression, insomnia and dyspnoea are typically treated using pharmacologic means. Even after these factors have been addressed, Mustian et al (2007) report that many patients continue to experience significant levels of fatigue. In these situations, where persistent, moderate to severe fatigue levels are being experienced by patients, with or without a known clinical causal factor, the NCCN (2010) guidelines recommend clinicians consider integrative non-pharmacological approaches.
Non-pharmacological interventions for CRF

Clinicians commonly advocate rest and energy conservation strategies to patients, despite this type of fatigue being unrelieved by rest. However, Mustian et al (2007) report promising preliminary results for treatment-induced fatigue with moderate intensity exercise of 10–90 minutes duration, three to seven times per week.

A key indicator of CRF is the presence of psychological distress (Ahlberg et al, 2003), prompting a substantial increase in studies investigating the effectiveness of psychosocial interventions. These include, individual and/or group support, education, stress-management and behavioural strategies designed to enhance patient’s coping mechanisms and fatigue management (Mustian et al, 2007). In addition, cognitive behavioural strategies to aid sleep quality, relaxation and management of concurrent symptoms of pain and depression are also favourably reported (Mitchell, 2010).

Complementary approaches offer a wider range of options. Some show promising results, particularly hypnosis (Montgomery et al, 2007) and the use of Panax quinquefolius (American ginseng) (Barton et al, 2009), for treatment-induced fatigue. In the first narrative review of complementary therapies in this area, aromatherapy was reported as offering a potential reduction in fatigue levels (Sood et al, 2007). Whilst this is one of the most popular complementary therapies sought by patients with cancer (Macmillan Cancer Relief, 2002), aromatherapy is not routinely advocated by clinicians. It is important to consider the clinical evidence surrounding this.

Aromatherapy in CRF: Current clinical evidence

Several studies have investigated the use of essential oils in the management of fatigue in differing health populations, including haemodialysis (Kim and Kim, 2009; Kang and Kim, 2008), multiple sclerosis (Bahraini, 2011) and post-partum mothers (Lee, 2004). Each of these studies report lower levels of fatigue in the aromatherapy groups. However, an updated review of complementary and alternative medicine (CAM) approaches for CRF identified that studies with specific focus on the symptom itself demonstrate a greater reduction in fatigue levels than those addressing multiple symptom management (Finnegan-John et al, 2013). Currently, two studies have investigated the use of aromatherapy in the specific management of CRF and they are discussed below.

In 2004, Kohara et al identified significant improvements in fatigue levels in 20 terminally ill patients who received a three minute foot-soak with lavender (type not stipulated) essential oil followed by a 10 minute foot reflexology using lavender essential oil with Jojoba oil. Interestingly, the therapeutic effects of the combined aromatic footsoak, aromatherapy and reflexology were sustained for up to four hours following treatment.

More recently, Park et al (2016) investigated the effects of aromatherapy massage on fatigue levels and sleep in a group of 30 hospice patients. This randomised study compared 17 patients who received a 10 minute hand massage using lavender (type not stipulated) and Citrus bergamia (bergamot) essential oils in a 1:1 ratio blended to 1% with jojoba oil, with 13 patients who received a 10 minute hand massage using plain jojoba oil. Each group received their treatment between 9 and 10pm for five consecutive evenings. Although no significant differences were found, levels of fatigue were lower and sleep quantity improved in the aromatherapy group.

Similar findings are reflected in other non-cancer studies where the addition of essential oils reduced fatigue levels (Bahraini et al, 2011; Kang and Kim, 2008). This enhanced therapeutic effect with essential oils has also been observed in studies comparing aromatherapy versus plain carrier oil massage to manage other cancer-related symptoms (Chang, 2008; Soden et al, 2004; Wilkinson et al, 1999; Corner, 1995).

The potential of aromatherapy

Aromatherapy offers plausible potential in the complementary management of CRF. However, evidence-based research is limited, as demonstrated by the absence of aromatherapy interventions in a recent review of CAM’s literature in this area (Finnegan-John et al, 2013). This indicates a need for future quality research.
Whilst Finnegan-John et al (2013) provide a valuable general ‘road-map’ for future studies (see Table 1), there are additional areas, specific to aromatherapy, which warrant further consideration for clinical practice and research within this area. These include:

- Essential oil choice
- Essential oil dilution
- Botanical hydrosols
- Aromatic applications
- Collaborative decision-making
- Timing
- Psychological aspects

**Essential oil choice**

Essential oil of *Lavandula angustifolia* (lavender) has featured prominently in most clinical studies investigating aromatherapy and fatigue levels, both in cancer and non-cancer populations. Blending lavender with other essential oils has also been clinically effective (see Table 2). Whilst the intention of these essential oils is to address the psychological aspects of fatigue, the actual choice of oils is generally that of the research teams rather than the patients.

Including the patient’s aroma preference is crucial to the success of any aromatherapy treatment (Lewis, 2015). Generally, this forms an integral part of aromatherapy sessions outside of the clinical research environment. However, it is possible to offer patients a choice of essential oils within aromatic research. A good example is a study conducted by Wilkinson et al (2007) which investigated the effects of aromatherapy massage in the management of anxiety and depression. This large scale, multi-centre trial involved trained aromatherapists working with clients to construct individual blends from a selection of 20 essential oils. The results showed significant improvements in levels of anxiety in the aromatherapy group lasting for up to 2-weeks post aromatherapy massage. Similarly, a patient experience survey conducted by Dyer et al (2016), which focussed on the use of personalised aromatherapy inhalers/ aroma sticks to aid peaceful sleep, identified that “enjoying the aroma” was reported by patients as a key factor which aided their time asleep.

Lewis (2015) further advocates asking the client, how the odour of each essential oil or aromatic blend makes them ‘feel’. Using the client’s own words or phrases provides them with a deeper emotional connection with their personalised blend. Collectively, these factors may enhance and sustain the therapeutic effect of the aromatic intervention.

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**Table 1. Summary of recommendations for future research initiatives investigating complementary therapies for CRF (adapted from Finnegan-John et al, 2013)**

- Stage of disease needs to be included to determine the relationship between fatigue levels and tumour burden
- Economic impact of the intervention being studied must be included
- Chronic nature of fatigue across the cancer spectrum must be considered
- Identify and report the sustained effect of the intervention being studied
- Sample sizes need to be sufficient to achieve statistical relevance
- Sample characteristics need to be included to eliminate/reduce bias
- Fatigue must be the primary outcome of investigation
- Quality assurance measures of the intervention as well as the therapist delivering the intervention must be included
- Optimum ‘dose’ needs to be determined (including techniques used, frequency of application and length of course)
- Ascertain and include appropriate timings to deliver the intervention
- Conduct a feasibility study prior to a large scale trial of complementary therapy
One challenge with using essential oils is that patients with CRF may be highly sensitive to odour as a result of pharmacological interventions such as chemotherapy. Conversely, a client’s odour acuity may also be reduced, depending on their health status and age, making detection of low dilution blends difficult, as found by Park et al (2016). In their study, several clients in the aromatherapy group were unable to smell the 1% blend used, which may have had detrimental therapeutic consequences. This can be explained through what is known about the effects of essential oils in people with anosmia. Robert Tisserand (2016) states that, “as far as we know, psychological effects do not take place for someone who has completely lost their sense of smell, but the physiological effects still do”. Quite possibly, this could also be the case in patients with CRF. Given that psychological factors are key indicators of CRF (Finnegan-John et al, 2013), using essential oils at a detectable odour level to the patient is vital if successful therapeutic intervention is to be achieved. This is important for future clinical practice and research.

### Essential oil dilution

Aromatically, their lighter fragrance may be preferred by those patients with heightened odour acuity. Hydrosols of *Rosmarinus officinalis* (rosemary) and *Mentha x piperita* (peppermint) are useful cephalics for those experiencing cognitive or memory impairment resulting from fatigue. *Citrus aurantium* var. *amara* (neroli), *Rosa damascena* (rose), *Lavandula angustifolia* (lavender), *Boswellia carteri* (frankincense) and *Melissa officinalis* (melissa) offer comfort for those seeking quality sleep and psychological relaxation (Catty, 2001).

### Botanical hydrosols

Another effective way of utilising aromatherapy for CRF includes the use of botanical hydrosols. In inhalation therapy, the hydrosols are used to mask the scent of the essential oils. This reduces the possibility of the patient detecting the odour of the essential oils.

### Aromatic applications

#### Massage

Within the general cancer population, essential oils are predominantly administered via aromatherapy massage (Fellowes et al, 2004), which has been shown to be the patient’s popular choice (Sefarty et al, 2012). In terms of CRF, the emphasis is with massage of shorter duration, such as the daily 10 minute sessions employed by Kohara et al (2004) and Park et al (2016) and the ‘M’ Technique® described by Buckle (2003). Massage of longer duration can be depleting for patients where energy conservation is vital.

#### Inhalation

There is increasing interest in the clinical benefits of inhaled essential oils via cold-air diffusion in children.
receiving stem cell therapy (Ndao et al, 2010) and via personalised aromatherapy inhalers/ aroma sticks
to manage symptoms of anxiety, nausea and sleep problems (Dyer et al, 2016; Stringer and Donald,
2011). Aroma sticks offer promising potential for patients with CRF because they are portable, easy
to use and require little effort. Personalised blends
can be created to manage the complex nature of
symptoms with which an individual may present
with additional scope to include the patient’s aroma
preference and odour acuity. More than one aroma
stick may be given to manage variations in fatigue
levels throughout the day. For example, a patient
may require an aroma stick designed to uplift mood
or alleviate anxiety and stress for daytime use and a
separate aroma stick to aid sleep quality for use at
night.

_Showering/bathing_

Other aromatic applications include using essential
oils in a warm/cool shower which can be beneficial
for physical and psychological fatigue (Knapp-Hayes,
2015). This is a useful way to administer citrus and
other monoterpane-rich essential oils such as _Picea
mariana_ (black spruce), _Cupressus sempervirens_
(cypress) and _Pinus sylvestris_ (Scots pine) known
for their uplifting properties. Aromatic bathing may
be soothing at the end of the day, particularly for
muscle tension and psychological relaxation to aid
using cooler water temperatures and bathing for less
than 15 minutes to reduce energy depletion.

_Other applications_

Cool compresses for face, hands and feet; aromatic
spritzers; herbal footbaths and roller-ball applicators
are other ways in which essential oils or botanical
hydrosols can also be utilised.

Within aromatherapy, there is scope for multiple
interventions using a variety of applications which
will vary according to the individual’s clinical
presentation, fatigue level and experience. However
the essential oils used (which must include the full
botanical names), dilution, frequency of application,
combination of interventions and their sustained
therapeutic effects, all need to be determined in this
area.

Collaborative decision-making

Exploring the patient’s fatigue experience and
working collaboratively with interventions tailored
to their needs is not generally a feature of orthodox
medicine or clinical research. And yet, in a small
qualitative study by Dunwoody et al (2002) which
examined aromatherapy massage in patients with
cancer, collaborative decision-making was highly
regarded by patients. They reported an increased
sense of empowerment, as well as feeling valued as
an individual with specific treatment needs, rather
than being ‘just another cancer patient’.

The patient’s choice of essential oils, botanical
hydrosols and applications, as well as considering
their aroma preference and odour acuity, could
collectively exert a positive and sustained influence
on therapeutic outcomes. These are crucial
considerations for clinical practice and research in
this area. Arguably, it would increase the number
of treatment variables in clinical studies. As such,
researchers should look to the methodology of
Wilkinson et al (2007) who included a range of
essential oils from which patients could choose as
well as involving qualified aromatherapists to work
directly with patients and collaboratively develop
targeted individual blends.

Timing

Currently, the emphasis of research surrounds
treatment-induced fatigue which may be an entirely
different experience to the fatigue of terminal end
stage disease or at other times across the cancer
spectrum. There is increasing evidence to support
fatigue as an early symptom of diagnosis, as well
as its presence extending many years beyond
completion of active cancer treatments (Hofmann
et al, 2007). These are factors which require careful
consideration in clinical practice and research in
order to determine at which point in the cancer
spectrum various aromatic interventions will be
most effective.

Psychological aspects

Quite possibly, the greatest potential for
aromatherapy as a complementary intervention for
CRF is in addressing its key psychological indicators.
These are areas of clinical relevance within aromatherapy which have been well researched in the general cancer population (Dyer et al, 2016; Imanishi et al, 2009; Chang, 2008; Wilkinson et al, 2007; Wilkinson et al, 1999; Corner, 1995). The relevant findings of these studies are summarised in Table 3.

Anxiety, depression, chronic stress and insomnia require the diverse effects of ester-rich oils on the central nervous system such as, *Lavandula angustifolia* (lavender), *Anthemis nobilis* (Roman chamomile), *Citrus reticulata* (mandarin), *Mentha citrata* (bergamot mint) and *Cananga odorata* (ylang ylang). The sedating qualities of aldehyde-

### Table 3. Studies showing the psychological benefits of aromatherapy intervention in patients with cancer

<table>
<thead>
<tr>
<th>Reference</th>
<th>Patient sample size</th>
<th>Aromatherapy intervention and control</th>
<th>Benefits of aromatherapy intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corner et al, 1995</td>
<td>52 patients receiving active cancer treatments</td>
<td>Randomised • Group 1 received 8 weekly, 30-min aromatherapy back massage using 2% blend lavender, rosewood, lemon, rose, valerian • Group 2 received 8 weekly, 30-min back massage using plain carrier oil • Group 3 received best supportive care</td>
<td>• Significant decrease in anxiety in group 1</td>
</tr>
<tr>
<td>Wilkinson et al, 1999</td>
<td>103 palliative care patients</td>
<td>Randomised • Full body aromatherapy massage 3 times per week using Roman chamomile blend • Full body massage 3 times per week using plain carrier oil</td>
<td>• Significant reduction in anxiety in both groups • Aromatherapy massage group showed enhancement of quality of life, physical and psychological symptoms</td>
</tr>
<tr>
<td>Wilkinson et al, 2007</td>
<td>288 patients with cancer</td>
<td>Randomised • Received 20-min aromatherapy massage using individualised blend created from 20 essential oils. Between 2-4 sessions received • Best supportive care</td>
<td>• Aromatherapy massage group showed a significant decrease in anxiety lasting for up to 2-weeks post-treatment</td>
</tr>
<tr>
<td>Imanishi et al, 2009</td>
<td>12 patients with breast cancer</td>
<td>• Received 30-min aromatherapy massage twice weekly for 4 weeks using a blend of sweet orange, lavender and sandalwood essential oils in jojoba oil</td>
<td>• Anxiety levels significantly decreased after each aromatherapy massage with both short and long-term effects</td>
</tr>
<tr>
<td>Chang, 2008</td>
<td>58 hospice in-patients</td>
<td>Randomised • Received daily 5-min aromatherapy hand massage for 7 days using a blend of bergamot, lavender and frankincense at 1.5% dilution • Received daily 5-min hand massage for 7 days using plain carrier oil</td>
<td>• Significant reduction in anxiety and pain in the aromatherapy massage group</td>
</tr>
<tr>
<td>Dyer et al, 2016</td>
<td>61 patients with cancer</td>
<td>Audit of cancer patients using aroma sticks to aid peaceful sleep • Blend A: bergamot and sandalwood • Blend B: frankincense, lavender and mandarin • Blend C: sweet orange, petitgrain, lavandin, mandarin, bergamot, lavender and Roman chamomile (proprietary blend)</td>
<td>• Blends A and B were more popular • Improvement in at least 1 point in sleep in 64% of patients</td>
</tr>
</tbody>
</table>
rich oils, including *Melissa officinalis* (melissa), *Cymbopogon citratus* (lemongrass) and *Litsea cubeba* (may chang) may also be beneficial as well as the tonifying and psychophysiological effects of alcohol-rich oils such as *Rosa damascena* (rose), *Pelargonium graveolens* (geranium), *Agonis fragrans* (fragonia), *Citrus aurantium var amara* (neroli) and *Origanum majorana* (sweet marjoram). Many of these essential oils are mentioned in the texts of Knapp-Hayes (2015), Buckle (2013) and Price & Price (2012), as oils with potential to enhance deep-level psychological relaxation for those experiencing the intense psychological and spiritual distress associated with cancer.

A final consideration is in combining aromatherapy approaches with other non-pharmacological interventions to evaluate if this results in greater therapeutic effect. CRF is multi-factorial and no single intervention is going to offer complete relief. Combined modalities warrant further investigation.

**Conclusion**

In conclusion, CRF is a complex symptom with several underlying causes. No two patients will present in the same way. As such, individualised assessment, treatment and management are crucial. A combination of pharmacological and non-pharmacological approaches seems the most appropriate way forward. Aromatherapy offers significant potential as a non-pharmacological intervention which addresses the holistic and individual needs of the patient, particularly the key psychological indicators of CRF. However, further clinical research is required which is specific to the aromatic management of this distressing symptom.

Whilst the recent review by Finnegan-John et al (2013) provides a valuable road map to aid general research in this area (see Table 1), there are specific issues surrounding aromatherapy which require clinical expertise. Qualified clinical aromatherapists are in a strong position to work collaboratively with patients, selecting and administering aromatic interventions appropriate to their individual needs. Further clinical research is paramount and will strengthen therapeutic outcomes and evidence-based practice in support of aromatherapy as a complementary intervention in the management of CRF.

**References**


