University of San Diego

Digital USD

Dissertations

Theses and Dissertations

2011-04-01

Fibromyalgia Self-Care Management: Use of Essential Oils

Regina Ann Sacco Izu PhD
University of San Diego

Follow this and additional works at: <https://digital.sandiego.edu/dissertations>

Part of the [Nursing Commons](#)

Digital USD Citation

Sacco Izu, Regina Ann PhD, "Fibromyalgia Self-Care Management: Use of Essential Oils" (2011).
Dissertations. 406.

<https://digital.sandiego.edu/dissertations/406>

This Dissertation: Open Access is brought to you for free and open access by the Theses and Dissertations at Digital USD. It has been accepted for inclusion in Dissertations by an authorized administrator of Digital USD. For more information, please contact digital@sandiego.edu.

UNIVERSITY OF SAN DIEGO

Hahn School of Nursing and Health Science

DOCTOR OF PHILOSOPHY IN NURSING

FIBROMYALGIA SELF-CARE MANAGEMENT: USE OF ESSENTIAL OILS

by

Regina Ann Sacco Izu

A dissertation presented to the

FACULTY OF THE HAHN SCHOOL OF NURSING AND HEALTH SCIENCE

UNIVERSITY OF SAN DIEGO

In partial fulfillment of the

requirements for the degree

DOCTOR OF PHILOSOPHY IN NURSING

April 2011

Dissertation Committee

Jane Georges, RN; PhD, Chairperson

Ann M. Mayo, RN; DNSc

Patricia Quinn, RN; PhD

© Copyright by Bell & Howell, 2011

All Rights Reserved

Abstract

FIBROMYALGIA SELF-CARE MANAGEMENT: USE OF ESSENTIAL OILS

Regina A. Izu, RN; PhD
Hahn School of Nursing and Health Science
University of San Diego, San Diego, CA
Jane Georges, RN; PhD, Advisor

Fibromyalgia is a female dominant chronic syndrome of diffuse muscle pain on palpation of at least 11 of 18 syndrome-associated tender points present for 3 months or longer. There is no cure. Self-care management involving multimodal integrative medicine approaches may increase treatment involvement resulting in a sense of control and pain relief.

This embedded, single case study explored ‘how’ and ‘why’ an informant with fibromyalgia chose to initiate and continue self-care management using essential oils over several years to treat symptoms within context reality. Orem’s Self-Care Deficit Model and the Principles of Integrative Medicine from the University of Arizona formed the holistic theoretical research frameworks. Mixed methods (descriptive statistics, pattern matching and thematic analysis) were used to analyze and triangulate converging data from four Likert visual analog scales, rheumatologic medical records, indepth interview transcripts, literature reviews, field notes and observations.

Results indicated that the informant’s skills progressed from using pre-mixed transdermal essential oils applications to using undiluted, neat, layered transdermal interventions of essential oils. Additionally, of the 12 fibromyalgia symptoms treated with essential oils, six significantly improved and 5 different symptoms moderately improved. Compared to pharmacological measures, self-care management using essential oils empowered the informant to more rapidly control her symptoms.

Quantitative and qualitative data supported internal and external validity and reliability.

Implications indicated the need for further research in fibromyalgia self-care using essential oils to delineate efficacy in symptom management, impact on functional status and measurement development.

Dedication

The Lord has blessed and sustained me throughout life.
I begin my PhD journey with the same five year old heart dreaming of becoming a nurse;
to give meaning to suffering; light in the darkness, compassion within this world.

I am forever appreciative to the lights in my life:

My family, for their presence and energy sustain me in love. They walk in courage
despite hardships. Each uniquely touches the lives of many to add light. I am honored to
be in their presence for they are truly gifts within this world.

My friends, for joys and tears shared with me on my journey. In thanks for your belief in
me as a person, nurse, researcher, and friend.

My teachers, past, present, and future, for knowledge shared with and without words.

My students, past, present, and future, for teaching and inspiring me by continuing
leadership and compassion within the nursing profession.

Most importantly, for the patients, I am honored to bear witness and give meaning
to your journey. You are my passion and voice.

Acknowledgements

My dissertation committee represents an exceptional team of gifted nurse leaders who gave me the courage to succeed. Thank you each for your support, time and energy.

Jane Georges, RN; PhD, Chairperson

Ann M. Mayo, RN; DNSc, CNS

Patricia Quinn, RN; PhD, FNP

To my professional mentors:

Patricia Roth, RN; Ed.D.

Marguerite Jackson Dill, RN; PhD, FAAN

Roger Strong, RN; PhD, ACHPN, FPCN

Rodney Schwan, Aromatherapist, CMT, Esthetician

TABLE OF CONTENTS

ABSTRACT	
COPYRIGHT	
DEDICATION	ii
ACKNOWLEDGEMENTS	iii
LIST OF TABLES	xiii
LIST OF FIGURES	xiv
LIST OF APPENDICES	xv
CHAPTER	
1. INTRODUCTION AND SIGNIFICANCE	1
Chronic Illness	1
Fibromyalgia	1
Interventions	3
Theoretical Models	4
Case Study Research	4
Integrative and Complementary Alternative Medicine	.5
Aromatherapy	6
Essential Oils	7
Nursing and Self-Care Deficit	7
Aim and Purpose	8
Research Purpose and Questions	9

2. BACKGROUND and LITERATURE REVIEW	.11
Literature Review	.11
Organizing Theoretical Models	.11
Integrative and Complementary Alternative Medicine	.11
Case Study Research	.13
Orem's Self-Care Deficit Model	.13
Self-Care	.15
Self-Care Management	.15
Self-Care Agency	.15
Stages in Self-Care Decision-Making.	.16
Self-Care Deficits	.17
Health-Deviation and Self-Care Requisites	.18
Calculating Therapeutic Self-Care Demand	.18
Summary of Orem's Theoretical Model	.19
Interventions	.20
Embedded Analysis Concepts.	.21
Fibromyalgia	.21
Etiology	.22
Fibromyalgia Symptoms	.24
Pain	.24
Others	.25
Fibromyalgia Treatment	.25

Pharmaceuticals	.26
Physical Therapies	.27
Psychological Therapies	.27
Essential Oils	.28
Aromatherapy	.28
Aromachology.	.28
Aromatherapy	.29
Aromatology	.29
Physiology and Application	.29
Olfactory and Inhalation	.30
Transdermal Application	.31
Aromatherapy Massage	.31
Physiological and Symptom Management	.33
Essential Oils	.33
Definition of Essential Oils	.34
Essential Oil Standards	.34
Therapeutic Grade	.35
Standards for Therapeutic Grades	.35
Chemistry of Essential Oils	.36
Chronic Conditions and Essential Oils	.37
Fibromyalgia	.38
Lavender (<i>Lavandula angustifolia</i>)	.41

Analgesic Properties	.41
Anesthetic Properties	.42
Antispasmodic Properties	.42
Sedative and Anticonvulsant Properties	.42
Effects on Sleep	.43
Anti-Stress and Anxiolytic Properties	.44
Parasympathetic Properties	.45
Anti-Allergenic Properties	.45
Antimicrobial Properties	.45
Antimutagenic Properties	.45
Anti-Agitation Properties	.46
Anticoagulant Properties	.46
Basil (<i>Ocimum basilicum</i>)	.46
Anti-Inflammatory Properties, , ,	.47
Peppermint (<i>Mentha x piperita</i>)	.48
Antispasmodic Properties	.48
Analgesic Properties	.49
Antimicrobial, Antiemetic, and	
Anti-Allergenic Properties	.50
Tea Tree (<i>Melaleuca alternifolia</i>)	.50
Antimicrobial Properties	.50

Eucalyptus (<i>Eucalyptus globulus</i>)	. . .	.51
Research Studies	. . .	.52
Essential Oil Literature Review Summary	. . .	.53
Critique of Essential Oils, Research Findings	. . .	.54
Conclusion		.54
3. METHODS		.56
Research Purpose and Questions		.56
Research Designs		.57
Single Case Study Analysis		.57
Setting and Sample		.58
Measures		.58
Embedded Units of Analysis		.60
Chronic Symptoms of Fibromyalgia		.60
Self-Care		.60
Essential Oils		.61
Data Collection Procedures		.62
Informed Consent and Human Confidentiality		.62
Data Collection Study Protocols		.63
First Research Visit		.63
Post First Research Visit		.64
Second Research Visit		.64
Post Second Research Visit		.64

4. RESULTS

Introduction	.66
Sample.	.66
Data Analysis	.66
Visual Analog Scales	.67
Chronic Symptom Frequency Scale	.67
Sinus Congestion	.70
Sinus and Muscular Headaches	.71
Sensitivity to Touch	.71
Chronic Symptom Severity Scale	.71
Function and Activities of Daily Living	.77
Essential Oil Efficacy Scale	.81
Nasal Congestion	.84
Sinus Congestion	.84
Runny Nose	.85
Sinus Headaches	.85
Muscular Headaches	.85
Neck Pain	.85
Musculoskeletal Pain and Discomfort	.86
Increased Sensitivity to Touch	.87
Shoulder and Upper Back Pain/Discomfort	.87
Knee Pain	.87

Heel Pain	.87
Sleeping Problems	.88
Symptoms Not Routinely Treated with Essential Oils	.88
Visual Analog Scale Summary	.90
Rheumatologic Medical Records	.93
Fibromyalgia Diagnosis	.94
Medical Progression	.96
Stress	.97
Vitamin D Deficiency.	.97
Musculoskeletal Symptoms	.97
Sleep Disorder.	.98
Gastrointestinal Symptoms	.99
Complementary Therapies	.99
Medical Record Summary	.100
Indepth Informant Interview	.100
Inception of Self-Care Experience	.101
Past Medical History	.101
Fibromyalgia Diagnosis	.101
Treatment	.102
Complementary Alternative Medicine	.104
Self-Care Practice: Midpoint.	.105
Quality of Life.	.106

Treatment	.106
Complementary Alternative Medicine	.106
Currently Lived-Care Experience	.108
Treatment	.109
Complementary Alternative Medicine	.110
Quality of Life.	.112
Function and Activities of Daily Living	.112
Self-Care Philosophies, Perceptions and Accountability	.113
Indepth Interview Summary	.114
Essential Oil Analysis.	.115
Essential Oil Literature Review	.115
5. DISCUSSION	
Introduction	.117
Embedded Units of Analysis	.117
Chronic Fibromyalgia Symptoms	.118
Self-Care Agency	.119
Essential Oils	.123
Internal Validity	.124
External Validity	.125
Reliability	.126
Significance to Nursing	.127
Recommendations	.127

Limitations	.	.	.	.	.	.	.	.	.128
Conclusions	.	.	.	.	.	.	.	.	.129
REFERENCES	.	.	.	.	.	.	.	.	.132

LIST OF TABLES

TABLE

1. AROMATHERAPY MASSAGE RESEARCH	.160
2. RESEARCH ON ESSENTIAL OILS' PHYSIOLOGICAL AFFECTS .	.162
3. VISUAL ANALOG SCALE RESULTS	.92

LIST OF FIGURES

FIGURE

1. DAILY SYMPTOM FREQUENCY IN FIBROMYALGIA .	.68
2. WEEKLY SYMPTOM FREQUENCY IN FIBROMYALGIA .	.69
3. MONTHLY SYMPTOM FREQUENCY IN FIBROMYALGIA.	.70
4. SEVERE SYMPTOM SEVERITY IN FIBROMYALGIA .	.73
5. MODERATE SYMPTOM SEVERITY IN FIBROMYALGIA: 1	.74
6. MODERATE SYMPTOM SEVERITY IN FIBROMYALGIA: 2	.75
7. MINIMAL SYMPTOM SEVERITY IN FIBROMYALGIA .	.76
8. SEVERE TO MODERATELY SEVERE LIMITATIONS FROM FIBROMYALGIA	.78
9. FUNCTIONAL LIMITATIONS FROM FIBROMYALGIA: MODERATE	.79
10. FUNCTIONAL LIMITATIONS FROM FIBROMYALGIA: MINIMAL	.80
11. SIGNIFICANT ESSENTIAL OIL EFFICACY ON FIBROMYALGIA SYMPTOMS	.82
12. MODERATE ESSENTIAL OIL EFFICACY ON FIBROMYALGIA SYMPTOMS	.83

APPENDICES

APPENDIX

A. PRINCIPLES OF INTEGRATIVE MEDICINE	.164
B. INSTITUTIONAL REVIEW BOARD APPROVAL	.166
C. INFORMED CONSENT	.167
D. CHRONIC SYMPTOM FREQUENCY SCALE.	.170
E. CHRONIC SYMPTOM SEVERITY SCALE	.177
F. FUNCTION AND ACTIVITIES OF DAILY LIVING SCALE	.184
G. ESSENTIAL OIL EFFICACY SCALE	.190
H. INDEPTH INTERVIEW QUESTIONS	.197
I. DILUTED FIBROMYALGIA BLENDS	.201
J. DILUTED RESPIRATORY BLENDS	.203

Chapter 1 Introduction and Significance

Chronic Illness

One of the most urgent medical challenges in the US is the care of those who live with chronic illness or disease (Lawrence, 2005). Chronic conditions "are health problems that *require ongoing management over a period of years or decades*" (WHO, 2002, p. 11). Chronic illness marginalizes and stigmatizes; ageing is a risk factor (Stuenkel & Wong, 2009; WHO). Individuals with chronic illness present antithetical American values which emphasize youth, attractiveness, independence, and personal accomplishment (Stuenkel & Wong).

Chronic musculoskeletal pain is the number one disability in North America, the second most frequent cause of primary care visits; the third most frequent etiology for hospitalizations (Ko, Whitmore, Gottfried, Hum, Rahman, Traitses, 2005). Prominent within the working population, chronic conditions result in work disabilities, high sick absenteeism, early retirement, reduced productivity, poor health outcomes, increasing healthcare expenses, decreased or terminated employment, shortened life span, and lowered quality of life (QOL) (Henderson, Glozier, & Elliot, 2005; Lewin, 1999; WHO).

Fibromyalgia

While many chronic conditions currently impact the health of Americans, fibromyalgia (FM) has become one of the most difficult syndromes to manage. A functionally disabling chronic condition or syndrome, FM is a female dominant (80% - 90% of cases) chronic illness peaking at ages 30 to 50 years and demonstrating an age increasing

population prevalence of 2%-13% (Crowther-Radulewicz, 2010; Vierck, 2006; Wolfe, Smythe, Yunus, Bennett, Bombardier, Goldenberg, et al, 1990). The American College of Rheumatology defines FM as a syndrome of diffuse muscle pain for a minimum of 3 months duration with pain on palpation of at least 11 of 18 tender points (Crowther-Radulewicz, 2010; Crowther-Radulewicz & McCance, 2010; Wolfe, et al.). These points occur bilaterally on the body. Women with FM experience pain and profound fatigue exceeding 90% of their wake time; lowering QOL (Buckwalter & Lappin, 2000).

Fibromyalgia is a challenge to treat with conventional medicine (Holcraft, Assefi, & Buchwald, 2003). Thus, the use of integrative and complementary alternative medicine (IM; CAM) in the treatment of FM is an appropriate area of study. Such approaches as aromatherapy (AT) utilizing essential oils (EOs) have shown promise in reducing symptoms in FM (Ko, Hum, Traitses, 2006; Ough, 2008).

Self-Care

The "hidden" health care system is now self-care (Keysor, DeVellis, DeFrieze, DeVellis, Jordan, Konrad, et al., 2003, p. 724). Patients are in control of important self-management decisions and can veto health professional recommendations (Glasgow & Anderson, 1999). Self-management (SM) and self-care (SC) are interchangeable terms. Usually, people self-initiate care activities with the intent to promote health and/or manage chronic conditions (DeFrieze, Konrad, Woomert, Norburn, & Bernard, 1994; Hang, Akiyama, Tryban, Sonoda, & Wykle, 1991; Keysor, et al.; Ory, DeFrieze, & Duncker, 1998; Holman & Lorig, 1997). Self-care management (SCM) narrates the context of human suffering. Daily courage to live with chronic conditions is challenging and brings ramifications.

Self-management encompasses an individual's ability to manage symptoms, or to treat chronic conditions associated with biopsychosocial consequences and lifestyle changes (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002). This implies more than simple adherence to treatment guidelines (Hummel, 2009; Newman, Steed, & Mulligan, 2004).

Interventions

The enduring nature of chronic conditions mandates SC or self-management interventions (SMIs) as imperative, inevitable, nonoptional behaviors (Bodenheimer, Lorig, Holman, & Grumbach, 2002; Cross, 2007). Self-management interventions create a process opportunity to increase a person's treatment involvement while bringing control and order into their lives (Kralick, Koch, Price, & Howard, 2004; Newman, et al., 2004). Care strategies reflect protracted time frames and clarify patient roles and acceptance of responsibilities (Newman, et al.; WHO, 2002).

Individuals with chronic conditions use a variety of techniques to manage symptoms and maintain social role normalcy (Larsen, 2009). They process and perceive stressors uniquely within their lived context, resulting in either SM, or self-control opportunities (Delmar, Bøje, Dylmer, Forup, Jakobsen, Moller, et al., 2006). More than 400 published articles provide evidence that interventions promoting patient roles in the management of chronic conditions lead to improved outcomes (WHO, 2002). Participation in decision-making and treatment planning increases efficacy and efficiency (Holman & Lorig, 2000). Individuals can choose actions that improve their health. They need knowledge, motivation and coping skills to live with chronic conditions (WHO).

Interventions favor medical technology and pharmacological agents at the ex-

pense of low-tech strategies, but daily SC health choices are more influential than medical interventions alone (WHO). The efficacy of SCM encompasses self-monitoring, effective cognitive, behavioral and emotional responses to maintain QOL (Barlow, et al., 2002).

"Prevention and health promotion should be part of every health care encounter, but this is far from routine clinical care" (WHO, 2002, p. 34). Health care reimbursement is proportionate to volume and cost of delivered services and "punished" for engaging in innovative, health promoting clinical practice (WHO). This paradigm shifts from industrial age health care provisions (Cross, 2007) to a challenge for prepared, proactive practice teams interacting with informed, activated patients (Bodenheimer, et al, 2002).

Theoretical Models

This study modeled a single case study research by Yin (2009). The 8 Principles of Integrative Medicine (IM) (Appendix A) originated from the University of Arizona's Center for Integrative Medicine (Maizes, Rakel, Niemie, 2009) forming a conceptual framework for this research study encompassing both allopathy and CAM. Dorothea Orem's (1985) self-care deficit (SCD) model integrated and organized research findings.

Case Study Research

Case study research (CSR) designs "are the preferred method when (a) 'how' or 'why' questions are being posed, (b) the investigator has little control over events, and (c) the focus is on contemporary phenomenon within a real-life context" (Yin, 2009, p. 2). This common research method in nursing analyzes multiple sources of evidence for data convergence in a triangulating fashion (Yin).

Case study research can include single and multiple-case study designs with a

quantitative, qualitative, or mixed method approach (Yin, 2009). Yin identifies 4 distinct applications. Most importantly, case studies explain presumed causal links in real-life interventions too complex for survey or experimental designs. Secondly, they describe an intervention occurring within real-life context. The boundaries between phenomenon and context are not clearly evident. Thirdly, case studies illustrate certain topics within a descriptive evaluation. Finally, case study strategies can enlighten situations in which interventions are without a clear, single set of outcomes.

Yin (2009) identifies multiple rationales for using a single CSR design. A single CSR design can represent a *critical case* to test a well-formulated theory. Secondly, it can represent an *extreme* or *unique case* or thirdly, a *representative* or *typical* case. A *revelatory case* can observe and analyze previously inaccessible phenomenon. Two variants of the single case study are a holistic design or an embedded unit of analysis.

Integrative and Complementary Alternative Medicine

Integrative medicine (IM), a new health care vision, provides a broad patient-centered paradigm embracing a healing-oriented blend of conventional and complementary therapies that affirms the importance of therapeutic relationships (Maizes, et al., 2009). Integrative therapy combines complementary or alternative therapies with allopathy (Lewis, de Vedia, Reuer, Schwan, & Tourin, 2003; Rakel, 2007).

Chronic illness disabilities compel many individuals to complementary alternative medicine (CAM) therapies in quest of reducing pain, anxiety, and stress while searching for a QOL (Consentino, 2006). "Currently CAM is defined as those medical fields that fall outside of conventional medicine" (Maizes, et al., 2009, p. 5). Complementary therapies are used in addition to allopathy, or medical approaches taught in accredited

schools of medicine (Chiappelli, Prolo, Cajulis, 2005; Lewis, et al., 2003). Alternative approaches refer to treatments instead of standard medical therapy, or allopathy.

“The use of CAM by the general population in the US is common, widespread, and on the rise” (Kravits & Berenson, 2010, p. 547). The Institute of Medicine (IOM, 2005) reports that up to one third of US adults use some form of CAM, or 15 million adults take herbal remedies and vitamins in addition to drugs. Self-medication is becoming more popular using unclear compounds and uncontrolled doses (Nehr, Gstöttner, Thaurer, Augustijns, Reinelt, & Schobersberger, 2008). Many CAM research studies demonstrate methodological flaws (Holdcraft, et al, 2003) making it difficult to identify best CAM practices. To summarize, CAM is highly prevalent in the US allowing individuals some control or expression but in serious illness, CAM patients continue to seek standard medical care (Lewis, et. al., 2003).

The National Institutes of Health (NIH) initiated attention to CAM research in 1993 becoming the National Center for CAM [NCCAM] by 2006 (Rakel, 2007). The NCCAM classifies therapies into 5 domains including: alternative medical systems; mind-body interventions; biologically-based therapies; manipulative and body-based therapies; and energy therapies. Aromatherapy is biologically-based since it uses substances found in nature (Consentino, 2006, p. 121).

Aromatherapy

Aromatherapy (AT) identifies the need to treat mind, body and soul together (Lis-Balchin, 2006) and is divided into 3 overlapping sciences. They include AT, aromatology and aromachology. “Clinical aromatherapy is the therapeutic use of essential oils, the efficacy of which is supported by research data” (Buckle, 2001, p. 124).

Essential Oils

Essential oils (EOs) are considered mankind's first medicines. Historically, they are described in Egypt, Babylon, China, India, Greece, Rome, and Arabia for physical and spiritual health (Lewis, et al., 2003; Smith, 2003). These aromatic volatile liquids are a plant's immunity distilled as extracts from shrubs, flowers, stems, branches, bark, roots, bushes, leaves, needles, fruits, and seeds; produced in practically every country of the world (*Essential Oils Pocket Reference [EOPR]*), 2004; Halm, 2008; Helms, 2006; Lewis, et al.; Stewart, 2005; Worwood, 1996).

Essential oils promote healing, are non-toxic, and harmless to human tissue demonstrating a long history of safe traditional use when properly administered (Duning, 2005, Fischer-Rizzi, 1990; Rose, 2006; Stewart, 2003, 2005). Stewart (2003) identifies 6 ways that EOs support people as antimicrobials, antioxidants, balances bodily functions and emotions, raises bodily frequencies, and increases our spiritual awareness (p. 34). Growing evidence supports their use in nursing care (Dunning). Research supporting EOs' efficacy claims for clinical implementation in various clinical situations is unavailable or highly flawed, yet combined with observations, aromatherapy warrants further study (Buckle, 1993; Lewis, et al., 2003; Spencer & Jacobs, 1999).

Nursing and Self-Care Deficit

Nursing signifies the care of "*sick and well persons*" in hospitals or homes (Nightingale, 1859). Orem's (1985) self-care deficit (SCD) theory describes nursing agency as the interface to self-care agency. Nursing is complex, compound actions. Nursing equates to knowledge; poor nursing, or a lack of nursing, results in symptoms and suffering.

Orem (1985, p. 15) claims 4 propositions to express facts or beliefs of nursing. Nursing is deliberate action, a function of the practical intelligence of nurses. Nursing action brings about humanely desirable conditions of persons and their environments. Nursing focuses on human beings and their relation to the living reality of persons including their function within environmental situations.

A nurse's role encompasses both art and science. Nursing art involves skill, practical intelligence and creative care design for individuals or groups under unique, prevailing or changing conditions and circumstances such as chronic conditions, symptoms, and illnesses. Nursing science synthesizes knowledge to create new solutions to problems within the individual's environment and the challenges within their lived context. Nurses provide care for others who are partially or completely unable to meet their SC requisites through the vehicle of their specialized knowledge base. Individuals make SC decisions based on their knowledge, culture, values, age, and maturity within the context of their lived experience.

Little focus is given, however, to the real clinical potential of EO (Buckle, 2007) within the lived context of FM. Nurses need to consider the possibility of integrating or facilitating complementary therapies into their practice. Nursing research is the platform for an appropriate knowledge base (Norton, 1995). There is great potential for collaborative research to explore clinical applications moving beyond low dose application paradigms.

Aim and Purpose

This was a single case, embedded study. The global aim of this evaluative, descriptive research was to explain presumed causal links in the SC use of EOs over

several years' usage to mitigate chronic symptoms associated with FM within the real life context of an individual.

The purpose of this study was to explore "how" and "why" the informant chose to initiate and continue the SC interventions of EOs over several years. The study included how and why an individual self-manages chronic symptoms through several years of lived experience; how and why this SC choice maintains function and activities of daily living; how and why EOs manage chronic symptoms as well as how the lived experience integrated their use and outcomes. Also, since minimal measures existed to collect data related to AT, Likert scales were designed, utilized and collected.

Research Purpose and Questions

Yin's (2009) single case study research (CSR) embedded method design framed the study. The overall purpose of this evaluative, descriptive research was to explore proposed causal links in the SC use of EOs over several years of use to mitigate chronic symptoms associated with FM within context reality. This study was completed to establish the feasibility and efficacy of EOs in the SCM of a middle aged woman with FM. It established a baseline for further research studies.

The specific aims of this single, embedded CSR explored 'how' and 'why' the informant, who suffered from FM, chose to initiate SC with EOs and continue this regimen over several years. This study addressed the following questions:

1. How and why did the informant use essential oils in self-care?
2. How and why did the informant self-manage chronic symptoms of fibromyalgia using other aspects of integrative medicine besides essential oils?
3. How and why did essential oil self-management intervention help the informant

maintain function and activities of daily living?

4. How did the informant integrate self-care management with essential oils, their use, effects, and outcomes into the context of her daily life?

Chapter Two, the background and literature review, presents details regarding the theoretical models, fibromyalgia, self-care, integrative and complementary alternative medicine, aromatherapy and essential oils as a specific therapeutic intervention.

Chapter Two Background and Literature Review

The purpose of this study was to explore "how" and "why" the informant chose to initiate and continue the self-care intervention (SCI) of essential oils (EOs) over several years. The study included how and why an individual self-managed chronic symptoms through several years of lived experience; how and why this self-care (SC) choice maintained function and activities of daily living (ADL); how and why EOs managed chronic symptoms as well as how the lived experience integrates their use and outcomes.

Literature Review

The review of literature provided a summary of the relevant literature informing this study. Specifically, it described the organizing theoretical model, the Self Care Deficit Model of Orem (1985). The following major concepts were also explored in this study: 1) self-care; 2) fibromyalgia and its attendant distressing symptoms; 3) integrative and complementary alternative medicine; 4) aromatherapy; 5) essential oils as a specific therapeutic intervention.

Organizing Theoretical Models

The Principles of Integrative Medicine from the University of Arizona provided an umbrella conceptual framework (Maizes, et al., 2009) to discuss aromatherapy (AT) and EOs. This study followed the case study research (CSR) work of Yin (2009). Dorothea Orem's (1985) self-care deficit (SCD) model permeated and integrated the chain of evidence within the study.

Integrative and Complementary Alternative Medicine

Integrative medicine (IM), a new health care vision, provides a broad patient-

centered paradigm embracing healing-oriented therapies (Maizes, et al., 2009). Within the IM paradigm, allopathy (traditional, conventional medicine) and complementary and alternative therapies (CAM) coexist and affirm the importance of therapeutic relationships (Lewis, et al., 2003; Maizes, et al., 2009; Rakel, 2007). Large numbers of CAM therapies are available and controversial anecdotal stories prevail amidst research paucity (Kravits & Berenson, 2010).

Searching for quality of life (QOL) in a world of noncurative treatment, chronically ill individuals try CAM therapies in quest of symptom palliation to reduce pain, anxiety, and stress (Consentino, 2006; Kravits & Berenson, 2010). High rates of CAM interventions occur in those suffering from rheumatologic disorders like fibromyalgia (FM) which offers unsatisfactory, noncurative treatment options (Holdcraft, et al., 2003). Reasons individuals choose CAM therapies include the reduction of disease, treatment of side effects, improvement of overall health and immune system, easier access to care with less expense than conventional medicine and the hope of altering disease progression (Kravits & Berenson).

In 2004, Jokic, a researcher at The University of Toronto, completed a community CAM survey during an education session attended by 72 FM participants. The most common products tried did not mention EO but included topical rubs, sleeping pills, and transcutaneous electrical nerve stimulation (66.7%), braces and orthotics (58.3%), diets and over the counter (OTC) oral (PO) medications (54.2%), glucosamine, herbals, megavitamins (50%), magnets (37.5%), and opioids (41.7%). The most common CAM practitioners or therapists utilized by the FM participants included massage (75%),

meditation/relaxation and acupuncture (70.8%), chiropractic (58.3%), homeopathy/naturopathy (41.7%), and spiritual healing/prayer (37.5%).

Case Study Research

This study models the work of Yin (2009), who proposed the use of a specific approach to CSR as appropriate in the applied social sciences. According to Yin's model, CSR designs are preferred when 'how' or 'why' questions are posed, if the focus is on real-life contemporary phenomenon or when the investigator has little control over events. This method analyzes multiple data sources of evidence convergence in a triangulating fashion.

Case study research includes single or multiple-case study designs with a quantitative, qualitative, or mixed method approach (Yin, 2009). Yin identifies 4 distinct CSR applications. Most importantly, case studies explain presumed causal links in real-life interventions too complex for survey or experimental designs. Secondly, they describe an intervention occurring within real-life context when boundaries between phenomenon and context are unclear. Thirdly, CSR illustrates topics within a descriptive evaluation. Finally, CSR strategies can enlighten situations when interventions are without clear, singular outcomes. In Yin's approach, the investigator utilizes a theoretical framework that examines the "logic linking the data to the propositions" (Yin 2009, pg. 27). For the purpose of this study, nurse scientist Dorothea Orem's (1985) Self-Care Deficit Model links propositions regarding the "how and why" of utilizing essential oils as self-care in fibromyalgia.

Orem's Self-Care Deficit Model

Orem's (1985) propositions express facts or beliefs of nursing. Nursing is

deliberate action; a function of practical nursing intelligence to bring about humane desirable conditions and environments. Nursing care is unique. It focuses on human beings by providing care in relation to environmental situations, living reality (context reality) and their functions. The platform for good nursing is nursing research and an appropriate evidence-based knowledge (Norton, 1995). There is great potential for collaborative research on EOs to explore clinical applications moving beyond low dose application paradigms (Buckle, 2007).

Orem's (1985) holistic sense of *self* refers to *one's whole being* (p. 84). "The theory of self-care deficit assumes self-care" (p. 82). Performing SC is a decision, or choice. Prior to becoming a habit, reflection determines SC activities, or what is done, and how it should be done (p. 88). Therapeutic SC practice supports life processes, promotes normal functioning, and maintains normal growth, development, or maturation. Age, developmental stage, beliefs, habits, and cultures influence SC practices. Health states, environmental conditions, the effects of medical care, and other variables can modify SC (p.19). Choices in SC behaviors can prevent, control, or cure disease processes and injuries. For the purpose of this study, SC is the personal, practical, purposeful, self-initiated action which demonstrates a pattern and sequence that benefits an individual's life, health, and well-being.

Orem (1985) acknowledges that health deviations, illness and chronic disease can result in feelings of dysfunction or the inability to function normally. Medical care can increase a persons' SC requisites often accentuating components of pain, discomfort, frustration, and hazards. Integrated human functioning, behaviors, and habits change over time and redirect an individual's self-attention. The person who seeks and partici-

pates in medical care to manage their health deviations is performing SC actions.

Therapeutic SC demands vary to accommodate SC requisites and always include preventative health (p.102). Daily executed SC measures become the context of life.

Self-Care

Self-care is a learned human behavior engaged in over time; characterized by deliberate action in the individual's environmental settings and within the context of their patterns of daily living (Orem, 1985, p. 106). The basis for SC judgment and decision-making emerges from knowledge, purpose, common-sense and the meaning of SC.

Social support and environments may also influence self-management (SM) (Gallant, 2003).

Self-Care Management

Self-care management (SCM) can prevent or compensate for disability and promote well-being. Chronic illness management often requires the sufferer to assume extensive daily care responsibilities for day-to-day decisions and actions (Newman, et al., 2004). A central concept in SM is self-efficacy or the “confidence to carry out a behavior necessary to reach a desired goal” (Bodenheimer, et al., 2002, p. 2469). For the purpose of this study, SCM is self-initiated; efficacious action integrated with consistency over time which demonstrates a pattern and sequence that benefits a person’s life, health, and well-being. For the purpose of this study, interventions specifically focusing on aspects of patients’ chronic illness management are often referred to as self-management interventions (SMI) (Newman, et al).

Self-Care Agency

Orem (1985) defines an agent as the person taking action. Self-care agency is a

"complex acquired ability to meet one's continuing requirements for care that regulates life processes, maintains or promotes integrity of human structure, functioning and human development, and promotes well-being" (p. 105). Practicing SC agency requires motivation and skill to examine one's SC habits, appraise their benefits, recognize needs for change, and become knowledgeable about new SC requisites and interventions.

Orem (1985) identifies extreme agitation, inexperience, and level of cognitive development as internal factors creating inference to SC appraisal and judgment. External factors, like a lack of resources or extreme social pressure, can also interfere with SC judgment. Existing conditions and possible options create thought and constitute rational judgment. Unreasonable judgment occurs when decisions are not in accord with existing therapeutic SC demands, existing health and well-being conditions. Individuals investigate health care options and conditions making difficult decisions about what can and should be done. Decisions to follow SC actions determine whether or not SC requisites and outcomes are met.

Orem (1985) views SC actions as subsystems within a total SC system or SM program regulating internal and external factors. Orem identifies 4 types of externally oriented SC actions: knowledge-seeking sequences (p.10), assistance-and resource-seeking behaviors, expressive interpersonal action and externally oriented SC action sequences.

Orem (1985) identifies 2 internally oriented SC actions. Resource-using action sequences control internal factors. Secondly, action sequences control the person's thoughts, feelings, and orientation to regulate internal factors or external orientations.

Stages in Self-Care Decision-Making

There are 2 stages in SC decision-making (Orem, 1985). Stage one, or the "*investigative and decision-making phase of self-care*" (p. 123) focuses on the preceding operations leading up to a decision and the purpose of that decision. Effective SC requires self-knowledge and information about environmental conditions. Adults usually follow normal decision-making patterns to meet daily living routines. Self-care requisites and decision-making patterns change during the illness trajectory. Medical or nursing professionals become useful resources to help arrive at a valid judgment. The first phase of SC concludes when a person reaches a decision.

The person's choice at the closure of phase one sets the goals for stage two or the "*production phase of self-care*" (Orem, 1985, p. 123). The second phase concentrates on operations occurring after the SC decision that allows engagement in a selected course of action. Orem's action phase begins with the decision to meet specific, or a set of SC demands. The plan must specify what kind of action is to occur.

Self-care "*requires expenditure of effort to satisfy*" known care demands (Orem, 1985, p. 121). Sustainable effort is deliberate to achieve specific results or until there is evidence that the effort is not productive. The attention is on performed actions, and evidence to judge these actions to determine if the desired results are or have been achieved.

Self-Care Deficits

Self-care deficits (SCD) refer to the relationship between SC agency and therapeutic SC demands (Orem, 1985). "Self-care deficits are associated not only with individuals' limitations for performing care measure, but also with the lack of validity or effectiveness of the SC in which they engage" (p. 130). A person's capabilities have limita-

tions. Orem describes SCD, or limitations, as complete or partial. Partial SCD can be limited, extensive, or based on limitations to achieve one or several SC requisites. Complete SCD means the individual has no capability of meeting a therapeutic SC demand.

Deficits result in judgment and decision-making limitations. Disordered or impaired functioning results in new health-deviations and universal SC requisites. Newly prescribed, complex, SC measures create new needs. Performance integrates specialized knowledge and skill acquired through training and experience.

Health-Deviation Self-Care Requisites

Orem (1985, p. 99) describes 6 categories of health-deviation SC requisites. The first requires that an individual seek and secure appropriate medical assistance. The second involves awareness of and attendance to pathological conditions, their effects and results. In the third category, a person carries out medically prescribed diagnostic, therapeutic, and rehabilitative measures to prevent, regulate and integrate functioning. The next category requires an awareness or regulation of discomforting or deleterious effects on development. The fifth category modifies SC and self-image to accept oneself in a particular state of health with specific forms of health care needs. Finally, an individual learns to live with the effects of the pathological condition. Self-care expression is a human regulatory function.

Calculating Therapeutic Self-Care Demand

Orem (1985) reviews 6 operations to determine therapeutic SC demands (p. 100). The first involves identification and particularization of existing, emerging, or projected developmental and health-deviation SC requisites. The second operation involves identification of internal or external variables that affect the attainment of SC. The third shows

interrelationships among various SC requisites. The next operation determines how SC requisite interventions affect other SC requisites. The fifth operation is an interventional course of action to meet SC requisites. A designed formulation for total SC action with specified duration and integration of elements occurs within the context of daily living.

Summary of Orem's Theoretical Model

Orem's (1985) SCD is the organizing theory for this CSR. Nursing agency is seen as the interface to SC agency. Individuals make SC decisions based on their knowledge, culture, values, age, and maturity and within the context of their lived experience. Nursing encompasses both art and science. A nurse synthesizes knowledge to create problem solutions within the individual's environment. Nurses provide care for others who are partially or completely unable to meet their SC requisites. The nurse's unique education, knowledge base, and experience in practice create the platform to help others live through the lived contextual experience of chronic illness.

Self-Care

The "hidden" health care system for chronicity is now SC (Keysor, et al., 2003, p. 724). Patients are in control of important SM decisions and can veto health professional recommendations (Glasgow & Anderson, 1999). Courage to live each day with chronic conditions is a challenge with ramifications. Self-care management narrates this challenge within the context of human suffering. Self-management and SC are interchangeable terms. People self-initiate SC activities with intent to promote health and/or manage chronic conditions (DeFriesse, et al., 1994; Hang, et al., 1991; Keysor, et al.; Ory, et al., 1998; Holman & Lorig, 2000).

Self-management implies more than simple adherence to treatment guidelines

(Hummel, 2009; Newman, et. al, 2004). The scope of SM encompasses an individual's ability to manage symptoms, or to treat chronic conditions associated with physical and psychosocial consequences and lifestyle changes (Barlow, et al., 2002).

Interventions

The enduring nature of chronic conditions mandate SMI as imperative, inevitable, and nonoptional behaviors (Bodenheimer, et al, 2002; Cross, 2007). A person uses SMI to create processes and opportunities to increase treatment involvement and bring control/order into their lives (Kralick, et al., 2004; Newman, et al., 2004). Care strategies reflect protracted time frames; clarify patient roles and acceptance of responsibilities (Newman, et al.; WHO, 2002).

Larsen and Hummel (2009) discuss that a disease focus cannot manage the illness experience for the person. Chronic illness mandates heterogenic adaptation within the reality context of each unique individual. Therefore, individuals with chronic conditions use a variety of techniques to manage symptoms and maintain social role normalcy (Larsen, 2009). Self-control opportunities or SM emerge as outcomes of uniquely perceived and processed stressors within the lived context (Delmar, et al., 2006). More than 400 published articles provide evidence that interventions promoting patient roles in the management of chronic conditions result in improved outcomes (WHO, 2002). A person's participation in decision-making and treatment planning increases efficacy and efficiency (Holman & Lorig, 2000). Individuals can choose actions which improve their health. They need knowledge, motivation and skills to cope with the lived experience of chronic conditions (WHO). The efficacy of SCM encompasses self-monitoring, effective cognitive, behavioral and emotional responses to maintain QOL (Barlow, et al., 2002).

"Prevention and health promotion should be part of every health care encounter, but this is far from routine clinical care" (WHO, 2002, p. 34). Health care workers gain monetary rewards proportionately to the volume and cost of delivered services but not for engaging in innovative, health promoting clinical practice (WHO). Interventions favor medical technology and pharmacological agents at the expense of low-tech strategies, but daily SC health choices are more influential than medical interventions alone (WHO). This paradigm shifts from industrial age health care provisions (Cross, 2007) to a challenge for prepared, proactive practice teams interacting with informed, activated patients (Bodenheimer, et al, 2002).

Embedded Analysis Concepts

The following indepth literature reviewed additional data for embedded concept analysis within the CSR. Previously discussed within Orem's (1985) theoretical framework, SC integrated into the rubric of FM and aromatherapy (AT). Fibromyalgia symptoms and treatment discussed a multimodal, IM approach. Aromatherapy included a detailed discussion of EOs emphasizing those used by the informant in her self-care regimen.

Fibromyalgia

The American College of Rheumatology defines FM as a syndrome of diffuse muscle pain for a minimum of 3 months duration with pain on palpation of at least 11 of 18 tender points (Wolfe, et al, 1990; Crowther-Radulewicz, 2010; Crowther-Radulewicz, & McCance, 2010). Points occur bilaterally on the body. Crowther-Radulewicz classifies FM as a chronic pain, subjective complaint syndrome rather than presenting with unique pathophysiologic characteristics. Due to this vagueness, FM is a diagnosis

of exclusion without confirmatory common laboratory diagnostic tests; patient history is important for diagnosis (D'Arcy, 2008).

Anteriorly, generalized muscle tenderness points are found at 4 bilateral locations (Freundlich & Leventhal, 1997). The first are located in the low cervical neck areas. These are palpated in the anterior aspects of the fifth through seventh cervical intertransverse spaces. At the second rib, the second costochondral junctions are palpated. The third palpation points are located 2 centimeters (cm) distal to the lateral epicondyles. The fourth palpation points are located at the knees in the medial fat pad proximal to the joint line.

Posteriorly, 5 bilateral points are examined for tenderness (Freundlich & Leventhal, 1997). The first point of tenderness is located at the occiput with palpation at the suboccipital muscle insertion sites. The second point is found at the trapezius mid-point of the upper border; the third palpation point at the supraspinatus above the medial border of the scapular spine. The fourth palpation point is examined in the upper outer quadrants of the gluteal or buttock muscles. Finally, the fifth palpation point is located at the greater trochanter, specifically, posterior to the trochanteric prominence.

Etiology

Etiology is debatable and unknown with common, multiple precipitating factors including viral illness (Epstein-Barr, hepatitis C, parovirus, chronic fatigue syndrome, human immunodeficiency virus infection, lyme disease, physical or emotional trauma, catastrophic events, psychologic or emotional distress, and medications, especially steroid withdrawal (Crowther-Radulewicz, 2010; Sierpina & Carter, 2002). Aggregating data suggests that disordered central pain processing contributes to its pathogenesis

(Abeles, Pillinger, Solitar, & Abeles, 2007). Rheumatic diseases may coexist or initially manifest with FM.

It seems that genetic and environmental factors play roles in FM susceptibility (Arnold, Hudson, Hess, Ware, Fritz, Auchenbach, et al., 2004; Buskila & Neumann, 1997; Buskila & Sarzi-Puttini, 2006). Although the pathogenesis of FM is not well understood, family studies show familial aggregation of FM and related conditions are most probably polygenic in nature (Buskila & Sarzi-Puttini; Staud, 2006).

Lee, Choi, Ji, Song (2010) completed a meta-analysis of 18 studies of candidate gene polymorphisms contributing to FM susceptibility using allele contrast, recessive, dominant models and a contrast of homozygotes. Twenty-one different comparisons were considered. Seventeen candidate genes and over 35 various polymorphisms in FM studies were identified. The overall odds ratio (OR) association between the C allele and FM was 1.222 (95% CI = 1.053-1.688, $p = 0.017$). Authors' concluded that the serotonin 5-HT_{2A} receptor 102T/C polymorphism confers susceptibility to FM (p. 218).

Sierpina and Carter (2002) propose additional theories to explain the etiology of FM. Although primary etiology is undetermined, neuroendocrine axis imbalance is probably a key variable. Examples of this imbalance includes autonomic nervous system abnormalities, altered norepinephrine, low insulin-like growth factor-1 levels, decreased serotonin and tryptophan levels and altered levels of substance P, a peptide neurotransmitter, and norepinephrine. Other presentations in FM include lower cerebral blood flow, low sympathetic tone, orthostatic intolerance, visceral dysfunction and vasomotor instability. The second central variable is sleep disruption (disturbed non-rapid eye movement [REM]). Both variables seem central. Another theoretical hypothesis suggests

hypothalamic-pituitary-adrenal (HPA) axis dysfunction. Many researchers report abnormal concentrations of central nervous system (CNS) neuropeptides, biogenic amines, and alterations of the HPA axis (Bradley, Alárcon, Sotolongo, Weigent, Alberts, Blalock, et al., 1998; Neeck, 2000; Russell, Orr, Littman, Vipraio, Alboukrek, Michalek, et al., 1994; Vaeroy, Helle, Forre, Kass, & Terenius, 1998).

Fibromyalgia Symptoms

Fibromyalgia is a syndrome comprised of many complex symptoms. The following literature reviews highlights on some of the most important chronic symptoms.

Pain

The chronic pain syndrome of FM represents the extreme end of musculoskeletal (M/S) pain affecting women 9:1 times more often than men (Staud, 2006). Sierpina and Carter (2002) report that over 90% of FM patients report fatigue, generalized pain, morning fatigue, and stiffness. Pain perception, known as nociception, normally occurs peripherally where stimuli are originally felt, spinal cord where stimuli processing occurs, and the brain where stimuli interpretation equates to pain (Sierpina & Carter). Pain is a burning or gnawing sensation; an altered pain process that lowers mechanical and thermal pain thresholds; produces high pain ratings as a result of provoking stimuli; alters temporal summation of pain stimuli as the outcome (Crowther-Radulewicz, 2010; Bennett, 2007; Dannecker, Knoll, & Robinson, 2008).

Allodynia or the mechanical pain hypersensitivity experienced in FM patients seems to be widespread (Kosek, Ekholm, & Hansson, 1995). Muscle abnormalities, including trigger points, are thought to act as pain generators in FM contributing to pain through mechanisms of pain amplification (Staud, 2006). Biomechanical mediators can

sensitize muscle nociceptors thereby indirectly inducing or contributing to central sensitization (Staud). The cerebrospinal fluid (CSF) of FM sufferers shows 3-5 times the normal substance P levels, a pain-facilitating agent (D'Arcy, 2008). Nerve growth factor is also elevated with FM which can affect sensory processing (Wolfe, et al., 1990). Exposure to cold aggravates FM pain (Berglund, Harju, Kosek, & Lindblom, 2002; Carli, Suman, Biasi, & Marcolongo, 2002).

Others

Crowther-Radulewicz (2010) reports other characteristic symptoms of FM as increased sensitivity to touch, absence of localized or systemic inflammation, fatigue, and sleep disturbances. Anxiety related to the diagnosis of FM is almost universal. Other symptoms include migraine HA in 45%, irritable bowel symptoms (IBS) in 41.8%, dysmenorrhea, female urethra syndrome, endometriosis, noncardiac chest pain, plantar heel pain, temporomandibular joint (TMJ) pain, sinusitis, Sjorgren's syndrome, pares-thesia, excessive sensitivity to cold (Raynaud-like) in 50% of the individuals; 25% seek psychological support for depression (Bonafede, Downey, & Bennett, 1995; Cleveland, Fisher, Brestel, Esinhart, & Metzger, 1992; Crowther-Radulewicz; Harvey, 1993; Lapossy, Gasser, Hrycaj, Dubler, Samborski, & Muller, 1994; Mukerji, Mukerji, Alpert, & Selukar, 1995; Nicolodi & Sicuteri, 1996; Paira, 1994; Plesh, Wolfe, & Lane, 1996; Sinaii, Cleary, Ballweg, Nieman, & Stratton, 2002; Sivri, Cindas, Dincer, Sivri, 1996; Yunus, Masi, & Aldag, 1989a). Neurotransmitter deficits from serotonin, norepinephrine, and dopamine might account for some of the depressive symptoms associated with FM (D'Arcy, 2008).

Fibromyalgia Treatment

There is no cure for FM and treatment is usually multimodal (Sierpina & Carter, 2002). The main goal of treatment is symptom management frequently involving pharmacological and nonpharmacological interventions (Sierpina & Carter). Rooks (2007) discusses current treatments for FM including medical (pharmacology, physical, and psychological therapies) SM and CAM interventions. Randomized control trial CAM FM studies are increasing from the past decade, yet treatment remains inadequate (Holdcraft, et al., 2003). Individuals continue to suffer from persistent symptoms which result in functional limitations and declining QOL. Evidence-based standards of care are not available.

Pharmaceuticals

Tried pharmacological agents for FM are extensive (Ko, et al., 2005). In 2005, best supported medications were low-dose tricyclic antidepressants, but benefits were short-term without significance when compared to placebo at 6 months of study (Caruso, Puttini, Cazzola, & Azzolini, 1990; Clauw & Crofford, 2003; Tofferi, Jackson, & O'Malley, 2004). Many published trial medications were ineffective in FM pain management including acetaminophen (paracetamol), 4% lidocaine sphenopalatine nerve blocks, lidocaine intravenously (IV) at 5 milligram (mg)/kilogram (kg), morphine sulfate IV 0.3 mg/kg, ibuprofen, naproxen, prednisone 15 mg daily, citalopram, and zolpidem (Clark, Tindall, & Bennett, 1985; Goldenberg, Felson, & Dinerman, 1986; Gunther, Mur, Kinigadner, Miller, 1994; Janzen & Scudds, 1997; Moldofsky, Lue, Mously, Roth-Schechter, & Reynolds, 1996; Norregaard, Volkmann, & Danneskiold-Samsoe, 1995; Sorensen, Bengtsson, Ahlner, Henriksson, Ekselius, & Bengtsson, 1997; Yunus, Masi, & Aldag, 1989b). Medication treatments were also used to improve sleep, decrease

inflammation, supplement vitamin D deficiency, and certain CNS-active medications, like pregabalin (Lyrica®) (Crowther-Radulewicz, 2010; Mease, Russell, Arnold, Florian, Young, Martin, et al., 2008).

To date, the only US FDA approved medications for FM are pregabalin (Lyrica®) and duloxetine (Cymbalta®). Pregabalin treats pain and has a short onset of action, less than one week (Klipa & Rousseau, 2009). Duloxetine is a serotonin and norepinephrine reuptake inhibitor that treats major depressive disorders (Arnold, Lu, Crofford, Wohlreich, Detke, Iyengar, et al., 2004; Nemeroff, Schatzberg, Goldstein, Detke, Mallinckrodt, & Lu, 2002).

Physical Therapies

Multiple modes of physical therapies were helpful for FM pain. Aerobic exercise (Burckhardt, Mannerkorpi, Hedenberg, Bjelle, 1994; McCain, Bell, Mai, Halliday, 1988; Richards & Scott, 2002; Wigers, Stiles, Vogl, 1996) especially when combined with flexibility and strength training were found superior to relaxation alone (Martin, Nutting, MacIntosh, Edworthy, Butterwick, & Cook, 1996). Pool exercise, hydrotherapy and strengthening exercises were also efficacious (Ammer & Melnizky, 1999; Cedraschi, Desmeules, Rapiti, Baumgartner, Cohen, Finckh, et al. 2004; Gunther, et al., 1994; Hakkinen, Hakkinen, Hannonen, Alen, 2001; Karagulle & Karagulle, 2004; Mannerkorpi, Nyberg, Ahlmen, & Ekdahl, 2000; Rooks, Silverman, & Kantrowitz, 2002). Low intensity training programs were recommended to support compliance and minimize pain exacerbation since contractions inhibit pain mechanisms (Lannersten & Kosek, 2010).

Psychological Therapies

Psychological stress is palpable for individuals suffering with FM. Mind body therapies such as cognitive-behavioral therapy (CBT), biofeedback, hypnotherapy, meditation-based stress reduction, imagery, and self-efficacy show degrees of efficacy (Haanen, Hoenderdos, van Romunde, Hop, Malle, Terwiel, et al., 1991; Kaplan, Goldenberg, Galvin-Nadeau, 1993; Redondo, Justo, Moraleda, Velayos, Puche, Zubero, et al., 2004; Sierpina & Carter, 2002; Williams, Cary, Groner, Chaplin, Glazer, Rodriguez, et al., 2002) as well as group therapy and relaxation (Bennett, Burckhardt, Clark, O'Reilly, Wiens, & Campbell, 1996; Keel, Bodoky, Gerhard, & Muller, 1998; Sierpina, & Carter).

Essential Oils

Essential oils have been studied for the treatment of FM. These nonallopathic treatments are discussed below in depth under the topic of EOs used for chronic conditions.

Aromatherapy

Aromatherapy is one of the fastest growing CAM therapies (Lis-Balchin, 2006) using EOs, or the essence of plants, herbs, and trees for therapeutic purposes as one possible option to pharmacotherapy (Ballard, O'Brien, Reichelt, & Perry, 2002; Kravits & Berenson, 2010). For the purpose of this study, AT is a CAM intervention that uses volatile, essential plant oils for an individual's biopsychosocial well-being. Essential oils are centuries old. The Holy Bible mentions their use before Christ's birth. Three categories define AT: aromachology, AT and aromatology.

Aromachology

Aromachology is defined by the Sense of Smell Institute (SSI) as “a concept based on systematic, scientific data collected under controlled conditions” (Lis-Balchin, 2006, p. 3). It studies interrelationships of psychology and fragrance technology to transmit through odor a variety of feelings directly to the brain (Lis-Balchin).

Aromatherapy

Aromatherapy is defined by SSI as “the therapeutic effects of aromas on physical conditions ... as well as psychological conditions” (Lis-Balchin, 2006, p. 3). It is an offshoot of herbal medicine influencing the limbic system which encodes odors into associations and memories that, “...when awakened alter basic physical functions such as heart rate, blood pressure, breathing, and hormone level” (Matzo & Sherman, 2006, p. 59). Pleasant scents can become memories of joy, safety, love and caring.

Aromatology

Aromatology uses EOs as internal medicines (Franchomme & Pénnoel, 1990); includes the intensive application of neat (undiluted) oils through the skin (3-45 mL/day) (Lis-Balchin, 2006). Aromatology concentrates on the effects of chemicals in the EOs taken internally via oral, anal, vaginal or other possible openings by medically qualified doctors or herbalists.

Physiology and Application

The physiology involved in the response to EOs is complex and undergoing continual investigation. This section reviews physiological interactions.

There are many methods of administration for EOs. The most commonly known is inhalation through the use of diffusion. Body powders, candles, baths crystals and compresses are also methods of administration (Lis-Balchin, 2006; Schiller & Schiller,

2001). Self-application refers to an application of the EO on the skin, rubbing it in until it is fully absorbed (Schiller & Schiller). For the purpose of this study, transdermal application refers to SC application of any EO on the skin with rubbing into the skin until it is fully absorbed on any body location.

Olfactory and Inhalation

Smell is closely linked to emotions and vastly more sensitive than taste (Lis-Balchin, 2006). Humans are capable of registering at least 10,000 different fragrances. “The sense of smell stimulates reactions and actions at both subconscious and conscious levels” (Rubert, Long, & Hutchinson, 2007, p. 31).

Odors almost immediately reflect on the brain through the olfactory system (Buckle, 2001; Lis-Balchin, 2006). The olfactory membrane exposes the CNS brain cells directly to the environment (Fischer-Rizzi, 1990). Molecules stimulate impulse passage along the olfactory tract to the primitive limbic system, amygdala, or noncognitive, middle brain entering the bloodstream via the lungs (Holmes & Ballard, 2004; Lis-Balchin; Mariano, 2006).

“Odor stimuli in the limbic system or olfactory brain release neurotransmitters - among them enkephalin, endorphins, serotonin, and noradrenalin” (Fischer-Rizzi, 1990, p. 27). Enkephalin and endorphins reduce pain and create a feeling of well-being. Enkephalin also produces pleasant, euphoric sensations while endorphins stimulate sexual feeling. Serotonin helps relax and calm; noradrenalin acts as a stimulant (Fischer-Rizzi).

Factors to consider in treatment response outcomes of inhaled EOs are categorized into psychological aspects and neurochemical effects by Holmes and Ballard (2004). Psychological variables in treatment response are the individual’s perception of

the pleasantness of an odor and the individual's past association with an odor. Neurochemical effects are identified as the inhibition of glutamate binding, gamma-aminobutyric acid (GABA) augmentation, and acetylcholine receptor binding.

Transdermal Application

Essential oils are lipid soluble and rapidly absorbed into the bloodstream when applied externally, inhaled or ingested (Buckle, 2001; Maddocks-Jennings & Wilkinson, 2004). "Any essential oil placed anywhere on the body is transdermal and can reach every part of your body within minutes" (Stewart, 2003, p. 16). Transportation through the human body occurs via the circulatory, connective and lymphatic systems, crossing through tissues, cell walls, membranes and blood brain barriers (Holmes & Ballard, 2004; Fischer-Rizzi, 1990; Stewart, 2003, 2005). Elimination of EO is through lung exhalation (carbon dioxide), kidney (urinary) excretion, nose, mouth and feces (Fischer-Rizzi; Lis-Balchin, 2006; Maddocks-Jennings & Wilkinson).

Aromatherapy Massage

Aromatherapy massage (ATM) combines the use of EOs with massage therapy. This route has more research studies to report than other methods (Tables 1). Difficulty arises, however, in determining whether it is the massage component or the EOs that comprises research results.

Popular and widely practiced within cancer settings, ATM reduces stress and improves mood in terminally ill patients combined with touch and listening skills (Lis-Balchin, 2006; Kravitz & Berenson, 2010; Wilkinson, Love, Westcombe, Gambles, Burgess, Cargill, et al., 2007). Roman chamomile, lavender, and clary sage are often used for ATM with beneficial effects on physical and psychological symptoms (Rakel,

2007; Wilkinson, Aldridge, Salmon, Cain, & Wilson, 1999).

Kite, Maher, Anderson, Young, Wood, et al. (1998) found that ATM helped reduce psychological distress and improved symptom management in cancer patients.. After a course of 6 ATM sessions, there was a significant improvement in the Hospital Anxiety Depression Scale (HADS) in 58 cancer patients at $p < .001$. Large RCTs indicated that ATM reduced levels of anxiety in cancer patients for short term effects (Fellowes, Barnes, & Wilkinson, 2004; Wilkinson, et al., 1999; Wilkinson, et al., 2007).

Hadfield (2001) studied 8 patients with primary brain tumors attending their first radiotherapy appointment to determine whether ATM would reduce anxiety. Physical parameters, HADS, and semi-structured interviews were used for measurements. There was no significant improvement in the HADS scores within this small sample size, but significant improvement was shown in 4 physical parameters. Patient interviews verified relaxation after the ATM supporting QOL improvement.

Wilkinson, et al. (2007) identified the only outcome predictor for anxiety and depression as AT versus ATM. Komori, Fujiwara, Tanida, and Namura (1995) reported that adjunctive AT allowed for decreased antidepressant doses within a small, randomized trial. Fellowes, et al. (2004) showed psychological well-being from massage with (w) or without (wo) AT to decrease anxiety. Cooke and Ernst (2000) completed a systematic review of AT literature concluding that ATM studies suggested a mild, transient anxiolytic effect. Richards, Gibson, and Overton-McCoy (2000) reviewed 22 articles examining the effect of massage therapy on relaxation and reported the most consistent finding as a reduction in anxiety. Thus, design flaws and small samples sizes concluded the need for improved methodologies on larger scales over longer periods of

time to confirm findings.

Physiological & Symptom Management

Research shows that in vivo physiological parameters and symptom management change through inhalation or transdermal applications of EOs (Table 2). Findings suggest that stimulating EOs affect the sympathetic nervous system (SNS). Calming EOs relax it.

Essential Oils

Essential oils (EOs) are used in AT and considered mankind's first medicines for physical and spiritual health (Lewis, et al., 2003; Smith, 2003). These aromatic volatile liquids are composed of a plant's immunity distilled as extracts from shrubs, flowers, stems, bark, branches, roots, bushes, leaves, needles, fruits, and seeds; produced in practically every country of the world (*Essential Oils Pocket Reference [EOPR]*), 2004; Halm, 2008; Helms, 2006; Lewis, et al.; Stewart, 2005; Worwood, 1996).

Most EOs promote healing. Usually non-toxic, and harmless to human tissue, EOs demonstrate a long history of safe traditional use when properly administered (Dunning, 2005; Fischer-Rizzi, 1990; Rose, 2006; Stewart, 2003, 2005). Stewart (2003) identifies 6 ways that EOs support people as antimicrobials, antioxidants, balancers of bodily functions and emotions, raising bodily frequencies, and increasing our spiritual awareness (p. 34). Growing evidence supports EO use in nursing care (Dunning). Little focus is given, however, to the real clinical potential of EOs (Buckle, 2007). Research supporting EOs' efficacy claims for clinical implementation is unavailable or highly flawed, yet combined with observations, warrants further study (Lewis, et al., 2003; Spencer & Jacobs, 1999).

Definition of Essential Oils

Holistic therapies used in CAM require the purest EOs which, when properly stored and sealed, have centuries of shelf lives (Stewart, 2005). For the purposes of this study, EOs are volatile liquid extracts from shrubs, flowers, stems, branches, bark, roots, bushes, leaves, needles, fruits, and seeds; produced around the world (*EOPR*, 2004; Halm, 2008; Helms, 2006; Lewis, et al., 2003; Smith, 2003; Stewart, 2005; Worwood, 1996).

The *EOPR* (2004) describes 3 therapeutic models for treatment. The English model advocates body massage for relaxation and stress reduction using small amounts of EOs in a carrier or diluent oil for application. The French focus on internal ingestion and neat or undiluted topical application of therapeutic grade EOs. The Germans use EOs for inhalation. For the purpose of this CSR, neat and diluted EO will be utilized by the informant without internal ingestion.

Possible adverse side effects while using EOs include photosensitivity, allergic reactions, dermatitis, nausea and headache (HA) (Kravitz & Berenson, 2010). Essential oils might enhance or reduce the effects of medications (Perez, 2003).

Essential Oil Standards

The quality and quantity of EOs are mediated by: location and geographical region of growth, altitude, moisture, climate, soil condition/fertilizer (organic or chemical), part(s) of the plant producing the oil, season, time of plant material harvest, method of harvesting, and distillation processes (*EOPR*, 2004; Schiller & Schiller, 2001). Wild or organically grown plants are noted to yield EOs of optimal quality (Schiller & Schiller).

Therapeutic Grade

Preservation of delicate aromatic chemical compounds within the EO is imperative to attain a therapeutic grade (*EOPR*, 2004). Laboratories can not replicate EO molecules or isomers. Plants from the proper botanical genus, species, and cultivar grown without chemical soil fertilizers, herbicides, and pesticides are desirable (Stewart, 2005). “Inferior quality or adulterated oils most likely will not produce therapeutic results and could possibly be toxic” (*EOPR*, p.10). Extraction is usually by steam distillation at minimum temperatures and pressures without using chemical solvents in the extraction process. Distillation, condensation, and separation are performed in receptacles constructed with relatively inert materials. For the purpose of this study, a therapeutic grade EO is natural, without chemical additives, distilled from parts of plants (botanical herbs) and bottled in brown, amber, or blue glass containers with air tight, non-reactive lids that shield from light (Stewart, 2005).

Standards for Therapeutic Grades

Standards for therapeutic grade EOs are not set by any government agency, or FDA. Principal constituents that quality EOs should have are outlined in a set of European standards known as the *Association French Normalization Organization Regulation* (AFNOR) and *International Standards Organization* (ISO) from Switzerland (*EOPR*, 2004; Stewart, 2005). The AFNOR is a team written standard lead by government-certified botanical chemist Hervé Casabianca working with several analytical laboratories throughout France. Primary constituents in an EO must occur in certain percentages to be considered therapeutic. The ISO sets standards for therapeutic grade EOs adopted from AFNOR. If EO constituents are too high or low, it cannot be certified.

Marriott, Shellie, and Cornwell (2001) discuss the use of gas chromatography (GC) to analyze volatile and semi-volatile substances. This technique is available to contrast and compare EOs by determining composition, quality, and adulteration. This technique can discover new compounds or chemical classes. This powerful separation method reassures the CAM practitioner that EOs are medicinal grade for the use of therapeutic treatments. This process can also raise the cost of EOs.

Chemistry of Essential Oils

One drop (gtt) of EO contains about 40 million-trillion molecules creating complex chemical compounds composed of isoprene units (carbon and hydrogen atoms). Major components are phenols and phenylpropanoids (P), monoterpenes (M) and sesquiterpenes (S) (Stewart 2003).

Unfriendly living conditions are created with P so that viruses and bacteria cannot live. The function of P is to clean cell receptor sites facilitating healthy cellular communication. Examples of EOs with P compositions include: clove, cassia, basil, cinnamon, oregano, anise, and peppermint which was used as an ancient medication over 10,000 years ago (Sego, 2008; Stewart, 2003).

Essential oils also contain M consisting of 2 isoprene units that can reprogram miswritten information in cellular memory or deoxyribonucleic acid (DNA). Examples of EOs with M include galbanum, angelica, hyssop, rose of sharon, peppermint, juniper, frankincense, spruce, pine, cypress and myrtle (Stewart, 2003).

Another main constituent of EOs is S consisting of 3 isoprene unit compounds found in cedarwood, vetiver, spikenard, sandalwood, black pepper, patchouli, myrrh, and ginger; at lower percentages in galbanum, onycha, and frankincense (Stewart, 2003).

These molecules deliver oxygen to the cells. They “can erase or deprogram miswritten codes in cellular memory”; thought to be especially effective in fighting cancer by deleting garbled information creating “an environment where cancer cells can’t reproduce” (Stewart, 2003, p. 29).

Oils containing P, M, and S are useful in addressing many illnesses, injuries, and disease conditions. Stewart (2003) hypothesizes that P, M, S oils cleanse receptor sites, deprogram bad information, and reprogram correct information (p. 30).

Perez (2003) uses the chemical structures of EOs to categorize mechanisms of action. Terpenes have antiviral, antiseptic, bactericidal and anti-inflammatory properties. Esters are fungicidal and have a sedative effect. Aldehydes are both antiseptic and sedative. Ketones reportedly ease congestion and may be very toxic. Alcohols have antiseptic and antiviral attributes and are generally regarded as nontoxic in nature. Phenols can be stimulating to the sense and oxides can be used as expectorants (p. 595-596). Ginger’s antimicrobial effects are contributed to M: 1, 8-cineole, β -pinene, and α -terpineol (Martins, Salgueiro, Goncalves, da Cunha, Vila, Canigueral, et al., 2001).

Chronic Conditions and Essential Oils

“Most chronic and life-threatening diseases become whole-person experiences that inevitably include suffering” (Ferrell & Coyle, 2008, p. 9). Suffering is a private, lived experience of a whole person, individually unique resulting from the most important aspects of threatened or lost personal identity (Kahn & Steeves, 1996). Suffering is complex and perceivable through the lens of a contextual praxis (Georges, 2002). A caring environment can influence a person’s suffering positively or negatively (Kahn & Steeves). Within this environment, perceptions of fragrances in AT are highly

personalized and dependent on social customs and the individual's historical experiences (Matsui, Declercq, Sparacio, Voight, Marenus, Maes, 2002).

Nursing as a practice discipline acknowledges that “competence resides in the use of context-specific knowledge, skills and clinical judgments to meet patient and families’ health needs” (Murray, 2008, p. 45). The relief of suffering is at the core of nurses’ work and nothing is routine (Ferrell & Coyle, 2008). The use of EOs in American healthcare is not routine, but since conventional medicine does not offer cures for chronic illnesses it seems urgent that other interventions be researched to mitigate suffering. One of these CAM interventions is AT or the use of EOs.

Fibromyalgia

Holdcraft, et al.’s (2003) evaluation post systematic review of empirical evidence concludes that acupuncture has the strongest supportive evidence for FM, magnesium, S-adenosyl-L-methionine (SAMe), and massage therapy have moderate evidence. Authors state that *Chlorella pyrenoidosa* (a green alga dietary supplement), relaxation, biofeedback, magnet therapy, homeopathy, botanical oils, balneotherapy (sulphur baths) anthocyanidins (common plant pigments) and dietary modifications have limited empirical evidence (p. 681). Other treatments include education, exercise, and cognitive therapy (Crowther-Radulewicz, 2010). For the purpose of this study, literature reviews will focus on EOs and AT treatments.

Ammer and Melnizky (1999) completed and investigator-blinded RCT assessing 10 whirl-bath (3 times per week) treatments using pine oil ($n = 7$), valerian ($n = 12$) or plain water ($n = 11$). Results indicated that valerian baths improved sleep. Pine oil increased sensitivity to pain. Plain water whirl-baths appeared to decrease the intensity

of pain. Baths with EOs promoted well-being. This was a small sample size with patient blinding and missing data in the final analysis.

A randomized controlled trial (RCT) was conducted by Ko, et al. (2006) using a patented OTC topical (O24) for a block of 4-6 weeks which consisted of a proprietary blend of 6 EOs including rosemary, peppermint, camphor, aloe vera, and lemon/orange. Subjects were recruited by newspaper advertisements and FM internet support groups. Clinical diagnoses were confirmed through medical evaluation. Treatment instructions were given by a blinded registered nurse (RN) consultant. Topical O24 was given to half of the FM participants ($n = 65$) applying every 4 hours PRN pain avoiding eyes, mucous membranes, genitalia, or open wounds. “Placebo oils (peppermint oil) identical in smell and appearance to active oils were supplied to the other half” ($n = 68$) (p. 5). Authors reported the primary action as a counter-irritant for pain sensation by stimulating large A-beta sensory fibers inhibiting pain from A-delta and C fibers at the dorsal horn. Local inhibition of pain transmitters included bradykinin, histamine, and prostaglandins. Based on a 7 point subjective Lanier scale, $p < .0001$ in the treatment group with a significant mild to moderate pain management improvement over the control group who noted no significant change. Statistical analysis was performed using Statistical Analysis Software, but specific tests were not mentioned within the article to determine validity of reported data. Actual frequency of participants’ use of the control or O24 variable or amount of application was not reviewed in the article. The EO species, concentrations, and compounding processes were also excluded. Although larger and longer studies need to confirm findings, authors concluded that this pilot RCT suggests that topical O24 may be effective for FM pain (Ko, Hum, Traitses, & Berbrayer, 2007).

Lukaczer, Darland, Tripp, Liska, Lerman. Schiltz, et al (2005) investigated the efficacy of Meta050, a proprietary combination of reduced iso-alpha-acids from hops, rosemary extract and oleanolic acid, in an open-label, 8-week observational trial. Participants (N = 54) were suffering from osteoarthritis, rheumatoid arthritis and FM pain. They were given 440 mg TID for 4 weeks. During the last 4 weeks of the study, the dose was increased to 880 mg twice daily (BID) for the majority of patients. Outcomes were measured using a VAS for pain and associated specific condition symptoms. Arthritic subjects (40% - 50%) showed a statistically significant decrease in pain ($p < 0.0001$; Wilcoxon-ranked sums) and AIMS2 ($P < 0.0001$) with no serious side effects. Unfortunately, FM subjects did not significantly improve.

Osborn, Barlas, Baxter, and Barlow (2001) conducted a survey of current practice among aromatherapists in the UK to determine the management of rheumatic disease symptoms using EOs. The overall response rate was 54% ($n = 269$) and 48% ($n = 240$) were currently practicing AT; 95% ($n = 229$) were females with a mean age of 42.9 years (SD = 9.51). The mean duration of AT practice was 4.2 years (SD = 3.1). The most frequently addressed symptom was stress (74% of $n = 178$ respondents). Lavender (*Lavandula angustifolia*) and rosemary (*Rosmarinus officinalis*) were the EOs used for painful joints. Stiffness was treated with Rosemary (*Rosmarinus officinalis*) and marjoram (*Origanum marjorana*). Joint inflammation was treated with German chamomile (*Chamomilla recutita*) and Roman chamomile (*Anthemis nobilis*). Pain was treated with lavender (*Lavandula angustifolia*) and Roman chamomile (*Anthemis nobilis*). Depression symptoms were treated with bergamot (*Citrus bergamia*) and (*Rosa damascena*). Anxiety symptoms were treated with lavender (*Lavandula angustifolia*) and

frankincense (*Boswellia carterii*). Finally, fatigue was usually treated with rosemary (*Rosmarinus officinalis*) and lemon (*Citrus limonum*).

Lavender (*Lavandula angustifolia*)

Lavender (*Lavandula angustifolia*, [*La*]) was generally regarded as safe (GRAS), but allergies to lavender have occurred (EOPR, 2004). Prashar, Locke and Evans (2004) reported evidence that linalool, a major component of lavender EO, may be cytotoxic to human skin cells. *La*, chiefly composed of linalyl acetate (51%) and linalool (35%), acted as potential irritants; allergenic skin reactions with proposed membrane damage as the possible mechanism of action. Linalool was identified as the active component of *La*. Linalyl acetate cytotoxicity was higher than the oil, suggesting suppression of its activity by an unknown factor in the oil. Linalool and linalyl acetate were rapidly detected and absorbed into skin after a massage, reaching peak levels after 19 minutes (Jager, et al. 1992).

Battaglia (2003) identified the therapeutic actions of *La* as: analgesic, anticonvulsive, antispasmodic, antidepressant, antispasmodic, antimicrobial, carminative, decongestant, deodorant, diuretic, emmenagogue, hypotensive, nervine, and sedative. Recent research has added even more categories to this list.

Analgesic Properties

Lavender EO has been studied for pain relief; relaxation with anti-inflammatory and cell regenerating properties. It has been applied neat or undiluted to the skin (Enteen, 2005). Several studies have demonstrated *La*'s abilities to alter pain perceptions. Kim, Wajda, Cuff, Serota, Schlame, and Axelrod, et al. (2006) reported a RCT study of 50 patients' post-operative (postop) course after undergoing breast biopsy surgery. The

control group ($n = 25$) received standard postop care, supplemental oxygen (O_2) through a face mask, while the experimental group ($n = 25$) was given 2 drops of 2% *La* through a face mask postop with the oxygen. Outcomes did not significantly affect pain scores, narcotic requirements or recovery discharge times, but those with *La* reported a higher satisfaction rate with pain management than the control group ($p = 0.0001$).

A gender balanced, randomized crossover design using pretest/posttest VAS measurements on 13 men and women evaluated results on physical parameters after separate inhalation treatments of lavender, rosemary, and distilled water. Aromatherapy did not elicit a direct analgesic effect, but altered the affective appraisal of the experience and subsequent retrospective treatment evaluations of pain (Gedney, Glover, & Fillingim, 2004).

Anesthetic Properties

Rabbit conjunctival reflex tests were completed with *La*, linalyl acetate and linalool. *La* was administered into the conjunctival sac. A dose-dependent increase in the number of stimuli necessary to provoke the reflex resulted. This supported in vivo local anesthetic activity (Ghelardini, Galeotti, Salvatore, & Mazzanti, 1999).

Antispasmodic Properties

La has been used to relieve muscle spasm, sprain, strain, cramp, contracture and rheumatic pain. Too much lavender, however, can be as stimulating as a cup of espresso (Enteen, 2005).

Sedative and Anticonvulsant Properties

Lavender's sedative effects compare to valium (Buckle, 2000). Harris (2008) reports *La*'s gamma-aminobutyric acid (GABA) activity, similar to benzodiazepine. *La*

is also an inhibitor of glutamatergic transmission in the brain with comparative effect to the barbiturate phenobarbital thus supporting sedative, hypnotic and anticonvulsant properties (Harris). Concomitant use with drugs that act on GABA or glutamate neurotransmitters might compete at the ligand binding sites or enhance sedation (Harris). Interaction probably depends on the administration route and absorbed dose.

Inhaled *La* significantly slowed activity in mice related to exposure time (Buchbauer, Jirovetz, Jager, Dietrich, & Plank, 1991). Mice fed a 1.6% dilution of *La* significantly increased sedative effects of pentobarbital by increasing sleep time (Guillemain, Rousseau, & Delaveau, 1989). Other in vivo animal studies suggested that *La* had anticonvulsive, sedative, and antispasmodic activities (Gilani, Aziz, Khan, Shaheen, Siddiqui, & Herzig (2000).

Effects on Sleep

Lavender is a CNS sedative relieving HA, nervous tension, and insomnia (Enteen, 2005). It helps balance mood swings (Enteen). Lavender is also useful as a nocturnal sedative in elderly patients (Hudson, 1996).

Masago, Matsuda, Kikuchi, Miyazaki, Iwanaga, & Harada, et al. (2000) reported changes on an electroencephalogram (EEG). Parietal and posterior temporal EEG regions demonstrated significant decrease in alpha 1 (8-10 Hz) soon after the onset of *La* inhalation ($p < 0.01$). There may be a correlation between alpha 1 activity and subjective evaluation.

Olfactory stimulus sleep effects were studied on 31 healthy sleepers of 18 – 30 years of age. They completed 3 consecutive overnight sessions in a sleep lab experiencing an intermittent presentation of 2 minutes of the *La* with 10 minute intervals

or distilled water. Polysomnographic sleep and self-rated sleepiness and mood data were collected. Lavender increased the percentage of slow-wave sleep (SWS) in men and women. All subjects reported higher morning vigor after lavender exposure, corroborating the SWS increase. Females showed increased stage 2 (light) sleep, and decreased rapid eye movement (REM) and time taken to wake after first falling asleep in females ($n = 15$) with opposite effects in males ($n = 16$) (Goel, Kim, & Lao, 2005).

Anti-Stress and Anxiolytic Properties

Lavender EO sachets reduced test-taking stress in graduate nursing students as evidenced by lower scores on test anxiety measure, personal statements, and pulse rates (McCaffrey, Thomas, & Kinzelman, 2009). Inhalation of lavender for 3 minutes increased alpha power of an EEG as anxiety decreased bringing about a comfortable feeling and a better mood (Diego, Jones, Field, Hernandez-Reif, Schanberg, & Kuhn, et al., 1998; Masago, et al., 2000).

Ambient lavender reduced anxiety and improved mood in patients waiting for dental treatment. The sample consisted of 200 patients with equal gender distribution. Ages ranged between 18 and 77 years (Lehrner, Marwinski, Lehr, Deecke, & Deecke, 2005).

Fourteen female chronic hemodialysis patients were studied for mood and anxiety using lavender aroma. Effects were measured using the Hamilton scale for depression (HAMD) and the Hamilton scale for anxiety (HAMA). Lavender EO was not found to significantly decrease depression, but significantly decreased mean scores for anxiety as measured by HAMA (Itai, Amayasu, Kurigbayashi, Kawamura, Okada, Momose, et al., 2000).

Parasympathetic Properties

Lavender is a tonic to the cardiovascular and gastrointestinal (GI) systems. It lowers blood pressure (Enteen, 2005). A 10 minute, hot *La* foot bath appeared to be associated with small, but significant changes in autonomic activity (Saeki, 2003). *La* produced an increased finger-tip blood flow, decreased galvanic skin resistance and systolic blood pressure (Satoko & Yuka, 2000).

Anti-Allergenic Properties

Cell-mediated immediate-type allergic reactions were tested by putting lavender EO on and under the skin of mice. Allergic reactions by mast-cell degranulation were inhibited (Kin & Cho, 1999).

Antimicrobial Properties

Nelson (1997) reported that *La* was effective against 15 strains of methicillin resistant *Staphylococcus aureus* (MRSA) and 5 strains of vancomycin resistant enterococcus (VRE). Effective dilutions were one lower than tea tree.

Lavender shows fungistatic and fungicidal activity against *Candida albican* strains. Lower concentrations inhibit germ tube formation and hyphal elongations and may reduce fungal progression or spread of infection (D'Auria, Tecca, Strippoli, Salvatore, Battinelli, & Mazzanti, 2005).

Antimutagenic Properties

Reports of mutagenic and antimutagenic properties are now surfacing for EOs. Lavender shows promising antimutagenic properties on bacterial strains of *Salmonella typhimurium* and *Escherichia coli* (Evandri, Batinelli, Daniele, Mastrangelo, Boile, & Mazzanti, 2005).

Anti-Agitation Properties

Multiple studies conducted to control agitation associated with dementia concluded that Lavender may relieve dementia's agitation (Holmes, Hopkins, Hensford, MacLaughlin, Wilkinson, & Rosenvinge (2002). Patients with severe dementia in a LTC unit were recruited for a study with EOs. A communal area for 15 patients was diffused with 2% lavender oil steam for 2 hour periods alternating with placebo (water) for 10 treatments every other day. Results showed that agitated behavior significantly improved for 9 patients (60%); 5 patients (33%) showed no change; 1 patient (7%) became worse during aromatherapy compared to placebo (Holmes, et al.).

Cross-over studies of randomized trials for Chinese older adults with dementia using lavender inhalation tested with Chinese versions of Cohen-Mansfield Agitation Inventory (CCMAI) and Neuropsychiatric Inventory (CNPI) showed significant decreases after receiving lavender. CCMAI total scores decreased from 14.68-17.77 ($t=10.79$, $df = 69$, $p \leq 0.001$). The CNPI scores changed from 63.17 (SD = 17.81) to 58.77 (SD = 16.74); ($t = 14.59$, $df = 69$, $p < 0.001$). There was no period or sequential effects noted. Lavender was effective as an adjunctive therapy to alleviate agitated behaviors in Chinese patients with dementia (Lin, Chan, Ng, & Lam, 2007).

Anticoagulant Properties

Ballabeni, Tognolini, Chiavarini, Impicciatore, Bruni, Bianchi, et al., 2004 reported initial in vitro evidence that lavender's synergistic components had effects of antiplatelet/antithrombotic properties. The coumarins in lavender helped thin blood (Enteen, 2005).

*Basil (*Ocimum basilicum*)*

Basil is an aromatic, medicinal plant used in ancient Indian medicine for ailments such as muscle cramps, pain, insecticidal, anti-ulcer, anti-inflammatory, diabetes and respiratory tract problems (Abas, Lajis, Israf, Khozirah, & Kalsom, 2006; Chaha, Eze, Emuelosi, & Esimone, 2006; Keita, Vincent, Schmidt, Arnason, & Belanger, 2001; McClatchey, 1996; Pushpangadan & Sobti, 1977). Basil EO is GRAS (EOPR, 2004) and demonstrates strong bactericidal properties against *Aeromonas hydrophilia* and *Pseudomonas fluorescens* (Wan, Wilcock, & Coventry, 1998).

Anti-Inflammatory Properties

Basil is an anti-inflammatory, antimicrobial, antispasmodic EO that relaxes muscles (EOPR, 2004). Basil is an external analgesic in massage oil formulas to ease tension in muscles and tendons (Rose, 2006). Dwivedi, Rahul, and Chaturvedi (2010) recommend basil for muscular pain, colds, depression, and fatigue.

Singh (1999) reported anti-inflammatory activity in rats using basil EO. Mice and rat models showed that basil EO showed antinociceptive effects, antibacterial effects against multidrug resistance, and anti-ulcer properties (Opalchenovaa & Obreshkovab, 2003; Rabelo, Souza, Soares, Miranda, Matos, & Criddle, 2003; Singh).

An anti-inflammatory activity of crude extracts of *Ocimum basilicum* using peripheral blood mononuclear cells (PBMC) of healthy individuals showed a significant inhibitory effect (78% of crude methanolic extract at 30 µg/mL) on proliferative response of PBMC in mitogenic lymphocyte proliferation assays. Basil down-regulated proinflammatory cytokines like tumor necrosis factor- α (TNF- α), Interleukin-1 β (IL-1 β) and Interleukin-2 (IL-2). Basil also suppressed the induction of inducible nitric oxide synthase (iNOS) and subsequent production of nitric oxide (NO). Results showed that basil

methanolic extract inhibits key proinflammatory cytokines; mediators, and accounts for anti-inflammatory effect (Selvakkumar, Gayathri, Vinaykumar, Lakshmi, & Balakrishnan, 2007).

Peppermint (Mentha x piperita)

Peppermint is a perennial flowering member of the mint family (Schelz, Hohmann, & Molnar, 2010) extracted from the plant's stems, leaves and flowers (Kligler & Chaudhary, 2007). Peppermint EO is GRAS (EOPR, 2004); a carminative (Sego, 2008).

Current use of peppermint EO had roots in Ancient Greece. It was used as an internal medicine for digestive aid, management of gallbladder disease, treatment of upper respiratory diseases and coughs (Schelz, et al, 2010).

Kligler and Chaudhary (2007) reported that peppermint oil was well tolerated in common doses, but may cause significant adverse effects at higher doses. Full-doses were not recommended for patients with hiatal hernia, severe gastroesophageal reflux, gallbladder disorders, pregnant or lactating women (Kligler & Chaudhary). Common side effects were topical allergic dermatitis associated to menthol sensitivity which resolves with cessation, chronic urticaria 'hot flashes' and GI irritation (Sego, 2008; Woolf, 1999).

Antispasmodic Properties

Active ingredients in peppermint EO include menthol, menthone, cineol, and other volatile oils (Blumenthal, 2000). Menthol is commonly seen in OTC topical products for respiratory congestion, HA and muscle pain. Peppermint is effective in relaxing GI smooth muscle, possibly through calcium channel blocking on a local level in

the gut resulting in smooth muscle relaxation (Hills & Aaronson, 1991; Micklefield, Greving, & May, 2000; Schelz, et al., 2010; Taylor, Luscombe, & Duthie, 1983, 1984). It also relaxes the lower esophageal sphincter, which can result in gastroesophageal reflux (Brinker, 1998). Peppermint seems to alleviate symptoms in functional somatic disorders like IBS, FM, and chronic fatigue syndrome, (Grigoleit & Grigoleit, 2005; Logan & Beaulne, 2002).

Peppermint EO has inconsistent or limited-quality patient-oriented evidence as a safe alternative for reducing symptoms of irritable bowel syndrome (IBS) with enteric-coated peppermint oil (Lawson, Knight, Tran, Walker, Roberts-Thompson, 1988; Logan & Beaulne, 2002; Spanier, Howden, & Jones, 2003). Peppermint has also been used for non-ulcer dyspepsia; relieving some IBS symptoms (Pittler & Ernst, 1998). In combination with caraway oil, peppermint EO has been used for reducing symptoms of non-ulcer dyspepsia (Holtmann, Haag, Adam, Funk, Wieland, & Heydenreich, 2003; Madisch, Holtmann, Mayr, Vinson, & Hotz, 2004).

Analgesic Properties

Topical applications of peppermint EO are claimed to effectively treat tension HAs (Göbel, Fresenius, Heinze, Dworschak, & Soyka, 1996; Kligler & Chaudhary, 2007). Several research studies support this claim.

Göbel, Schmidt, and Soyka (1994) studied 32 healthy subjects in a double-blind crossover, placebo-controlled, randomized trial. Eucalyptus, peppermint and ethanol were tested in 4 preparations. Combinations of eucalyptus, peppermint and ethanol increased cognitive performance with muscle and mental relaxing effects, but little influence on pain. There was a significant decrease in HAs with peppermint and ethanol.

Göbel, Fresenius, and Heinze (1996) studied local applications of 10% peppermint EO to test effects on 164 tension HAs in 41 people between the ages of 18 and 65 years. A double-blind, crossover, placebo-controlled, randomized trial was completed measuring pain recorded in a self-reported diary log. Results were significant and equal to the efficacy of acetaminophen 1 gram ($p < .01$). Peppermint significantly decreased pain after 15 minutes compared to the placebo ($p < .01$) which continued over a one hour observation period.

Peppermint enhances the effects of other EOs. It has analgesic and antimicrobial properties, stimulates circulation and cools inflamed tissue (EOPR, 2004).

Antimicrobial, Antiemetic, and Anti-Allergenic Properties

In vitro, peppermint was effective against 15 strains of MRSA; 5 strains of VRE at one dilution lower than tea tree (Nelson, 1997). Peppermint decreased postop nausea with less traditional use of antiemetics (Tate, 1997). Six flavonoid glycosides have been identified in peppermint EO, compound 4 showing a potent inhibitory effect on histamine release induced by antigen-antibody reactions in rats (Inoue, Sugimoto, Masuda, Kamei, 2001).

Tea Tree (Melaleuca alternifolia)

Australian tea tree (*Melaleuca alternifolia*, [Ma]) grows in the low swampy coast of New South Wales in Australia; it does not grow naturally outside Australia. Originally, the plant was used by aboriginals for coughs and colds (Schelz, et al., 2010).

Antimicrobial Properties

Tea tree oil (Ma), is a broad-spectrum antimicrobial agent, (Messenger, Hammer, Carsen, & Riley, 2005; Papadopoulos, Carson, Hammer, & Riley, 2006; Schelz, et al.,

2010) with strong antibacterial activity against periodontopathic and cariogenic bacteria (Takarada, Kimizuka, Takahashi, Honma, Okuda & Kato, 2004). *Ma* efficiently killed *Staphylococcus aureus* in the stationary growth phase and with biofilms (Kwieciński, Eick, & Wójcik, 2008). In vitro, *Ma* was potent against 15 strains of MRSA and 5 strains of VRE (Nelson, 1997).

Ma demonstrated inhibitory and fungicidal activity (Hammer, Carson, & Riley, 2000, 2002). Components showing the most fungicidal activity with minimum inhibitory concentrations (mic) were terpinen-4-ol, α -terpineol, linalool, α -pinene and β -pinene, followed by 1.8-cineole (Hammer, Carson, Riley, 2003).

Eucalyptus (Eucalyptus globulus)

Eucalyptus globulus Labill. (*Myrtaceae*) EO is rich in cineole and obtained through steam distillation of the leaves (Arctander, 1960; Garg, 2005). *Eucalyptus* is rapidly absorbed. The active ingredient, eucalyptol, is made of 1.8 cineole plus tannins; capable of hepatic microsomal induction that may affect the metabolism of other drugs and chemicals. The cineole-monoterpenol synergy found in EO treats viral pathologies of the respiratory tract (Baudoux, 2005). This synergy can be found in many EOs that come from trees of the *Myrtaceae* family, like *eucalyptus*.

"*Eucalyptus globulus* is an Approved Herb used for catarrhs of the respiratory tract (internal and external application) and externally for rheumatic complaints" with actions listed as "secretomotor, expectorant, mildly antispasmodic and mild local hyperaemic" (Lis-Balchin, 2006, p. 185). The rich cineole creates antibacterial, antifungal, antiviral, anticatarrhal, mucolytic, expectorant and antidepressant properties (Garg, 2005) and can also act as a decongestant and stimulant (Dwivedi, et al., 2010).

Lis-Bachin reports a wide range of use for *Eucalyptus globulus* (*E. globulus*) including decongestion, asthma, bronchitis, and emphysema (with infection), catarrh coughs, whooping coughs, tuberculosis, tonsillitis, sinusitis, nose, ear, and throat infections.

Eucalyptus EOs are ingredients in inhalants, liniments, and Vicks® ointment for respiratory and muscular problems (Garg, 2005). Eucalyptus EO products for rhinitis and chronic associated symptoms are usually OTC; not regulated by the Federal Drug Administration (FDA).

Lis-Balchin (2006) reports that *E. globulus* and *Eucalyptus radiata* (*E. radiata*) tested at 10% showed nil effect on irritation and sensitization, though hypersensitivity for *E. globulus* has been reported. There has been no phototoxicity reported (Lis-Balchin). External applications on humans is considered generally non-sensitizing, non-toxic, and non-phototoxic (Tisserand & Balacs, 1995). "Undiluted eucalyptus oil is toxic and should and should not be taken internally" (Lis-Balchin, p. 186).

Neurotoxicity is reported especially with oral ingestion/aspiration including miosis, weakness, headache, ataxia, seizures, coma and death (Melis, Bochner, & Janssens, 1989; Spoerke, Vanderberg, Smolinske, Kulig, & Rumack, 1989). Toxicity and complications are more frequently reported in children (Woolf, 1999).

Research Studies

Ciliary beat frequency (CBF) of nasal mucosa *in vivo* was tested using sesame, soy, peanut, thyme, lavender, eucalyptus oils and menthol at 0.2% and 2% concentrations (Nehr, et al., 2008). Thyme oil was ineffective, peanut oil was the strongest and all other oils resulted in an increased CBF strongest at the 0.2% concentration (Nehr, et al.).

Galdi, Perfetti, Calcagno, Marcotulli, & Moscato (2003) reported a case study of a

30 year old woman with asthma and rhinoconjunctivitis with exacerbated asthma from exposure to eucalyptus pollens while camping and by ingestion of an infusion containing eucalyptus. The composition of the eucalyptus infusion was not specified. Juergens (2001) proposed eucalyptus oil to treat bronchial asthma and respiratory diseases. Eucalyptus was also reported as an etiology to urticaria (Vidal & Calbeza, 1992), contact dermatitis and airborne contact dermatitis (Schaller & Korting, 1995). Minero and Fernandez-Mensaue (1994) consider eucalyptus pollens a potential cause of allergy.

Burkhard, Darben, Cominos, and Lee (1998) reported that a 6 year old girl developed slurred speech and muscle weakness becoming unconscious when eucalyptus oil was rubbed on much of her body for an itch rash. Once the ointment was removed, she recovered without long term sequelae.

Essential Oil Literature Review Summary

EOs have been used throughout ancient times for medicinal properties. *La*, basil, and peppermint EOs have been GRAS. Allergies have been reported with EO use.

Lavender, a universal EO, has been researched most extensively with reports of sedative qualities from GABA activity similar to benzodiazepine. *La* has demonstrated anxiolytic, anti-stress, antidepressant, anti-conflict, and anti-agitation properties. Lavender has altered the perceptions of pain. Several studies have demonstrated effects on EEG patterns and sleep facilitation. Other reports have shown antimicrobial properties against MRSA, VRE and *Candida albicans*. Lavender also has demonstrated antimutagenic properties. Another study has demonstrated anticoagulation properties.

Basil is an antispasmodic, anti-inflammatory EO which acts as an antinociceptive agent. Basil down-regulates proinflammatory cytokines and is used for sore muscles.

Peppermint, another universal EO, relaxes smooth muscles in the GI system. It also relaxes the lower esophageal sphincter. Studies show significant efficacy in analgesic properties at 10% concentrations equal to acetaminophen one gram. Also, peppermint shows antimicrobial, antiemetic, anti-allergenic properties, and for upper respiratory infections.

Tee tree is a powerful, broad antimicrobial agent. It effectively inhibits MRSA and VRE in low concentrations. Tee tree also has strong fungicidal properties.

Eucalyptus supports the upper respiratory system. It is a mucolytic, decongestant and expectorant. Eucalyptus properties include antiviral, antibacterial and antifungal.

Critique of Essential Oils, Research Findings

Inconsistent research designs and methodologies made EO study results difficult to evaluate and validate, perhaps contributing to failed outcomes. Many studies were unclear about EO species, therapeutic grades, dose or percentages administered to interpret accurate results. Studies working with multiple oils failed to establish clear individual responses to EOs. Small sampled numbers contributed to insufficient power needed to attain statistically significant results. Scientific thought places a great value on the randomized clinical trial (RCT); authorities state that RCTs are desirable in CAM therapy studies (Ernst, 2002). Yet, multicentered, double-blinded, longitudinal RCTs with meta-analysis rarely, if ever, were found to establish credible treatment options in a western allopathic society.

Conclusion

Given the current state of scientific knowledge regarding the use of essential oils, it was appropriate to undertake a descriptive and contextual approach in the examination

of their use in such a complex entity as fibromyalgia. This study was designed to meet the critical need for an enriched understanding of the context in which individuals perform self-care using essential oils for fibromyalgia.

Chapter three, methods, describes the research plan for this CSR approach. It goes into more detail on research design and data collection procedures.

Chapter 3 Methods

A single, case study best answers the questions of ‘how’ and ‘why’ an individual uses EOs to manage chronic symptoms as well as the outcomes of their use. Chapter 3 includes: 1) research purpose and questions; 2) research design; 3) setting and sample; 4) units of analysis; 5) data collection procedures; 6) data management and analysis; and 7) strengths and limitations of the proposed study.

Research Purpose and Questions

This feasibility study used the single case study research (CSR) embedded method developed by Yin (2009). The overall purpose of this evaluative, descriptive research was to explore proposed causal links in the self-care (SC) use of essential oils (EOs) over several years to mitigate chronic symptoms associated with fibromyalgia (FM) within context reality.

The specific aims of this single, embedded CSR was to explore ‘how’ and ‘why’ the informant, who suffered from FM, chose to initiate self-care (SC) with essential oils (EOs) and continue this regimen over several years. This study addressed the following questions:

1. How and why did the informant use essential oils in self-care?
2. How and why did the informant self-manage chronic symptoms of fibromyalgia using other aspects of integrative medicine besides essential oils?
3. How and why did essential oil self-management intervention help the informant maintain function and activities of daily living?
4. How did the informant integrate self-care management with essential oils, their

use, effects, and outcomes into the context of her daily life?

Research Design

This was an indepth, single case, embedded, research design. "A single-case study is analogous to a single experiment, and many of the same conditions that justify a single experiment also justify a single-case study" (Yin, 2009, p. 47). Yin cited 5 rationales to conduct a single case study. The chosen unit of analysis, an individual informant with a chronic condition of FM, met two of these 5 rationales.

First, this research study represented an extreme or unique case (Yin, 2009). Women experiencing FM used varied treatments simultaneously with fluctuating effects. Literature reviews did not, however, reveal information related to continuous and prolonged self-administration of EOs or the reality context of their use on chronic symptoms associated with FM. The majority of *in vivo* research studies failed to identify the specific EO's name, dose, frequency, and/or duration of use to reproduce reported outcomes. This case study presented an opportunity to report indepth information on the SC use of EOs within the lived context of chronic illness associated symptoms, self-management interventions (SMI), and outcomes.

Secondly, this study represented a *revelatory* case or a rare study opportunity (Yin, 2009). This researcher observed and analyzed the use of EOs as a SC phenomenon and their implementation into a self-care management (SCM) program for chronic symptoms associated with FM. The reliable informant was known to the researcher. The EOs used were medicinal grade with good purity and quality. This provided an extremely rare opportunity to analyze outcomes of these EOs used for SCM of chronic symptoms.

Single Case Study Analysis

The researcher collected relevant data to study the global phenomenon of SC intervention/SM within the informant's lived experience of the chronic symptoms of FM. Analyzed data included an indepth, qualitative informant interview, the informant's medical records, literature reviews, and Likert visual analog scale (VAS) using a zero (lowest point) to 10 (highest point) that measured symptom severities, functional impact, and the efficacy of EOs. Thus, the investigator collected and analyzed descriptive, quantitative, and qualitative data.

Setting and Sample

The case unit of analysis was an economically self-supporting, single 56 year old female. Sandi was a public high school math teacher who lived with a dog in a single level home. She used medicinal grade EOs for several years as a component of her SC interventions (SCI) and SM program for FM. The informant's behaviors, self-agency, and perceptions of using self-applied EOs to control chronic symptoms for health and well-being constituted the phenomenon of study.

Measures

Four Likert VASs (0 = lowest score; 10 = highest score) collected information. The Chronic Symptom Frequency (Appendix D), Chronic Symptom Severity (Appendix E) and EO Efficacy (Appendix G) Scales consisted of the same 29 questions based on literature findings. The Function and Activities of Daily Living Scale (Appendix F) originally consisted of 25 questions, but one was inadvertently repeated. Therefore, this scale consisted of 24 items. The informant needed clarification of directions on the severity scale and a 30 minute intermission between the second and third VAS completion. Additional brief comments were added by the informant at her discretion

under the VAS statements in the Chronic Symptom Frequency Scale and the Essential Oil Efficacy Scale. This additional information was analyzed for clarity and indepth comprehension of the VAS data. The VAS data collection was completed on 02/26/11.

The indepth, audiotaped interview occurred on 02/27/11 per informant's request in her home setting. The interview time totaled approximately 110 minutes answering questions on how the informant used EOs for the SCM of chronic FM symptoms. Questions (Appendix H) and interview information were grouped into the inception of SC practice, SC practice: midpoint, and the currently lived SC experience to understand the use of EOs within the lived context of FM and the evolution of SCM.

Eleven rheumatology visits were analyzed for FM diagnosis, symptom clusters and treatment approaches. The informant's medical history and comorbidities informed findings. Medical records were analyzed for FM symptom clusters, treatments, and medical recommendations. Per Sandi, the rheumatologist requested results of this study in the hope of helping other FM patients. Rheumatology records were dated from October of 2006 through November of 2010.

Research field notes maintained and documented communications with the informant before, during and after data collection. They noted method deviation(s), study revisions, reflections/insights, and/or future CSR design recommendations. Field notes clarified data and chains of evidence.

Field observations verified the informant's active lifestyle and the exacerbation of FM symptoms that resulted in functional decline. Observations clarified the integration of EOs and multimodal SCIs into Sandi's daily routine. The researcher observed the storage, applications and outcomes of the use of EOS and other SMI within the lived

experience of FM.

Embedded Units of Analysis

Embedded units provided a complete and thorough data analysis to study the global phenomenon of SCI/SMI within the informant's lived experience. The 3 embedded units of analysis within this case study included chronic FM symptoms, SC and EOs. The literature findings were analyzed within each embedded unit. This also provided detailed perspectives to help establish the CSR's chain of evidence.

Chronic Symptoms of Fibromyalgia

The first embedded unit of analysis was chronic symptoms experienced through Sandi's lived context of FM. This investigation included a literature review identifying common symptoms associated with FM. Data collection from the informant included an indepth qualitative interview as well as quantitative Likert Visual Analog Scales (VASs) to specify and quantify onset, location, duration, characteristics, aggravating, alleviating, relieving, treatments tried, and the severity of each symptom. The informant provided her rheumatologic medical records (MRs) for further data analysis related to symptom clusters. Field notes and observations verified functional declines with symptom exacerbation and triggers.

Self-Care

Chronic symptom SCM was the second embedded unit of analysis. Analysis included a literature review of FM to highlight *in vivo* SC treatment modalities and patterns. Pain intensity and the impact of FM on functional status were the most common variables in FM research (Rooks, 2007). The VAS was typically anchored by extremes of the characteristic being assessed (Rooks). Zero would indicate the absence of pain and

the other anchor would indicate the most pain ever experienced. Other common symptoms assessed with the VAS scale included general fatigue, tiredness upon awakening, sleep, and mood (Burckhardt, et al., 1994). Depression, anxiety, and sleep disorders were addressed independently of FMS symptoms (Rooks).

For this CSR, Likert VASs clarified the informant's self-reported levels of symptom frequency, severity and functional status. An indepth audiotaped informant interview reported integrative management modalities within her lived context. The interview included the informant's self-perceptions of FM; SC processes focused on 'how' and 'why' EOs as SMI were initiated and maintained over several years. Data included the informant's self-perceived efficacy of multimodal treatments utilized individually or in combinations to manage chronic symptoms. Field notes and observations provided further clarification, verification, and enriched understanding of the lived context of SCI/SCM.

Essential Oils

The third embedded unit of analysis was the use of EOs. Data included an extensive literature review, indepth informant interview, EO Efficacy VAS, the researcher's field notes and observations, and the rheumatology MRs. Reports included specific names, mixtures, grades, analysis, and storage methods of the informant's EOs. Collected data included EO doses, mixtures, frequencies, routes, locations, and administration methods. The effects of EOs from the literature review were discussed as well as the informant's self perception of chronic symptom management efficacy. Field notes and observations provided further clarification, verification, and enriched understanding of how EOs were stored, applied and used to treat FM symptoms with

resulting outcomes.

Data Collection Procedures

After obtaining research approval through the University of San Diego's Institutional Review Board (IRB) (Appendix B), the informant verbally consented over the phone to participate in the research study. Written consent (Appendix C) and the initiation of data collection were verbally agreed upon and scheduled for Saturday, 2/26/11 at the informant's private home. Sandi agreed to obtain MRs from the rheumatologist who supported research participation providing MRs without cost.

Informed Consent and Human Confidentiality

The CSR process was discussed with the informant. Possible negative effects were reviewed including fatigue, pain, feelings of sadness and loss during the recollection of the lived context of her diagnosis and chronic symptom management struggles. The informant was told that she could terminate participation in the research protocol at any time, refuse to answer uncomfortable questions; modify the data collection schedule to accommodate her personal physical and/or emotional needs without negative ramifications. After a brief discussion with only process oriented questions and answers (addressed later within this chapter), the researcher obtained written, informed consent including audio taping during the indepth interview. The informant received a copy of the informed consent.

Confidentiality was maintained by using a pseudonym (Sandi) for reporting purposes. Her geographic location was not revealed. The informant understood and accepted the risk that she could still be identified in the single case research design. Data were secured at all times. Only the researcher, transcriptionist, informant and the

researcher's dissertation chairperson had access to the data.

Data Collection Study Protocols

The completion of all Likert VAS forms, an audiotaped indepth interview and field observations were mutually agreed upon and completed at the informant's private home setting to maintain her comfort and confidentiality. Sandi requested that the Likert VAS use 0.5 increment intervals so that she could more accurately rank her FM symptom frequency, severity, functional status and the efficacy of the EOs. The researcher assented. Also, the informant requested that due to her busy schedules, data collection be completed within the available weekend (2/26/11 – 2/27/11). The researcher assented.

First Research Visit

During the first research session (02/26/11), the investigator explained the study, research confidentiality, addressed any study concerns, and answered the informant's question(s). After this was completed, written, informed consent was obtained. Completion of the Likert VASs occurred in the following order: Chronic Symptom Frequency Scale, Chronic Symptom Severity Scale, Function and ADL Scale, and Essential Oil Efficacy Scale. After the informant completed the Likert VASs, results were reviewed with the informant to ensure thoroughness and clarity. Field notes were maintained and informant comments were documented. Likert reviews were not recorded, but field notes and observations were maintained.

The informant needed a break after the third VAS form was completed due to complaints of right arm, shoulder and neck pain initiated from repetitive writing actions. She also complained of the room feeling "cold" and changed into warmer clothes. After applying 2-3 gtts of basil and peppermint EO neat (direct; undiluted) to these areas for pain management and a cup of tea, Sandi was comfortable to continue data collection.

She requested that the researcher document her answers on the EO Efficacy Scale so that pain would not flare back. The researcher assented.

Post First Research Visit

The researcher analyzed outcomes of Likert VASs using descriptive statistics. Data was analyzed into themes and patterns (Yin, 2009). Field notes were reviewed for further clarification prior to the indepth informant interview. This provided further guidance to additional questions needed to complete the global and comprehensive data collection.

Second Research Visit

The indepth interview was completed the day after the Visual Analog Scales (VAS) instead of a week later per original protocol. During the second research session, which occurred on 02/27/11, the investigator met with Sandi to complete a private, indepth interview (Appendix F). This interview was timed and audiotaped. Questions were asked encompassing the 3 embedded case study units within the chronological time reference of treatment inception, midpoint (approximately one year later), and current SC status. Break times were not needed. Field notes were later recorded to clarify post discussions with the informant.

Post Second Research Visit

After written confidentiality was obtained, audiotaped interactions were transcribed verbatim by a transcriptionist for data analysis. Field notes were analyzed for further research clarification and to provide details. The investigator reviewed transcripts. Copies of transcripts and completed VASs were mailed to the informant for final revisions, edits, and or verification. Verification and clarification of content were

obtained by phone one week after the informant received the data. Final approval of context, meaning and content were obtained by the informant at 2130 on 03/21/11.

Chapter 4 analyzes data and reports the CSR results. Final analysis results construct a linked chain of evidence within embedded units of analysis to answer the ‘how’ and ‘why’ of all original research questions. Global and holistic conclusions summarize the aim of the research study.

Chapter 4 Results

Introduction

The single overall purpose of this evaluative, descriptive research was to explore proposed causal links in the self-care (SC) use of essential oils (EOs) over several years to mitigate chronic symptoms associated with fibromyalgia (FM) within context reality. The specific aims of this single, embedded case study research (CSR) was to explore ‘how’ and ‘why’ the FM informant chose to initiate SC with EOs continuing this regimen for several years. Specifically, this study addressed the following questions:

1. How and why did the informant use essential oils in self-care?
2. How and why did the informant self-manage chronic symptoms of fibromyalgia using other aspects of integrative medicine besides essential oils?
3. How and why did essential oil self-management intervention help the informant maintain function and activities of daily living?
4. How did the informant integrate self-care management with essential oils their use, effects, and outcomes into the context of her daily life?

Sample

The sample for this CSR design was a 56 year old single, self-supporting female Caucasian informant educated at the masters level. Sandi, a public school mathematic high school teacher lived with a dog, never married, or had children. She was well-connected with social support systems, local family members and many friends.

Data Analysis

Data included results of 4 Visual Analog Scales (VAS) scales including brief

comments on 2 of the 4 VAS scales. Medical records (MRs) from Sandi's rheumatologist were analyzed for FM diagnosis, symptom clusters, prescribed pharmacologic and nonpharmacologic interventions. Interview transcripts were analyzed for the inception of self-care (SC) practice, midpoint SC practice, and the currently lived SC experience. To enhance VAS/ interview data analysis, field notes and observations were adjuvant identifiers of the lived SC practice experience/rituals. Literature reviews were analyzed to corroborate findings.

Visual Analog Scales

All VAS consisted of 0 to 10 Likert formats. Per informant's request, scale ratings were adjusted to include 0.5 increments to capture data more accurately. The Chronic Symptom Frequency, Chronic Symptom Severity, and the Essential Oil Efficacy scales consisted of the same 29 items. Significance was attributed to items scored from 7 to 10. Moderate significance was given to those items scored from 4 to 6.5. Mild significance was given to those items scored from 1 to 3.5.

The Function and Activities of Daily Living Scale consisted of 25 items. Inadvertently, "walking" was repeated twice so the final analysis included 24 items. Data were analyzed for significance as previously discussed; consistent with the other scales.

Chronic Symptom Frequency Scale

The Chronic Symptom Frequency Scale was "hard" for the informant; completed in 60 minutes (min). Ten (34.5%) of the 29 research based symptoms were experienced daily (Figure 1). Eight (80%) of these 10 daily symptoms were reported at a significant frequency. The remaining two (20%) daily symptoms were minimal occurrences. The average score for symptoms experienced on a daily basis was significant at 7.25.

The remaining 19 (65.5%) of the 29 FM symptoms were not experienced daily. Based on the informant's comments, 8 (27.6%) out of the 29 symptoms were experienced weekly (Figure 2). Six (20.7%) of the 29 symptoms were reported as monthly occurrences (Figure 3). The remaining symptoms were labeled as "sometimes". Instead of teary eyes, Sandi's had dry eyes "with shooting pains" which were treated as needed (PRN) with moisturizing OTC eye drops.

Figure 1: Daily Symptom Frequency in Fibromyalgia

Figure 2: Weekly Symptom Frequency in Fibromyalgia

Figure 3: Monthly Symptom Frequency in Fibromyalgia

Sinus Congestion

Comments on the Chronic Symptom Frequency VAS added indepth knowledge of etiology, patterns and manifestations. Sinus congestion usually occurred in the late afternoon without identification of precipitating factors, "could be the weather". Every few months, a runny nose lasted "2-3 days". This was not equated to a cold since she "hasn't

had colds as often in the last few years” but “more nasal problems like hay fever and colds before starting essential oils...using more Benadryl™ and Sudafed™ to treat symptoms before” (Field Notes, 2/26/11). The informant “rarely used antihistamines in the last 2 years” (Field notes 03/30/11); received annual flu shots. Sandi felt those years of teaching had “built up an immunity” noting that “new teachers get sick more often”.

Sinus and Muscular Headaches

Field notes (2/26/11) stated that sinus HAs occurred about twice weekly. These presented, as did muscular HAs and neck pain, “later in the day” or evening; probably related to “tiredness and stress”. After school activities made pain worse as did repetitive actions like writing, bending over her desk, using her arms, computers, and grading papers.

Sensitivity to Touch

Increased sensitivity to touch occurred “sometimes in certain places”. Field notes (2/26/11) clarified these as “trigger points: shoulders, knees, and leg tenderness”. Sandi questioned whether she bumped into something, but “there were no black and blue marks”.

Chronic Symptom Severity Scale

The informant completed the Chronic Symptom Severity Scale in 15 min. Sandi needed clarification of directions that modified read “What is the severity of your experience of these symptoms on a daily basis (24 hour)”?. There were no narrative comments written. The informant rated all symptoms whether or not they occurred on a daily basis.

Six (20.7%) of the 29 FM symptoms were reported as moderately severe discomfort to severe, consistent discomfort (Figure 4). Three (50%) of the 6 severe

symptoms (generalized musculoskeletal pain and discomfort; irregular bowel patterns; feeling frustrated because of living with FM) were experienced 80% of the time or more as a daily frequency pattern.

Most, 14 (48.3%) out of 29 of the symptom severity items were rated from bothersome to increasing moderate discomfort plus. Finally, 9 (31 %) of the 29 symptom severities were rated as minimal. The average severity for VAS items was moderately severe, or 4.9.

Figure 4: Severe Symptom Severity in Fibromyalgia

Figure 5: Moderate Symptom Severity in Fibromyalgia: 1

Figure 6: Moderate Symptom Severity in Fibromyalgia: 2

*Teary Eyes omitted on figure (0/10)

Figure 7: Minimal Symptom Severity in Fibromyalgia

Function and Activities of Daily Living

The informant took 10 min to complete this VAS without added comments. Two (8%) of the 24 behaviors severely and/or consistently interfered with function. These behaviors included gardening, doing outside chores, and/or hobbies. Completing repetitive actions resulted in the worse imaginable interference. The majority of behaviors, 14 (58.3%) out of 24 resulted in a bothersome interference to an increasingly moderate interference.

Instrumental activities of daily living (IADL) showed bothersome to severe and/or consistent interference for 16 (43.8%) of 24 behaviors (items 2, 3, 5 - 7, 10, 11, 22-25). Seven (43.7%) of the 24 behaviors showed bothersome to the worse imaginable interference. One third (8) of the 24 behaviors were rated as minimal to no interference in ADL function. The average of the 24 behaviors was 4.7 or moderately severe interferences.

Figure 8: Severe to Moderately-Severe Limitations from Fibromyalgia

Figure 9: Functional Limitations from Fibromyalgia: Moderate

Figure 10: Functional Limitations from Fibromyalgia: Minimal

Essential Oil Efficacy Scale

Prior to the completion of the last VAS form, the Essential Oil Efficacy Scale, Sandi complained of pain in her right arm. She excused herself and left the room to transdermally layer undiluted basil and peppermint EOs on the painful areas. She stated pain was relieved, but did not want to irritate trigger points further through repetitive writing. Sandi requested that the researcher ask EO Efficacy VAS questions, write answers and her comments on the form instead of rescheduling the remaining data collection.

Essential oils (EOs) were routinely used by the informant to treat 12 (41.4%) of the 29 symptoms. Efficacy ranged from 2 to 9. The average efficacy score of these 13 items was 6.04 indicating that EOs produced a moderate plus difference/improvement in FM symptom relief. The informant was unaware that 16 (55.2%) out of the 29 symptoms were associated with FM, therefore, she did not consider the use of EOs to treat these. Hip pain was treated with basil EO initially on 2/25/11 resulting in a 3 out of 10 efficacy result.

Six (50%) of the 12 symptoms that were treated with EOs provided significant relief (see figure 11). Another 5 (41.7%) of the 12 symptoms were moderately effective in relieving FM symptoms using of EOs. The final symptom, heel pain, treated with EOs had an efficacy rating of 2 with a severity rating of 3; experienced in her left foot at the calcaneus and outer lateral aspect a few times a month.

Figure 11: Significant Essential Oil Efficacy on Fibromyalgia Symptoms

Figure 12: Moderate Essential Oil Efficacy on Fibromyalgia Symptoms

Nasal Congestion

The frequency of nasal congestion was experienced by the informant 95% of the time on a daily basis with a moderate discomfort severity. Efficacy depended on the oils used. “Diluted oils take longer than full strength. I put them on every 5 to 10 minutes until desired effect is achieved”. The informant used diluted EOs at school (Appendix J). This was a new SC intervention practiced for 3 week duration.

Sandi uses undiluted EOs applied directly to her skin neat every night before sleeping. “neat essential oils work within one to two minutes” and help her “breath better with less discomfort”. Layering, applying one neat EO at a time, is her “new technique” using tea tree followed by peppermint. She is using eucalyptus (for the past 2 weeks) as her last layered EO. EO efficacy is a significant plus difference/improvement (8 out of 10).

The first drop is applied under her nose so that she can “inhale” the EO; then at the “top of her nares”. Next, “one drop on each side” of her anterior neck is applied to cover her “glands”. Finally, EOs are applied on the pre and sometime post auricular lymph nodes. In the near future, Sandi plans to mix the “respiratory EOs straight” without dilution for use.

Sinus Congestion

Undiluted EOs were applied neat, usually at home, for sinus congestion with a 5.5 efficacy result or slightly more than a moderate difference/improvement. The severity of this symptom was rated 6 and experienced 2 – 3 times per week. “I never feel like I really have full openings in my nasal passages to fill my lungs”. The EOs were diluted in the beginning; “didn’t think I could do it straight”. The informant applied tea tree and

peppermint preauricularly, to forehead and upper chest. “I go where I need to with the oils, wherever I feel I need them, I put them”.

Runny Nose

A runny nose was experienced “about twice a month usually lasting no more than a day – unless I have a cold. Every few months, a runny nose will last about 2 – 3 days, but it does not feel like a cold”. The severity of this symptom was rated 5. EOs “try to control it”. This “takes longer” and the informant often needed to “apply a second dose after blowing her nose several times”. EO “relieves congestion... or stops the production so it doesn’t run”.

Sinus Headaches

The informant treats sinus HAs in conjunction with sinus congestion “about twice a week” with a severity of 5.5. Undiluted EOs applied neat worked faster than tablet medications. “I don’t take other meds, but I have when I need to. The oils work faster. Sometimes I need additional meds for control”. During the past 3 months, she’s taken antihistamines 2 – 3 times; guaifenesin 5 – 6 times. Antihistamine use would increase without EOs.

Muscular Headaches

Muscular HAs were reported 3 – 4 times weekly with a severity of 6.5. EOs were very effective in relieving this FM symptom with efficacy at 8.5 - 9. Basil and peppermint were layered and applied neat; “rarely, lavender to relax”. Symptom was relieved “within one minute”.

Neck Pain

Neck pain occurred several times a week, usually in the afternoon or evening.

The frequency VAS, reported that this was “not severe pain generally”, but the severity VAS rated this symptom as significant at 7.5. The informant had not differentiated between muscular HAs and neck pain radiating up to her head. During the past 3 weeks, undiluted basil, peppermint, and sometimes lavender EOs were used in a layering, neat technique. EOs were used “if it bothers me during the day time, like today” but “not used every night if I don’t need it”. Sometimes she massaged the occiput areas putting pressure on the FM points.

The informant saw a chiropractor prior to the FM diagnosis for a work related fall with limited neck range of motion, back, spinal and neck adjustments. Back pain increased with right hip pain radiation. The informant continued chiropractic treatment approximately every 3 weeks.

Comments on the use of EOs were powerfully descriptive.

If it doesn’t work within a few times or days, why would you continue to use it?
Try something else! Some medications take longer to get effects, like Meloxicam. The oils work faster. You don’t have to wait. Sometimes, they don’t work long enough, so I reapply if I have to. No harm. No foul, they’re natural! Whatever works for me is what I’m going to do! That’s my life and my pain. I’ll treat it the way I want to, my way!

Musculoskeletal Pain and Discomfort

Generalized musculoskeletal (M/S) pain/discomfort was experienced daily, 80% of the time at a significant severity of 7 causing moderately severe discomfort. EOs made a moderate difference or improvement in the relief of this symptom. M/S symptoms challenged daily life and function.

It's all over, generalized. I have to put the oils all over. It's generalized, all over crap! They help, but they don't relieve the whole thing like they do in specific locations/areas. It's the nature of the beast! Generalized is harder to treat even with meloxicam. Then it's time to scale down, not vacuum, or garden. I have to scale back activities.

Increased Sensitivity to Touch

Increased sensitivity to touch on FM points at knees and sides of both legs were experienced "sometimes in certain places" at a minimal severity. "Maybe they don't bother me at the same time". Sandi used the diluted FM mix (Appendix I) in transdermal applications. They are "moderately effective, not earth shaking in changes".

Shoulder and/or Upper Back Pain/Discomfort

Shoulder and/or upper back pain/discomfort were experienced 80% of the time on a daily basis with an increasingly moderate discomfort in severity. EOs made more than a significant plus difference or improvement. Shoulder FM points were more problematic involving arms rather than legs. "As a teacher, I'm writing more, carrying books, grading papers; using arm muscles more". Undiluted neat EOs were used in a layering technique "same as the neck"; basil first, peppermint second and lavender as needed for the third step.

Knee Pain

Knee pain occurred a few times a month; experienced as a moderate discomfort. Using diluted, nonspecified EOs, efficacy was rated at 4, more than a minimal difference or improvement.

Heel Pain

Heel pain was experienced at the bottom of her left (L) foot in the morning with generalized achiness a few times a month on a minimal severity scale. Using nonspecified diluted EOs, the informant did not notice much of a difference.

Sleeping Problems

The informant reported sleeping problems 100% of the time on a daily basis with a severity of 5; moderate discomfort. The informant was more comfortable falling asleep in the recliner, but had problems sleeping in her bed; “just too tired to sleep”. Prior to FM, she slept on her stomach or sides, but now has to sleep with 2 pillows on her back from gastric esophageal reflux. Sleep improved after a hot bath with epsom salt and Skin So Soft™. Undiluted neat layers of EOs were used transdermally, basil first followed by peppermint. These 2 EOs were used to treat pain that might keep her awake. A final layer of undiluted lavender EO was used neat to “relax”. The informant did not rate the efficacy of this EO intervention during the data collection. Field notes (3/9/11) reported that the researcher phoned the informant to clarify the EO’s efficacy on sleeping problems. The informant rated efficacy at an 8 providing a significant plus difference of improvement.

Symptoms Not Routinely Treated with Essential Oils

The informant did not have knowledge of all symptoms associated with FM. Trouble concentrating (thinking) “it was just me”. Since jaw pain was rare, she never tried to treat the symptom. Exposures to cold made the informant “feel stiffer, contract more, and feel more tension in the neck/muscles and body”.

Sandi thought she was having cardiac problems, but not that FM could manifest as chest discomfort or heaviness. “Felt heaviness, feels like it skips a beat with shortness

of breath more at hours of sleep while trying to lie down and relax”. She stated this was more of a recent happening since her last rheumatologist visit. Informant was referred to her GP for follow up on this symptom.

EOs were rarely used for lower back pain (LBP). Field notes (3/12/11) commented that Sandi had difficulty reaching her mid/low back to apply EOs. On the EO Efficacy VAS, she usually did not have LBP, but results from the Frequency VAS reported that the symptom occurred 4 to 5 times a week; experienced about 30 % of the time on those days. Often out of alignment, the informant “hurt to walk”. The Severity VAS indicated that LBP was significant at 7 causing moderately severe discomfort. Sometimes she woke up with LBP.

The informant’s hip pain was experienced about 4 times a week; usually 60% to 70% of the time on those days. This pain was severe/consistent discomfort. Sandi first used basil on 2/25/11 for this symptom reporting minimal relief. Peppermint was not added for pain management since she did not associate this symptom with her FM.

Sandi felt her irregular bowel problems were related to the prolonged use (2006-2011) of meloxicam (Mobic™) prescribed by her rheumatologist to treat FM. She knew it was a nonsteroidal anti-inflammatory medication (NSAID) that “affects the stomach”.

Sandi did not know that anxiety was commonly associated with FM, or that you could feel overwhelmed by FM symptoms. She had feelings of anxiety 2 to 3 times a week; over-whelming feelings related to her FM symptoms occurred 5 to 6 times a month. These feelings of anxiety were bothersome. Feeling overwhelmed by these symptoms was scored slightly lower than anxiety at 3.5 or slightly more than a minimal experience. The informant had not used EOs purposively for these symptoms.

Feelings of sadness related to FM were experienced “maybe once a month” as a very minimal experience. Although Sandi did not identify any frequency for suffering from her FM symptoms, she rated the severity equal to her feelings of sadness. The informant had not purposively used EOs for these symptoms.

Living with FM resulted in 100% daily frustration producing a moderately severe discomfort, yet the informant did not know that others with FM experienced this as well. The informant became “frustrated when it impacts what I want to do in life”. The informant had not purposively used EOs for these symptoms.

The informant “sometimes” became angry because of living with FM. Anger was rated as 5.5 or a moderate discomfort.

The oils treat my pain which keeps me from doing what I want to do. Oils help alleviate my pain so I can do what I want to do, when I want to do it. If I can live my life the way I want, I’m not as frustrated and angry. I’m trying to control the pain so I can do what I want in life. Sometimes, I can’t control it all, so I get frustrated, “like I can’t go on the gondolas in Italy.

Visual Analog Scale Summary

The 4 VAS tools were completed per research protocol using 29 symptoms for comparison of frequency, severity, and EO efficacy as a SC intervention. Over 34% (34.5%) of the FM symptoms were experienced daily; 80% of the daily symptoms were reported at significant frequencies; experienced 70% to 100% of the time. Twenty point 7 percent of daily symptoms resulted in moderately severe discomfort to severe, consistent discomfort. Forty-two point 9 percent of the severe symptoms (generalized M/S pain/discomfort, irregular bowel patterns; feeling frustrated because of living with FM)

were experienced daily for 80% of the time.

EOs were routinely used by the informant to treat 12 (41.4%) symptoms. Efficacy ranged from 2 to 9. The average efficacy score was 6.04 indicating that most EOs produced a moderate plus difference/improvement in FM symptom relief. Information was compiled utilizing both diluted and undiluted EOs.

The following table represents FM symptoms in frequency, severity, and the efficacy of EOs.

Table 3 - Visual Analog Scale Results

FM Symptom	Chronic FM Frequency VAS	Chronic FM Severity VAS	Essential Oil Efficacy
Nasal Congestion	9.5	5	8
Sinus Congestion	2-3 x/week	6	5.5
Runny Nose	2 x/month	5	8
Teary Eyes	0, Dry eyes x 3 yrs	0	N/A
Sinus Headaches	2 x/week	5.5	5.5
Muscular Headaches	3-4 x/week	6.5	8.5 – 9.0
Trouble Thinking	Few times a week	6	N/A
Jaw Pain	Once q other month	2	N/A
Neck Pain	Several times a week	7.5	7
Generalized M/S Pain/Discomfort	8, Some days worse than others	7	5
Cold Makes Pain Worse	Sometimes	2	N/A
Body Feels Stiff	1 Morning	5	N/A
Morning Fatigue	7.5	3.5	N/A
Generalized Fatigue	7	4	N/A
↑ Sensitivity to Touch	Sometimes, certain places	3	5
Shoulder and/or Upper Back Pain/Discomfort	8	6	8.5
Chest Pain/Discomfort	2	6	N/A
Lower Back Pain	4-5 x/wk; 30% of day	7	N/A
Hip Pain	4 x/wk, 60%-70% of day	9	*N/A
Knee Pain	Few times/month	5	4
Heel Pain	Few times/month	3	2
Irregular Bowel Problems	9.5	8.5	N/A
Problems Sleeping	10	5	8
Anxiety R/T Symptoms or Diagnosis	2-3 x/week	4	N/A
Overwhelmed by Symptoms	5 – 6 x/month	3.5	N/A
Sadness Living with FM	Maybe once a month	2	N/A
Suffered from FM Symptoms	0	2	N/A
Frustrated Living with FM	10	7	N/A
Angry Living with FM	Sometimes	5.5	N/A

N/A = Sandi did not acknowledge these symptoms within FM symptom clusters.

*N/A = used once with result of 3

Per the informant's narrative comments and researcher's field notes, pre-mixed, diluted EOs were used during work hours to minimize attention and reactions by others in close proximity. Mixed, diluted EOs were chosen to globally treat all FM symptoms rather than carrying multiple, individual EO bottles for each symptom. Applied transdermally in the school setting as needed. They were effective if the informant "catches and treats the symptoms early". Applications repeated every 5 to 10 min until desired effects were achieved. Diluted, mixed batches of EOs "help me get through the day".

Undiluted EOs applied transdermally (neat) were effective within one to 2 min. EOs were more effective in the relief of localized versus systemic pain.

EOs were helpful in establishing a healthier sleep pattern by blocking FM pain. Neat, undiluted, transdermal EO applications of basil were followed by peppermint. Sleep was also aided by an undiluted neat layer of lavender to enhance relaxation. EOs onset of action was faster in FM SC symptom management than oral medication.

Sandi's SC philosophy reflected ownership. FM was "her" disease affecting "her" life. Consequently, treatment options were "her" choice. Sometimes, symptoms were not controlled. Pain and stress kept Sandi from doing what she wanted to do. Essential oils were used effectively to allow "her" life to continue via "her" choices. EOs helped alleviate pain, respiratory symptoms, and sleeping problems. Lavender EO helped her "relax". Sandi felt that using EOs minimized her frustration and anger to live "her" life the way she wanted.

Rheumatologic Medical Records

Eleven rheumatology visits were analyzed. Three visits, including the initial visit and FM diagnosis, occurred in 2006 (2 in October; one late December). Four medical

visits were analyzed in 2007 (February, July, September, and October). One visit was in August of 2008; one visit in February of 2009 and two in 2010 (April and November). Data were analyzed to increase understanding of FM symptom clusters, major/continuing patient complaints and medical recommendations/treatments. A thorough history and physical was reviewed to establish the FM diagnosis of exclusion and baseline status of the informant.

Fibromyalgia Diagnosis

Sandi was referred to the rheumatologist by her general practitioner (GP) for an evaluation of abnormal labs including a positive (+) antinuclear antibody (ANA) with continued muscle and joint pain. The first visit was on 10/16/2006. Diffuse arthralgias, episodic swelling, increasing soreness, erythema and warmth unassociated with movement presented over a 5 month duration. Positive diffuse myalgias of the L perisoulder with pain including the forearm developed. Positive symptoms included: fatigue, LBP (especially lumbar), sleep disturbances (wakes up early); HAs (+ tension, negative (-) migraines, - scotomas, - aura, - nausea/vomiting (N/V). Negative symptoms included: snoring, apnea, fever, chills, nausea, weight loss, sickle cell anemia symptoms [shortness of breath, dizziness, jaundice] oral ulcers, malar rash, abdominal pain, bright red blood per rectum, melena, dysuria, hematuria, or Raynaud's. Complaints of + constipation with alternating loose watery stools w/o recent travel were noted. Difficulty was reported getting up from a kneeling position. There was no specific triggering event. A trial of sulindac (Clinoril™) was helpful with initial symptoms, but resulted in diarrhea.

Family history was + for rheumatologic and celiac disease, - rheumatic arthritis (RA) or systemic lupus erythematosus (SLE); + history of juvenile rheumatic fever.

Sandi had no known drug allergies (NKDA). She was a nonsmoker with + alcohol use and did not exercise regularly.

Current medications were noted as Allegra-D 60-120 mg extended release (ER) one tablet (tab) every (q) 12 hours (hrs) PRN allergic symptoms orally (PO), and carisoprodol (Soma™) 350 mg one tab at hrs of sleep (HS) PO.

Review of systems included vital signs (VS): 122/80 millimeters of mercury, 74 heart rate (HR), 14 respiratory rate (RR), 97.5° temperature, 170 pounds (#). The M/S system revealed back pain/stiffness, calf muscle cramps, localized pain, swelling, & stiffness to ≥ 1 joint; + generalized muscle aches.

The physical exam showed + bouchard's/herbeden's node, + L radial volar aspect ganglion cyst; + FM trigger points: occipitus, trapezius, gluteal, knee and greater trochanteri. Negative symptoms included synovitis, spinous process/perivertebral tenderness to palpation, crepitus, enthesopathy/dactylitis, rash, periungual erythema, sclerodactyl/calcinosis/splinter hemorrhage/subcutaneous nodules; axillary/cervical lymphadenopathy.

Neurologically, the patient had 5/5 motor throughout, deep tendon reflexes 2+ symmetrically, sensation to light touch was intact. She had negative straight leg raises, tinea & phalen tests. Psychologically, the patient's affect was appropriate and normal (nml). She was alert and oriented times 3.

The rheumatologist's assessment included osteoarthritis (OA) of multiple joints, ganglion of the L hand, myalgia, myositis, fatigue and FM. Plans included comprehensive lab work-ups to rule out other diagnoses; Mobic™ (meloxicam) 7.5 mg daily PO as a trial Elavil™ (amitriptyline) 10 mg PO q HS to enhance delta wave sleep; hold sulindac and carisoprodol; consider proton pump inhibitors (PPIs) or histamine 2 (H2)

blockers for gastrointestinal (GI) signs and symptoms (S & S) on Mobic™, calcium 1500 mg daily PO; Vitamin D 400 IU daily PO; gentle aerobic exercise. A repeated ANA was planned at 4 months. All other labs were within normal limit (wnl) including Hepatitis A, B, C, magnesium, phosphorus, complete metabolic panel (CMP), and SLE; work-up; Vitamin D level was 31.

On October 30, 2006, trigger points included + elbow, neck, trapezius, gluteal, knee, and greater trochanteric. Bilateral lower extremity (BLE) knee pain was associated when arising from the chair with + knee crepitus. There was improvement in the sleep disturbance; - HA or weight (WT) gain. Vital signs were stable (VSS). Assessment included vitamin D deficiency, OA of multiple sites, FM, diffuse body aches, and sleep disturbance. After an extensive work-up (w/u), arthralgias were most compatible with (c/w) FM and - for chronic viral infection, immune rheumatologic or celiac disease.

Per rheumatologist, FM required a multidisciplinary approach; the goal was therapeutic care. Recommendations included combining pharmacology treatments for pain, depression, and sleep disturbances with nonpharmacologic approaches including graded aerobic exercise, and the “promotion of self-efficacy for control of pain through self-management”; education on the importance of removing life stressors that could clearly exacerbate or precipitate a flare in symptoms.

Mobic™ 7.5 mg daily PO and Elavil™ 10 mg po q hs were helping with symptom management. Mild vitamin D deficiency was likely secondary to decreased sun exposure so calcium 1200 mg and vitamin D 400 IU daily were prescribed. Gentle aerobic exercise was recommended with removal of stressful events. Education regarding trigger point injections was also given as a treatment option.

Medical Progression

Active problems were identified as FM, fatigue, ganglion of the hand; myalgias, myositis, OA in multiple sites with degenerative joint disease (DJD), and vitamin D deficiency. The hand ganglion never received treatment; was not involved in the FM symptom clusters. A hysterectomy for bleeding fibroids was noted in December 2006 leading to a brief interruption in the use of Mobic™. Most lab results were consistently wnl. Weight and VS were considered. Vitamin D deficiency was continually addressed at each medical visit.

Stress

Throughout the MR, the rheumatologist continued to educate on the importance of stress alleviation. Stressors in the informant's life included her chronically stressful, but stable faculty position, home renovations, and incidents involved with her aging mother living nearby. Sometimes, tension HAs were documented. On the 11/02/2010 medical progress note, the rheumatologist documented that "she is clearly aware of what causes her to flare which is really stress and not getting enough rest".

Vitamin D Deficiency

Vitamin D deficiency was related to insufficient sun exposure. Vitamin D ranges continued to fluctuate during 2006 to 2010; reported at 21.4-34 nanograms (NG)/mL. Normal ranges for vitamin D levels were established at ≥ 30 NG/mL). The rheumatologist continued to adjust vitamin D doses in response to these fluctuating lab results.

Musculoskeletal Symptoms

Musculoskeletal assessments mentioned joint aches in the knees and neck toward the end of the work day on Mobic™ 7.5 mg PO daily. On 12/27/2006, the dose was increased to 15 mg PO daily, remaining the consistent dose. Tylenol™ was used

sparingly with improvement. Pain continued at the end of the day despite the increased dose of Mobic™. Ultram was considered PRN further analgesia (02/06/2007); ordered (7/2/2007) as hydrocodone-acetaminophen 7.5/750 mg, quantity 60 wo refills to take 1 tab q 6 hrs PRN pain). Most recent progress notes documented that the rheumatologist did not want to initiate Cymbalta™, Lyrica™, or Savella™.

Erythrocyte sedimentation rates were intermittently elevated with reported lab values initially at 39 mm/hr to 14 mm/hr on 04/15/2010. C reactive protein was elevated mildly on 04/15/10 at .08 mg/dL; reported as .52 mg/dL on 11/02/2010 indicating the highest level of risk for future cardiovascular events. The plan was to return to clinic in 9 months.

Positive trigger points were noted at the right (R) cervical neck muscles, occipitus, trapezius, elbow, gluteal, greater trochanteric, and knee. Bicipital tendonitis with extensive synovial/bursal inflammation, + R subarachnoid/subachromial bursitis; + pericervical/shoulder muscle tightness was also documented on multiple visits. There was intermittent knee crepitus wo significant knee effusion. Once, the R cervical trigger point was injected with 1 mL NS and 2 mL of 2% lidocaine with epinephrine which was well tolerated, but subsequently refused as a treatment option. A chiropractic order, 02/24/2009, was noted for R bicipital tendonitis with ultrasound, deep tissue massage, electrical stimulation, stretching, an ergonomics evaluation and ice.

Fatigue levels fluctuated as well as responses to diffuse arthralgias. ADLs were not interrupted from 2006-2010. Interference in IADL was noted in the MR as discomforts associated with gardening and driving.

Sleep Disorder

Amitriptyline (Elavil™) remained effective for HS sleep disturbance until discontinued on 09/05/2007. Flexeril™ 10 mg PO q HS was trialed, tolerated with improved fatigue, but discontinued without further explanation per MR.

Gastrointestinal Symptoms

Gastrointestinal (GI) symptoms were noted on the initial visit. Further GI symptoms (9/5/2007) were noted as + burning sensation, + bloating, gassy sensation symptoms epigastric in origin worse in the supine position; improved with Prevacid™. On 04/15/2010, frequent burping was noted with + occurrence at night, + association with acid foods; increased burping with increased stress. On 11/02/10, progress noted documented more reflux symptoms with HS eating or coffee. Tums™ were intermittently taken as a self-initiated intervention. Prevacid™ samples were given for PRN use. Most recent recommendations were for an esophogastroduodenoscopy (EGD) and colonoscopy to rule out chronic gastritis since Mobic™ was taken since 2006. Colonoscopy and EGD were completed on 03/31/11. Per oral report, gastric reflux was from a weakened muscle, no gastric erosion or damage was noted. Recommendations included PPI or H2 blockers.

Complementary Therapies

Medical records did not indicate all of the OTC vitamins that were taken in addition to vitamin D. Records indicated that referrals were made to acupuncture research; to add acai berry supplementation. Chiropractic interventions were previously noted. In the final progress note (11/02/10), the following statements were written: "Of note, she is also on these essential oils that she is putting on topically which has helped her fibromyalgia a lot...she is basically going to continue this as it is helping a lot".

Medical Record Summary

The 56 year old female informant had a history of juvenile rheumatoid arthritis (JRA) with many symptoms of OA with DJD. Medical diagnosis affirmed literature findings that FM was a diagnosis of exclusion. The informant's lab diagnostics identified a vitamin D deficiency, and intermittent inflammatory indicators. She continued to live with symptom clusters of arthralgias, myalgias, myositis, and exacerbations of bicipital tendonitis treated (stable) on Mobic™ 15 mg PO daily.

Consistent with literature, FM was a diagnosis of exclusion and responded to a multimodal approach. Sandi was educated and empowered to control FM symptoms by trying self-care modalities. Approaches included Mobic™ (meloxicam), a NSAID for COX-2 inhibition and a course of Elavil™ (amitryptaline) for sleep. The trusted rheumatologist was supportive of CAM allowing options of SCM with chiropractic interventions, acupuncture research study participation, and support for the use/research of EOs.

The MR confirmed that faculty work was a constant, stable stressor at each office visit along with sleep deficit. The informant knew that lack of sleep and stress were triggers to FM flares. A mutually agreed upon stress management plan was absent from the medical plan, yet key to the control of FM flares.

Indepth Informant Interview

The indepth interview occurred on February 27, 2011 at the informant's residence and lasted one hr and 50 minutes. The interview followed the informant's lived experience with FM through the initial diagnosis through her current lived experience. Information gained was grouped into the inception of self-care practice, midpoint self-care practice, and the currently lived self-care experience.

Inception of Self-Care Experience

The inception of the SC experience captured the beginning journey narrates stage one, or the "*investigative and decision-making phase of self-care*" (Orem, 1985, p. 123). Sandi reflected on self-knowledge and emerging information about FM. Effective SC required self-knowledge and information about environmental conditions. The informant continued to learn about FM. Sandi initiated multimodal self-care management programs hinged on the quest of knowledge and the rheumatologist's support of this integrative treatment approach.

Past Medical History

The informant discussed JRA in the fifth grade with a reoccurrence in the eighth. She had gone to a rheumatologist "about 35 years ago" with joint problems. The informant was unaware that the current rheumatologist had diagnosed her with OA.

FM Diagnosis

Sandi sought medical evaluation from her GP in 2006 for the onset of L shoulder pain radiating to the elbow. She was unable to lift her arm without "excruciating pain". Her knee was also sore. Sandi suspected arthritis; "she was just getting older". Teaching the fall semester made her "tired"; "it's exhausting". She knew something wrong but was "not one to go running to the doctor for every little thing".

Sandi described the FM testing and symptom questioning by a GP. Referral to a rheumatologist was based on initial lab results and medical presentation. Sandi made an appointment; more blood was drawn. The rheumatologist tried to "eliminate the possibilities of what it could be by running tests that would be definitive". As a mathematician, Sandi understood this as a way to diagnose. "It made sense"; was not

upsetting. After lab work ruled out many possibilities, the rheumatologist “felt the different areas”. “There’s 18 points on your body and if 11 or 12 of those are tender to touch, that is an indicator of FM”.

Once the diagnosis was made, the informant focused on control. “I didn’t know much about FM at the time, so that became a learning thing for me”. She wanted to know what FM was and what to do about it. After the rheumatologist’s explanation, “I knew it was a chronic condition; that it wasn’t going away”. Sandi stated that she didn’t feel too badly with the FM label. “If we know what it is, we can deal with it; maybe try to control it”. The doctor gave pain medication for her arm that was already feeling better. “Okay, at least I don’t have that excruciating pain in my arm; I can live and deal with life”.

Trust in the rheumatologist seemed pivotal “from day one”. “I thought she was doing a great job”. Characteristics that seemed to contribute to this trust formation were identified as youth; desire to help; “explained things well; took time with me; genuinely concerned; knew what she was talking about”.

The etiology of FM was unknown. They “don’t know what caused it” but “usually something triggers it”. Sandi denied major emotional triggers or anything other than additional stress of work construction with “cement dust floating around...everyone on edge and stressed”. The Epstein Barr Virus (EBV) was diagnosed over “25 years ago”.

Treatment

Mobic TM was trialed “to see how that would react”. The rheumatologist told Sandi “to get good sleep, otherwise it’s not going to get things under control”. Not sleeping well “was causing part of the problem”. Amitriptyline was prescribed at night

“so that I would sleep better. This was a mild antidepressant”. The informant stated that she didn’t “like to be on drugs...I don’t think of myself as being a depressed person...so that bothered me more then Mobic™”. The rheumatologist explained that it was just a “mild thing to help you sleep”. The informant felt “okay, I’m not going crazy; I’m not going to get into depression”.

Sandi knew Mobic™ was a NSAID used “to control the inflammation involved with fibromyalgia”. The initial dose was trialed at 7.5 mg taken once in the morning. “It was okay, but I was finding that by the early afternoon, I was hurting again”. The rheumatologist instructed Sandi not to take aspirin that could cause “stomach problems”, but to take Tylenol™. “I bought a big bottle of Tylenol™. “I didn’t use it; still don’t”.

During her next 2006 appointment, Mobic™ was increased to 15 mg “working fine and I haven’t had as much trouble. I noticed more indigestion and bowel problems” after Mobic™ was increased, but “not right away”. She needed to be very careful to take the medicine with food.

The informant described an early SCMI after forgetting to take her Mobic™ one morning. A safety routine was established by pouring a glass of water; putting out her vitamins and medicine. “If that glass of water’s still there, I haven’t taken them”. Sandi went home “and sure enough, there it was on the sink because I put it out in the morning”.

Blood work was drawn with “checks in” from the rheumatologist “to make sure everything’s okay”. The informant took supplemental vitamin D as directed by the rheumatologist. A low vitamin D level was a “contributing factor that she wanted to remedy”; important to immunity.

Complementary Alternative Medicine

Sandi discussed that pharmacologic interventions were not all that the rheumatologist had prescribed, but “that’s what she had control over”. Explanations were given about relief through acupuncture; chiropractors. FM was a learning process. “She made me feel like part of the solution” by saying “if you find something that works, let us know because we’re still trying to get a handle on it. They’re just starting to do research on this”. Sandi participated in a FM acupuncture trial though not enthralled with treatments.

Well, I went, I got the needles put in me, sat there for a while with the needles and soothing music...it was kind of relaxing. The needles, every once in awhile, kind of hurt (laughed). I’m not sure to what extent they helped. I’m not sure that really did a lot.

Later, she felt regret. “I’m ashamed to say that I didn’t follow through on the reporting months after it was over”. She contributed this to “filling out forms and sending them back”. Retrospectively, she realized they were trying to determine long term interventional effects. “I don’t know which one (group) I was in”. Treatments were “a week or 2” for “6 to 8 treatments”.

The informant’s philosophy of SC outcomes described individual variance. “I believe that some things help some people, and some things don’t help people. I think everybody’s body is different; how they react is probably different to different things”.

Initial use of EOs occurred in spring of 2007. Sandi’s sister was “into healing touch. I was extremely sore that night and she had some EOs with her”. The sister “put

on some EOs and did healing touch at the same time”. This “seemed to relieve some of the pain. I still was hurting, but it was better”.

Sandi talked to her cousin on the East coast who was “excited to learn that I was trying some”. She felt strongly that EOs were important; “staying away from medicine and using natural things”.

Based on these experiences, EOs were trialed for relief of FM pain. EOs were obtained through her sister. “She mixed up a few of them for me and showed me how to use them; when to use them”. Sandi said she “pretty much” followed instructions. Initially, EOs were not used daily, but “when I felt I needed a little bit more than what my medicine was giving me. They helped; made it a little better. I don’t know that they miraculously took everything”.

Self-Care Practice: Midpoint

Sandi’s choice at the closure of phase one was to continue a multimodal treatment approach to FM, including the use of EOs. This set the goals for stage two or the “*production phase of self-care*” (Orem, 1985, p. 123). This second phase concentrated on operations that occurred after the SC decision allowing engagement in a selected course of SC action. Focus on how and why EOs were continued and integrated into the informant’s lifestyle unfolded. Sandi discussed the effects on functioning, medical treatment regimens and EOs’ effects. Narratives noted changes in SC practices involved with EOs; her overall well-being. Orem’s action phase began with the decision to meet FM SC requisites and demands. Sandi’s plan was to “control” the FM symptoms to maintain her faculty position and enjoy her lifestyle. Sandi’s SC plans required an expenditure of her depleting energy to satisfy demands for FM care. Sustainable effort was deliberate to

achieve specific, favorably perceived outcomes. The attention was on performed actions, and evidence to judge these actions.

Quality of Life

Sandi tried to convey feelings on how this life long chronic disease impacted her quality of life (QOL). “I was not as energetic”. She didn’t want to say “depressed, but it was getting me down that I had to deal with this and that, I wasn’t feeling 100%” or “bumming me out a bit”. She followed statements quickly with how she accepted the FM diagnosis; tried to control consequences. “I continued my life. I did what I could. I mean you live with these things”. She felt signs of improvement by “sleeping better...and getting more rest”.

Treatment

Sandi continued Mobic™ 15 mg; doses of vitamin D. Her rheumatologist continued to monitor lab results to maintain safety. “For some reason, I don’t absorb vitamin D”. She also continued to use large amounts of supplemental vitamins in addition to vitamin D. Sandi continued to see a chiropractor. This helped to keep her body in alignment.

Now, Sandi became aware of sinus problems. It “seems like I’ve had nasal problems for a long time” before FM, but “since my FM, constantly. I hardly ever feel that I can take a big, deep breath through my nose and get my lungs full”. She feels that this is a reason she doesn’t sleep well.

Complementary Alternative Medicine

The informant could not recall when she informed the rheumatologist of her EO use. “Some days were worse than others”. Tylenol™ was taken “in the afternoon or

evening... if I was hurting more”. The rheumatologist asked which EOs were used. The informant asked if there were any contraindications. The rheumatologist answered “no”; asked if they were helping. Sandi responded “I think so”.

Sandi “wasn’t completely sold on it (EOs) at first. I don’t know if it takes a while to get into your system and start to keep things under control, but it seemed not to hurt. It seemed to gradually get better as I used it... what’s the harm”? The informant felt better “knowing it was something natural; that I didn’t have to bump up a medicine dose of drugs”. Choice of treatment was important. Others with FM were taking Lyrica™. Sandi was fearful of this new drug that was initiated by television advertisements detailing side effects and risks associated with use.

I think the EOs added that little extra I probably needed rather than to up the dose again and/or switch medicines. So, I felt that was a good alternative. I could use it when I needed it, not that I had to have it all the time.

Sandi did not use as much EO “as I’m using now; probably used it more on my arms and legs. I don’t remember using it on my neck or shoulders, because at that point, I didn’t think that was a problem. I thought that whatever I felt was from stress, not from FM. So I didn’t think to put it there. I didn’t use it every day”.

The informant controlled the actual implementation of EOs as a SCMI, transdermal application, dose, and frequency. She knew these flammable oils should be protected from sunlight; not ingested and to avoid eye contact.

It was nice to have the control...not worry about using too much or too little, or if it was going to be a problem. I figure as long as it helps and I feel better, I'm not going to worry about it. Why should I?

The informant developed a nightly SC pattern using EOs to get better sleep. Sandi's sister mixed diluted respiratory EOs. "That worked; it helped. I would put some on before bed. It would help me breathe a little better. I could sleep a little better then if I didn't take them. So I continued those".

The informant stated her sister helped decide what to put into mixes and how strong to make them. She "talked to me about what seemed to work; what I felt I needed more for the FM". Sandi purchased bottles of EOs to keep on her bedroom dresser. She started mixing SC oils under her sister's guidance: one for respiratory symptoms; one for FM pain and muscle symptoms. Diluents were 100% olive oil. Dilutions were titrated with different EOs meeting the informant's fluctuating needs for symptom management.

Currently Lived Self-Care Experience

The enduring nature of FM's chronic conditions mandated self-management interventions (SMIs) as an imperative, inevitable, and non-optional behavior (Bodenheimer, et al, 2002; Cross, 2007). Sandi and her rheumatologist used SMIs to create processes and opportunities to increase treatment involvement; bring control and order back into her life (Kralick, et al., 2004; Newman, et al., 2004). Care strategy narratives reflected protracted time frames; clarified patient roles and acceptance of responsibilities (Newman, et al.; WHO, 2002).

The FM illness experience was not manageable through a disease focus. Chronicity mandated heterogenic adaptation within the reality context of Sandi's lived

experienced. Therefore, a variety of techniques managed symptoms and maintained social role normalcy (Larsen, 2009). Self-control opportunities or SM emerged as outcomes of uniquely perceived and processed stressors within the lived context (Delmar, et al., 2006). At the conclusion of the interview, it seemed clear that interventions promoting patient roles in the management of chronic conditions resulted in improved outcomes (WHO, 2002). For Sandi, participation in decision-making and treatment planning increased efficacy and efficiency (Holman & Lorig, 2000). She chose actions that improved her health. Sandi's knowledge, motivation and skills to cope with the lived experience of FM encompassed self-monitoring, effective cognitive, behavioral and emotional responses to maintain QOL (Barlow, et al., 2002).

Treatment

Sandi continued to follow FM care recommendations of her trusted rheumatologist taking Mobic™ at 15 mg daily with increasing GI complaints of lower abdominal cramps, frequent morning stools, looser in consistency, “a little mucous” with bleeding, and hemorrhoids that increased her discomfort. She modified coffee intake, diet choices, and eating patterns. Sandi “self-medicated” using OTC products like Neosporin Ointment™ and hydrocortisone. “I read more labels these days”. She takes a long list of vitamin supplements including titrated vitamin D doses. Lab work remained within ensuring patient safety.

The rheumatologist gave Sandi samples of Prevacid™, but she did not really want to take more drugs for prolonged periods of time. The rheumatologist told Sandi to just take it when she needed it. “So then I did use it one day...and it did help. I still have that option available”. The informant knew not to eat 3 to 4 hrs before HS, yet she liked

bedtime snacks.

Complementary Alternative Medicine

The chiropractor also believed “in managing pain without drugs. He would rather put me back in alignment, and that has helped”. Sandi did not know if the neck pain was from FM or misalignment. Chiropractic treatments kept skeletal alignment. “The chiropractor helps me when I’m hurting...and my hip is causing me to walk differently, putting more pressure on my other knee; I’m walking like an old lady”.

The EOs “sit on my dresser in my bedroom”. They are quickly accessible. Oils are all labeled and “kept in the same position” since she can’t read them without her glasses.

Sandi takes a mix of diluted respiratory EOs to work “because I’m not going to bring several different bottles...this is more convenient”. The informant feels a mix of diluted EOs aren’t “as obvious to people; I don’t bother people” yet “it helps me enough to get me through”. The informant adjusts EOs into a SCMI. “I fit it into my routine...at work. I put it on more often than if I was at home using undiluted EOs. Undiluted would hit more; work faster, quicker”.

In the future, Sandi would mix EOs to bring to school under her sister’s guidance. “I may not dilute them as much”. Jojoba wax would be the diluent rather than olive oil.

At night, the informant applied EOs undiluted, neat and layered. This was the most recent change in her SCMI technique. “It works more effectively; quicker. I feel it makes a difference faster”.

The informant discussed an example of her sister’s communication and resource guidance in the quest for FM symptom management. “I hadn’t been using basil. I was

using a tansy blue which was supposed to be an anti-inflammatory”. The current mixture was not effective. Sandi’s sister said “well, maybe we need to try this, and why don’t you try that”?

One night while talking to her sister, she had neck pain that “was going into a HA. I was hurting”. The sister said “why don’t you go and put this on straight and see what it does”? She stayed on the phone while Sandi tried the intervention. The undiluted basil EO heated up...I don’t know if it relaxed the muscle...or what FM really involves. I do know that it’s an inflammation of the CT that is muscle tendons, whatever connects everything. So maybe the heat from that loosened things up. I don’t know how it stopped the pain, but it helped. Sandi described the layered neat, undiluted transdermal applications on dry skin that absorbs quickly “so they get in right away”. She “put a drop or two of the basil first, then some peppermint, and probably some lavender. I didn’t mix them together”. Using a zero to 10 Likert scale for pain, she described her pre-intervention pain level as 7 (severe and significant) out of 10. Post-intervention, the informant rated her pain as a 1-2 (mild and insignificant). “I was hurting, uptight, and tense. So at least that helped me relax a little bit, I could unwind”. The informant described her pain tolerance. “I can handle a lot of pain, but that helped; I didn’t have to handle a great deal of pain after that. I put some more on before I went to bed that night, too”.

Sandi described several times when she woke up with a HA in the back of her neck. She took meloxicam. “That takes longer to work, but it helped. I think I put some oil on. I don’t think I put very much on, though, because I didn’t want to smell a whole lot when I went to work”. EOs helped before the meloxicam, “but it [HAs] started my

day off badly”.

Narratives supported the use of EOs to decrease or replace allopathic, pharmacological agents. Without the use of EOs, “I’d be taking more Sudafed™ and Benadryl™-type drugs to try and get it (sinus) under control”. Sandi felt she might have also required a stronger drug than meloxicam with the “religious addition of 2-3 Tylenol™ doses in the afternoon” for pain.

Quality of Life

Sandi did not feel that her FM was getting worse or progressing in severity, although “some days, it feels like it’s gotten worse”. She was grateful that she never felt that initial excruciating (10 out of 10) pain again. The informant described her FM pain as soreness, tiredness, an achy thing. When I feel worse, it’s usually in my shoulders and neck; my arms feel weighty, heavy, tired, and sore. It feels like I have to just sit; do nothing because it bothers me to move and lift them to do anything. That’s when it’s the worst; I just sit and do nothing. I veg until I can get things under control again...with the oils.

Function and Activities of Daily Living

Sandi is a dedicated teacher. She does not call in sick. “It’s more stressful for me to take a day off than to go into work and deal with it there”. Sandi attributes this stress to the creation of detailed lesson plans, and substitute planning. Usually, FM does not bother her in the morning, but later in the day “because I’m tired; I’ve overdone something; I’ve worked too hard at something; I’ve dug in my garden too much, or I’ve vacuumed too long”. Repetitive actions trigger it, but sometimes she needs to get things done. Knowing how to pace and what you can do is “all part of it”.

Self-Care Philosophies, Perceptions and Accountability

Sandi feels FM is “all learning. You make choices and live with those choices. They’re my choices”. Sandi’s goal in using EOs is to help manage symptoms that could change her ability to function.

Fear of an unknown chronic disease trajectory was discussed by the informant. “Things have evolved and they will probably continue to evolve. I don’t know if this disease gets worse as time goes on. I have no clue; I don’t know if anybody does”. This scared Sandi.

It’s triggered me more into looking at long-term care (LTC)...I’m going to be getting that kind of insurance because I’m single. I have no offspring. I have no spouse. I have no one to really take care of me later if I need help and I’m not going to become a burden to people I love. If they want to help, that’s fine. That way, if it gets to the point that I need help at home like vacuuming, cleaning, or if I can’t take care of myself, what do they say, 2 out of 3 or 3 out of 5 daily life activities, I will have somebody come in and help me...decisions about my life and my future if things get worse...as you get older, your body changes. You can’t do everything...so you deal with it.

Sandi spends money for SC absorbing out-of-pocket medical deductions from the medical insurance provided by the school’s district. Sandi co-pays for medication, LTC insurance, the chiropractor, and the EOs. Her financial planner advises her to teach 5 more years before retiring at 62 years with her teacher’s pension and paid home mortgage. Sandi feels confident that she can achieve this goal.

Indepth Interview Summary

Sandi uses a multimodal approach to SCM. She chooses SCMIIs to control FM symptoms. The chiropractor helps to keep Sandi's body alignment. Mobic™ 15 mg PO helps control generalized malaise, and achiness on an ongoing daily basis. "On another day if I'm hurting, I put the oils on my neck going up to my head; it keeps me from getting a massive HA". The informant concludes that "I guess you could say I weigh them equally, but on any particular day, one may be more important than another". The whole point of this is to allow her to be who she wants to be. "I'm not willing to get off the meloxicam, stop going to the chiropractor, or stop using the EOs". To Sandi, FM management is SCM. This includes the professionals she seeks to help her control this complex disease "which many do not understand". It involves making choices in activities, life styles, vitamins, medications and CAM treatments. Sandi tries to live through this, go to school each day, and continue her meaningful life. "This is my life. Teaching is my life...to help kids. I go to games, help at school, and do the yearbook. Sometimes, I don't get home until 6, 7, or 8 PM, long hours".

The informant felt sorry for anyone diagnosed with FM. She hoped a good rheumatologist listened, cared for them, and gave them what they needed. "I would tell them how I was handling things" if they asked. The informant felt that FM was a journey "a personal thing". She would not impose her way of handling FM. Powerfully, Sandi shared her wisdom for future practitioners.

How you treat this disease is a personal thing...everybody needs to treat it in a way that makes them feel comfortable. They need to make decisions for themselves. Nobody really understands it (FM) unless they have it themselves.

As a math teacher, I know there's no one way to solve a problem. There is no one way of handling something that is going to work for everybody...because of their personality, their life, or what they have to cope with. A health care provider can advise and suggest, but I think they need to give the patient enough respect and courtesy, to control their own situation. Respect any decision they make regarding their own life. It's the person's life and it's their decision. You don't do it if they don't consent to you doing it. Give them the facts, knowledge, and information. If they are able to make their own decisions, why should somebody else make their decision for them? As long as I can, I will manage this disease

Essential Oil Data Analysis

The informant's SMIs included the transdermal applications of tropical basil (*Ocimum basilicum*), peppermint (*Mentha x piperita*), tea tree (*Melaleuca alternifolia*), eucalyptus (*Eucalyptus globulus*), and lavender (*Lavandula angustifolia*). The informant also used EO diluted blends for FM and respiratory symptoms. Field notes and observations verify that all currently used EOs, except the eucalyptus, were obtained from Kneading Wellness ®. The Delaware State University's Department of Agriculture and Natural Resources verified EO analysis in an independent lab by gas chromatography (GC). Analysis did not detect adulteration and were identified as: Basil EO-tropical *Ocimum basilicum*, a cultivated USA plant with methyl chavicol; Lavender-*Lavandula angustifolia*, v. vera, wild, flower and plant from Bulgaria; Tea Tree-*Melaleuca alternifolia*, leaf and branch from Australia; Peppermint, *Mentha x piperita* a super plant from USA. *Eucalyptus globulus* did not have GC and was obtained over the internet.

Essential Oil Literature Review

An indepth literature review was presented in chapter two. Research trials and results were presented in that section.

Aromatherapy's early trials suggested that EO interventions helped patients manage pain, stress, and depression (American Cancer Society, 2008). Specific EOs supported different body systems. EOs were rapidly absorbed through skin (Jager, Buchbauer, Jirovetz, & Fritzer, 1992) bringing 21% increased oxygen to cells within 20 minutes of application (Smith, 2009). Transdermal, undiluted, neat EO applications were French aromatherapy techniques (EOPR, 2004). External, low dose use of EOs had very little evidence of likely interactions with drugs that are largely site and dose-dependent (Harris, 2008).

Literature reported that basil, peppermint and lavender had antinociceptive properties. Basil inhibited anti-inflammatory cytokines. Peppermint relieved HAs with efficacy comparable to acetaminophen; calmed IBS; potentiated effects of other EOs. Lavender had anti-conflict and anesthetic properties with actions on GABA receptors comparable to benzodiazepines. Antimicrobial properties abound supported by bench science and laboratory testing.

Essential oils can become an integral SC ritual to improve well-being (Smith, 2009). Subjects perceive EOs differently leading to differential effects on behavioral measures (Ilmberger, Heuberger, Mahrhofer, Dessovic, Kowarik, & Buchbauer, 2001).

Chapter 5 Discussion

Introduction

This indepth, single case, embedded research design was analogous to a single experiment (Yin, 2009). The study represented an extreme, unique, revelatory case. The overall purpose of this evaluative, descriptive research was to explore proposed causal links in the self-care (SC) use of essential oils (EOs) over several years of use to mitigate chronic fibromyalgia (FM) symptoms within context reality. The study addressed 4 questions related to how and why: (1) the informant used EOs in self-care; (2) multimodal approaches used to manage signs and symptoms (S & S) of FM; (3) EOs helped the informant maintain function and activities of daily living (ADLs); (4) the informant integrated self-care management (SCM) with EOs, their use, effects and outcome into the context of her daily life.

Chapter 5 reviews embedded units of analysis including chronic FM symptoms, self-care deficit (SCD) using Orem's (1985) theoretical foundation; EOs. Internal validity looks at pattern matching within quantitative and qualitative data using principles of SC and integrative medicine (IM). External validity reviews study findings related to IM principles and SCD theory (Maizes, et al, 2009; Orem). Reliability addresses protocols, specific EO species, grades, and amounts used in SC. Finally, this chapter includes significance to nursing, recommendations, study limitations, and conclusions.

Embedded Units of Analysis

Three embedded units analyzed data in this single case study research design. Together, these comprehensive units helped construct the complex reality of the

informant, the lived experience of FM, and interventions comprising self-care management.

Chronic Fibromyalgia Symptoms

Fibromyalgia symptoms identified in literature reviews were integrated into 3 of the 4 VAS tools. A total of 29 symptoms were chosen to thoroughly cover FM's complexity. Items were repeated within the Chronic Symptom Frequency, Chronic Symptom Severity and EO Efficacy Scales. The outcomes of living with FM were measured within the Function and Activities of Daily Living Scale.

The Chronic Symptom Frequency VAS clarified that only 10 (34.5%) of the 29 FM symptoms were experienced daily. Eight (80%) of these 10 symptoms were rated as *significantly frequent* or 70% to 100% of the time. The other 2 daily symptoms or 20% were rated at minimal frequencies. The average score for daily symptoms was rated significant at 7.25. Approximately one third of the symptoms identified in the literature review were experienced by the informant and 80% of these symptoms were rated *significantly frequent*.

The Chronic Symptom Severity VAS identified 6 (20.7%) severe symptoms out of 29 ranging from moderately severe discomfort (7 out of 10) to severe, consistent discomfort (9 out of 10). Most of the 29 symptoms were rated as bothersome (4 out of 10) to more than increasingly moderate discomfort (6.5 out of 10). Mild severity accounted for 9 (31%) of the 29 symptoms with the absence of one symptom (teary eyes) to slightly more than minimal.

The Function and Activities of Daily Living VAS consisted of 24 items. Two (8%) of the 24 behaviors severely and/or consistently interfered with function. These

behaviors included gardening, doing outside chores, and/or hobbies. Completing repetitive actions resulted in the worse imaginable interference. The majority of behaviors, 14 (58.3%) out of 24 resulted in a bothersome interference to an increasingly moderate interference.

Instrumental activities of daily living (IADL) showed mild to severe (2-9 out of 10) interference for 11 (46%) of 24 behaviors. Seven (29.2%) of 24 behaviors showed bothersome to the worse imaginable interference (4-10 out of 10). One third (8) of 24 behaviors were rated as minimal to no interference. The average of 24 behaviors was 4.7 or moderately severe interferences. Most of the interferences were noted in IADL activities versus ADLs.

The MR corroborated symptoms noted in the VAS tools. Identified FM trigger points paralleled Sandi's symptom complaints on the VAS tools. Scope, severity, location of trigger points and pain seemed down played in the MR compared to VASs, and interview that harmonized symptom presentations. This discrepancy related to the informant's knowledge deficit of all FM symptoms, truth-telling by the informant during medical visits, and/or perceptual variances between the informant and the rheumatologist.

The interview supported VAS and MR findings. Comments and observations on the VAS tools, field notes/observations, and indepth interview transcripts highlighted etiologies, trends, and challenges of daily life with FM. Narratives explored consequences of FM symptoms, sometimes so severe the informant was unable to do anything at all.

Self-Care Agency

Motivation for SC agency was demonstrated by the informant from the onset of

diagnosis. Sandi's goal was to control the symptoms of FM. She took meloxicam daily, effective for generalized, systemic FM symptoms; created a morning ritual for safety administration. Acupuncture was trialed but discontinued after the informant failed to detect sustainable improvement. Sandi continued chiropractic treatments that had a baseline efficacy prior to the FM diagnosis. Finally, through the support of her family, Sandi ventured into the use of EOs, becoming more knowledgeable in applications, doses, mixtures and effects. The informant's decisions to follow SC actions were framed on successful outcomes achieved through newly acquired knowledge.

Sandi discussed multimodal approaches to SC actions that became subsystems within her SCM program. Knowledge-seeking sequences involved the health care team: GP, rheumatologist, chiropractor, and a registered nurse (RN, her sister). Sandi was internally oriented to SC actions through her trusted rheumatologist and sister. She kept healthcare appointments, continued lab monitoring for safety and called appropriate healthcare providers as needed. Sandi accepted accountability for how the FM symptoms affected her life. Choices made tried to control the symptoms that interfered with her life.

The "*investigative and decision-making phase of self-care*" (Orem, 1985, p. 123) was completed during the inception of SC practice. Clearly, Sandi enunciated that the EOs worked, did not harm, and consequently were adapted into her SCM program.

The "*production phase of self-care*" (Orem, 1985, p. 123) focused on operations occurring after the decision to use EOs. Plans of action changed from the inception of SC, when the sister was mixing, instructing, and prescribing the EOs. The interview identified

midpoint SC actions involving the informant's knowledge acquisition, attainment and self-mixing of EOs. Sandi's sister evolved into a resource consultant when mixtures where ineffective in symptom relief. Finally, within the currently lived SC experience, Sandi experimented and adapted the use of undiluted, neat, layered transdermal applications of EOs because "they work faster".

Self-care deficits were translated as knowledge deficits by the informant and health care team. The health care team continued to empower Sandi's knowledge acquisition. The goal was to control symptoms. Barriers included Sandi's difficulty applying EOs to painful back areas since she could not reach those areas because she lived alone. Sometimes there was nothing that she can do except "scale everything down" resulting in decreased instrumental activities of daily living (IADL).

Self-care regulation is a human function. The informant meets Orem's (1985, p. 99) 6 categories of health-deviation SC requisites. First, Sandi seeks and secures appropriate medical assistance to manage FM. Secondly, she is aware of and continues to learn about FM, its effects and results within her lived experience. She knows of her vitamin D deficiency, and monitors lab results in collaboration with the rheumatologist. Interview transcripts show a knowledge deficit of OA with DJD and how it complicates FM symptoms. Thirdly, Sandi follows medical advice trying CAM interventions and controlling FM symptom manifestations. The informant usually carries out prescribed medical regimens, but she stresses that choices are not the health care teams' but hers. The professionals are consultants, not decision makers. An example of this is endoscopy/colonoscopy medical requests from April, 2010 which were finally completed a year later. Fourth, Sandi is aware of positive and deleterious effects of chosen

treatment modalities. She speaks of meloxicam's GI effects, but feels the positive outcomes outweigh negative effects. Fourth, the informant recognizes that sleep deficit and stress flare FM symptoms, but chooses to make decisions on when these violations need to occur; accepting consequences of these behaviors. She does not have a stress reduction plan especially since FM impedes her hobbies. The fifth category of self-image acceptance within the limitations FM imposes is most difficult. Sandi "pushes herself when she feels better" acknowledging possible consequences she is willing to accept. Finally, she continues to learn how to live with FM making arrangements for LTC insurance in the hope of "not burdening her family".

Orem (1985, p. 100) reviews 6 operations to determine therapeutic SC demands. The first requires identification and particularization of existing, emerging, or projected developmental and health-deviation SC requisites. Sandi demonstrates this requirement through multimodal SC approaches to manage FM and future prediction for LTC determination needs.

The second operation involves the identification of internal or external variables that affect the attainment of SC. Sandi knows that stress and sleep deficit flare FM symptoms. She chooses, however, lifestyles that facilitate these triggers, pushing limits and living life "my way". She accepts consequences of her action feeling this "comes with the territory".

The third operation is the identification of interrelationships among various SC requisites. Sandi clearly states when and why she uses her pharmacologic and CAM therapies. She notices that her FM symptoms become worse in the afternoon and evenings after she "works too hard" and completes "repetitive actions" especially with

her upper arms.

The fourth operation determines how SC interventions affect other SC requisites. Sandi recognizes that if she uses EOs she requires less analgesics, antihistamines and decongestants.

Finally, total SC actions are specified in duration and integration of elements within the context of daily living. Chiropractic appointments are set approximately every 3 weeks. EOs are used nightly for the relief of nasal congestion and PRN for pain, stress reduction and sleep.

Sandi's narrative conveys daily courage to live with chronic FM as a challenge with ramifications. Sandi initiates SC activities to manage and treat chronic conditions associated with psychosocial consequences and lifestyle changes. She demonstrates SCM adherence to treatment guidelines. Data analysis concurs that SCIs are non-optional to manage FM. Sandi uses SMIs to create control processes over FM treatment and bring order back into her life.

Essential Oils

Essential oils were used by Sandi to control symptoms of HAs, neck and shoulder pain, respiratory symptoms and sleep disturbances. They worked faster than oral medications. She used them when she needed them; as she decided. She stored, diluted, inhaled, and transdermally layered EOs or used them undiluted and neat. Choices depended on her setting and/or the intensity of symptoms. Sandi felt it was great to get some control back.

Initial EOs were obtained from Green Valley®. These were good medicinal grade EOs, but distributors did not complete gas chromatography. In 2009, EOs were

obtained from Kneading Wellness® with gas chromatography verification.

Internal Validity

Internal validity looks at pattern matching within quantitative and qualitative data and for this study, specifically, using the principles of SC and IM. Quantitative and qualitative data support patterns of SC and IM within this CSR. The MR documents the rheumatologist's approach to multimodal pharmacologic and nonpharmacologic interventions including complementary alternative medicine (CAM). The use of CAM is also woven throughout interview transcripts and the EO Efficacy Visual Analog Scale (VAS). Interview highlights show Sandi's choice to take meloxicam, creating a safety process around its administration. The MR confirms the use of this medication in stated interview dose. Both MR and interview transcripts verify chiropractic interventions successfully integrated into the SCM program. Patterns also match EO's use to manage FM symptoms noted in the MR, interview and EOs Efficacy VAS.

Patient and healthcare team members were partners in the healing process. The rheumatologist and sister (RN) encouraged SC. Team members empowered Sandi's decisions to manage symptoms. Treatment decisions encompassed health, wellness, mind, body and disease needs. Both conventional and alternative methods facilitated her healing response. Effective, natural, less invasive interventions were used whenever possible. Data from the interview, EO Efficacy VAS, MR, and literature reviews documented effective natural interventions rather than increased pharmacological antihistamines, sleeping medications and/or decongestants. New paradigms of SC were accepted; EOs helped maintain overall health and manage FM symptoms as supported in the interview, MR and EO VAS documentation.

Literature reviews and research on EOs represented a novice state of knowledge. Effects included, but were not limited to, sedation, anti-inflammatory, anti-anxiety, anti-conflict, antidepressant, muscle relaxation, anti-allergenic, antimicrobial, anti-mutagenic properties. Also, EOs chosen by the informant supported her respiratory status and helped to address sleeping disturbances. Multimodal approaches to SC matched patterns within the interview, MR, and literature review. Sandi was empowered to bring control back into her life.

External Validity

This CSR supported the integration of Orem's (1985) SCD theory, principles of SC and IM. The informant evolved in SC patterns. After deciding to try EOs, Sandi learned to mix, dilute and apply these creating rituals to manage the symptoms of FM. Health care providers demonstrated the principles of IM by empowering the informant's SC, educating the patient, encouraging SC decisions and using natural choices (CAM) when available and effective. Self-care and SCD integration were previously addressed.

This CSR encompassed the 9 principles of integrative medicine (Maizes, et al, 2009). The healing process was collaborative between the informant and health care team, as supported by the MR and interview, to honor Sandi's uniqueness. Health, wellness, mind, body, and disease were considered as Sandi made her treatment choices. Sandi appropriately chose conventional and alternative methods that would facilitate her body's innate healing response. Interventions more natural and less invasive were the informant's preference.

Good medicine was based in good science. The rheumatologist's FM diagnosis of exclusion and multimodal approach to care was supported in the literature review.

Self-control opportunities or SMIs emerged as outcomes of uniquely perceived and processed stressors within Sandi's lived context. Self-care interventions promoted Sandi's role in the management of FM. She felt her response was better than many others with FM. Participation in EO decision-making (doses, concentrations; applications) and treatment-planning (undiluted use at home and diluted at school) increased SCI efficacy and efficiency.

The use of self-care EOs in FM is a new paradigm; certainly further research is needed. Ultimately, Sandi clearly states how to proceed with treatment based on values, beliefs, and available evidence. Decisions are hers to make. Health care team members are consultants to those decisions. The informant's goals are to control FM as long as she can and to make choices to keep her healthy.

Reliability

The established CSR protocols followed the data collection as outlined in Chapter 3. There were two exceptions. Per the informant's request, the researcher asked questions on the EO Efficacy VAS and recorded answers and comments. Secondly, the in-depth interview occurred on the same weekend that the 4 VAS tools were completed instead of one week later per informant request.

The principle, undiluted EOs that Sandi used for transdermal, neat application included: Basil, Tropical (*Ocimum basilicum*) CT methyl chavicol, cultivated, Plant USA; newly added, Eucalyptus (*Eucalyptus globulus*); Lavender (*Lavandula angustifolia*), v. vera, wild, flower and plant, Bulgaria; Peppermint (*Mentha x piperita*), super, plant, US; Tea Tree (*Melaleuca alternifolia*), leaf and branch, Australia.

Specific amounts of EOs were modified and titrated by the informant as needed to

manage FM symptoms. Most EOs (except *Eucalyptus globulus*) were obtained from Kneading Wellness® with completed gas chromatography from the Department of Agriculture and Natural Resources from Delaware State University. Gas chromatography confirmed that EOs corresponded to the expected natural variation of the oil tested with good odor quality. Adulteration was not detected.

Significance to Nursing

Nursing agency interfaces SC agency (Orem, 1985). The nurse's role encompasses art and science synthesizing knowledge for innovative problem solutions. These innovative interventions must function effectively within the individuals' environment to endure the challenges within a lived context. Nurses bridge these realities. They assess individual knowledge and the ability to partially or completely meet SC requisites. Nurses use their unique education, knowledge base, and practice experience to create empowering, effective interventions for those with chronic illness within their context reality to gain quality of life.

Experienced RNs should learn about EOs, their safety, indications, applications, and efficacy. Schools of nursing should teach students evidence-based practice under the rubric of integrative medicine. Academic scholars and nursing researchers should pursue the study of herbal medicine, develop instruments, a scientific knowledge repository and cost-effective SC interventions for people living with chronic illness.

Recommendations

This study completed an initial step in the investigation of AT's feasibility and effectiveness in the SC of a middle-aged female with FM. This CSR established a

baseline for other researchers to build upon in examining the feasibility and effectiveness of such approaches.

The perceptions of individuals with chronic illness seems to be pivotal in SC management. Self-perceptions help facilitate the creation and implementation of SCI. Consistent, successful use of interventions form the framework for effective SC management. Therefore, it is recommended that psychoneuroimmunology be explored as a theoretical framework for further studies.

Recommendations include further VAS tool testing and modifications. A tool exploring the efficacy of EOs compared to function, ADL, and IADL also needs development and testing. Both qualitative and quantitative research is needed for SCIs using EOs for chronic illness. Studies need medicinal grade EOs with gas chromatography for EO verification.

Methodologically, recommendations include the researcher asking the VAS questions rather than the informant(s) writing answers since this behavior can elicit pain. Quality narrative can be added during this process, therefore, audio taping may be advisable. Further considerations include frequent breaks for the informant's personal needs and/or dividing VAS testing into multiple data collection dates. Data collection needs to be flexible enough to accommodate the informant's health care needs and comfort.

Limitations

This CSR glimpsed the contextual, multidimensional reality of living with FM from one informant's perspective. It captured the brutal truth of living with limitations imposed by FM symptoms with the comorbidity of OA. Data conveyed daily struggles and SCIs to control daily FM symptom fluctuations. Sensitively, it narrates the story of

one person, therefore, findings cannot be extrapolated and applied for larger populations. Yin (2009, p. 15), however, argues that “case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes”. Therefore, this CSR supports the application of Dorothy Orem’s (1985) self-care deficit theory and the principles of integrative medicine (Maizes, et al, 2009) in research studies of FM.

Conclusions

This CSR answered 4 questions related to how and why: (1) the informant used EOs in SC; (2) multimodal approaches managed S & S of FM; (3) EOs helped the informant maintain function and ADLs; (4) the informant integrated SCM with EOs, their use, effects and outcome into the context of her daily life. Data were analyzed from 11 rheumatologic MRs/visits, 4 VAS tools, literature reviews, and an indepth interview. These were supplemented with the researcher’s field observations and notes for further clarification.

The theoretical framework used was Orem’s (1985) self-care deficit supported by the principles of IM. Data supported the integration of SCD and IM as well as their congruency to the informant’s philosophy of care. Additionally, the MR and interview provided further confirmation that the principles of IM were reinforced and supported by health care team members.

Yin’s (2009) methods were used to establish internal and external validity as well as reliability. Triangulation of data occurred and supported conclusions involving SCD, SCI, SCM, and IM using EOs to support FM symptom management.

The diagnosis of FM was one of exclusion. Approaches to FM were multimodal. The informant used meloxicam, chiropractic treatments, vitamins, diet modifications, and

EOs to maintain her health. She tried acupuncture but determined that it was not effective. Meloxicam managed her generalized FM pain and discomfort. Chiropractic treatments managed her skeletal misalignments which predated her FM diagnosis. Vitamins were used as dietary supplements including fluctuating vitamin D doses for an identified deficiency. Diet modifications were made to manage the gastroesophageal reflux possibly related to the continued use of meloxicam. EOs were used to control daily fluctuations of FM symptoms.

Essential oils were used to treat FM pain at trigger points, especially for HAs, shoulders, arms and other areas she could reach for M/S discomfort. Using a 10 point Likert VAS scale, EOs were significantly effective (7-10) to manage 6 of 29 FM symptoms: nasal congestion, runny nose, muscular HAs, neck pain, shoulder and/or upper back pain/discomfort, and problems sleeping. Essential oils were moderately effective (4-6.5) in treating 5 other symptoms: sinus congestion, sinus HAs, generalized M/S pain/discomfort, increased sensitivity to touch, and knee pain. One symptom, heel pain, was minimally managed by the application of EOs. Sandi used EOs once on her hip pain with a 3 out of 10 rating, This was not included in the report of “routine” symptoms treated with EOs. The informant did not use EOs on 16 symptoms since she did not know they were related to FM symptoms.

The informant’s best self-reported FM symptom management was through the use of undiluted EOs. Oils related to the control of her FM symptoms were the focus of the literature review. Studies were previously cited in the literature review (Chapter 2). In summary, the literature review on the properties of the informant’s selected undiluted essential oils supported her use and essential oil efficacy to relieve FM symptoms.

The informant found that EOs relieved symptoms faster than oral drugs. Diluted EO mixes were used in the work setting so that they would not offend others. Diluted EO transdermal efficacy was achieved when applied/reapplied as needed early for symptom management. Undiluted, neat, layered EO applications were stronger and more effective than diluted mixes. Applications of undiluted transdermal EOs occurred in the home setting after work and before sleep for pain resolution, improved breathing and relaxation. Pharmacologic agents were decreased or eliminated with the use of EOs including antihistamines, analgesics, and decongestants.

Sandi reported that living with FM is frustrating 100% of the time. She took personal accountability making daily decisions to manage pain (with a high tolerance level), teach, participate in school activities, socialize and continue her life. The informant narrated her journey of learning to manage FM cautioning healthcare providers that they are respectful consultants, not decision makers.

The SC use of EOs for this informant is best captured in her following narrative:

The oils treat my pain which keeps me from doing what I want to do. Oils help alleviate my pain so I can do what I want to do, when I want to do it. If I can live my life the way I want, I'm not as frustrated and angry. I'm trying to control the pain so I can do what I want in life. Sometimes, I can't control it all so I get frustrated.

REFERENCES

- Abeles, A. M., Pillinger, M. H., Solitar, B. M., & Abeles, M. (2007). Narrative review: the pathophysiology of fibromyalgia. *Annals of Internal Medicine*, 146:726-734.
- Abas, F., Lajis, N. H., Israf, D., Khozirah, S., & Kalsom, Y. U. (2006). Antioxidant and nitric oxide inhibition activities of selected Malay traditional vegetables. *Food Chemistry & Toxicology*, 95:566-573.
- American Cancer Society (2008). Making treatment decisions: aromatherapy. Retrieved on 07/14/2008 @ http://www.cancer.org/docroot/ETO/content/ETO_5_3X_Aromatherapy.asp?sitearea=ET
- Ammer, K., & Melnizky, P. (1999). Medicinal baths for treatment of generalized fibromyalgia. *Forschende Komplementarmedizin*, 6:80-85.
- Arctander, S. (1960). *Perfume and Flavor Materials of Natural Origin*. Elizabeth, NJ: Arctander.
- Arnold, L. M., Hudson, J. L., Hess, E. V., Ware, A. E., Fritz, D. A., Auchenbach, M. B., et al., (2004). Family study of fibromyalgia. *Arthritis and Rheumatism*, 50: 944-952.
- Arnold, L. M., Lu, Y., Crofford, L. J., Wohlreich, M., Detke, M. J., Iyengar, S., et al, (2004). A double-blind, multicenter trial comparing duloxetine with placebo in the treatment of fibromyalgia patients with or without major depressive disorder. *Arthritis & Rheumatism*, 50:2974-2984.
- Ballabeni, V., Tognolini, M., Chiavarini, M., Impicciatore, M., Bruni, R., Bianchi, A. et al. (2004). Novel antiplatelet and antithrombotic activities of essential oil from *Lavandula hybrida* Reverchon "grosso". *Phytomedicine*, 11: 596-601.

- Ballard, C. G., O'Brien, J. T., Reichelt, K., & Perry, E. K. (2002). Aromatherapy as a safe and effective treatment for the management of agitation in severe dementia: the results of a double-blind, placebo-controlled trial with *Melissa*. *Journal of Clinical Psychiatry*, 63:553-558.
- Barlow, J., Wright, C., Sheasby, J., Turner, A., & Hainsworth, J. (2002). Self-management approaches for people with chronic conditions: a review. *Patient Education and Counseling*, 48: 177-87.
- Battaglia, S. (2003). *The Complete Guide to Aromatherapy*. (2nd ed). UK: The International Centre of Holistic Aromatherapy. ISBN: 0646428969.
- Baudoux, D. (2005). Antiviral and antimicrobial properties of essential oils. Retrieved on 11/30/10 @ <http://www.aromabar.com/articles/naud55.htm>
- Bennett, R. (2007). Myofascial pain syndromes and their evaluation. *Best Practice & Clinical Rheumatology*, 21: 427-445.
- Bennett, R. M., Burckhardt, C. S., Clark, S. R., O'Reilly, C. A., Wiens, A. N., & Campbell, S.M. (1996). Group treatment of fibromyalgia: a 6 month outpatient program. *Journal of Rheumatology*, 23:521-528.
- Berglund, B., Harju, E. L., Kosek, E., & Lindblom, U. (2002). Quantitative and qualitative perceptual analysis of cold dysesthesia and hyperalgesia in fibromyalgia. *Pain*, 96:177-187.
- Blumenthal, M. (2000). *Herbal Medicine: Expanded Commission E. Monographs* (1st ed.). Newton, MA: Integrative Medicine Communications.
- Bodenheimer, T., Lorig, K., Holman, H., & Grumbach, K. (2002). Patient self-management of chronic disease in primary care. *Journal of the American Medical*

Association, 288: 2469-2475.

Bonafede, R. P., Downey, D. C., & Bennett, R. M. (1995). An association of fibromyalgia with primary Sjogren's syndrome: a prospective study of 72 patients. *Journal of Rheumatology*, 22:133-136.

Bradley, L., Alárcon, G. S., Sotolongo, A., Weigent, D. A., Alberts, K. R., Blalock, J. E., et al. (1998). Etiology of fibromyalgia. *Arthritis & Rheumatism*, 41(Suppl. 9): S256.

Brinker, F. J. (1998). *Herb Contraindications and Drug Interactions: With Appendices Addressing Specific Conditions and Medicines* (2nd ed.). Sandy, OR: Electric Medical Publications.

Buchbauer, G., Jirovetz, L., Jager, W., Dietrich, H., & Plank, C. (1991). Aromatherapy: evidence for sedative effects of the essential oil of lavender after inhalation. *Zeitschrift Für Naturforschung*, 46:1067-72.

Buckle, J. (1993). Aromatherapy: does it matter which lavender essential oil is used? *Nursing Times*, 89:32-36.

Buckle, J. (2000). Aromatherapy. In Novey DW (Ed.). *Clinicians Complete Reference to Complementary and Alternative Medicine*. St. Louis, MO: Mosby, pp. 651-666.

Buckle, J. (2001). Aromatherapy and diabetes. *Diabetes Spectrum*. 14(3): 124-126.

Buckle, J. (2007). Literature review: Should nursing take aromatherapy more seriously? *British Journal of Nursing*. 16(2): 116-120. [Abstract]. Retrieved on 08/01/08 @ <http://www.internurse.com/cgi-bin/go.pl/library/article.cgi?uid=22772;article=BJN>

Buckwalter, J. A., & Lappin, D. R. (2000). The disproportionate impact of chronic arthralgias and arthritis among women. *Clinical Orthopaedics*, 372: 159.

- Burckhardt, C. S., Mannerkorpi, K., Hedenberg, L., Bjelle, A. (1994). A randomized controlled trial of education and physical training for women with fibromyalgia. *Journal of Rheumatology*, 21:714-720.
- Burkhard, P. R., Darben, T., Cominos, B., and Lee, C. T. (1998). Topical eucalyptus oil poisoning. *Australas Journal of Dermatology*, 39:265-267.
- Buskila, D., & Neumann, L. (1997). Fibromyalgia syndrome (FM) and nonarticular tenderness in relatives of patients with FM. *Journal of Rheumatology*, 24:941-944.
- Buskila, D., & Sarzi-Puttini, P. (2006). Biology and therapy of fibromyalgia. Genetic aspects of fibromyalgia. Genetic aspects of fibromyalgia syndrome. *Arthritis Research and Therapeutics*, 8:218-223.
- Carli, G., Suman, A. L., Biasi, G., & Marcolongo, R. (2002). Reactivity to superficial and deep stimuli in patients with chronic musculoskeletal pain. *Pain*, 100:259-269.
- Caruso, I., Puttini, S., Cazzola, M., & Azzolini, V. (1990). Double-blind study of 5-hydroxytryptophan versus placebo in the treatment of primary fibromyalgia syndrome. *Journal of Internal Medicine and Research*, 18:201-209.
- Cedraschi, C., Desmeules, J., Rapiti, E., Baumgartner, E., Cohen, P., Finckh, A., et al. (2004). Fibromyalgia: a randomized, controlled trial of a treatment programme based on self management. *Annals of the Rheumatic Diseases*, 63:290-296.
- Chaha, K. F., Eze, C. A., Emuelosi, C, E., & Esimone, C. O. (2006). Antibacterial and wound healing properties of methanolic extracts of some Nigerian medicinal plants. *Journal of Ethnopharmacology*, 104:164-167.

- Chiappelli, F., Prolo, P., Cajulis, O. S. (2005). Evidence-based research in complementary and alternative medicine 1: history. *Electronic Complementary Alternative Medicine*, 2:453-458.
- Clark, S. Tindall, E., & Bennett, R. M. (1985). A double-blind crossover trial of prednisone versus placebo in the treatment of fibrositis. *Journal of Rheumatology*, 12:980-983.
- Clauw, D. J., & Crofford, L. J., (2003). Chronic widespread pain and fibromyalgia: what we know, and what we need to know. *Best Practice in Clinical Rheumatology*, 17:685-701.
- Cleveland, C. H., Fisher, R. H., Brestel, E. P., Esinhart, J. D., & Metzger, W. J., (1992). Chronic rhinitis an under recognized association with fibromyalgia. *Allergy Procedures*, 13:263-267.
- Consentino, B. W. (2006). Complementary and alternative medicine in the mainstream. Pathways to Professional Development. *Nurse Week*: 120-122.
- Cooke, B., & Ernst, E. (2000). Aromatherapy: a systematic review. *British Journal of General Practice*. 50(455): 493-496(4). [Abstract]. Accessed on 08/01/08 @ <http://www.ingentaconnect.com/>
- Cross, H. (2007). A focus on the issues associated with implementing self-care as an intervention. *Leprosy Review*, 78: 57-64.
- Crowther-Radulewicz, C. L. (2010). Structure and function of the musculoskeletal system. In K.L. McCance, S. E. Huether, V. L. Brashers, & N. S. Rote's *Pathophysiology: The Biologic Basis for Disease in Adults and Children*. (6th Ed.). Maryland Heights, MO: Moby Elsevier, pp. 1540-1567.

- Crowther-Radulewicz, C. L., & McCance, K. L. (2010). Alterations of Musculoskeletal function. In K.L. McCance, S. E. Huether, V. L. Brashers, & N. S. Rote's *Pathophysiology: The Biologic Basis for Disease in Adults and Children*. (6th Ed.). Maryland Heights, MO: Mosby Elsevier, pp. 1568-1617.
- Dannecker, E. A., Knoll, V., & Robinson, M. E. (2008). Sex differences in muscle pain: self-care behaviors and effects on daily activities. *Journal of Pain*, 9: 200-209.
- D'Arcy, Y. (2008). Difficult-to-treat chronic pain syndromes. *Clinical Advisor*, Dec: 27-30; 32-34.
- D'Auria, F. D., Tecca, M., Strippoli, V., Salvatore, G., Battinelli, L., & Mazzanti, G. (2005). Antifungal activity of *Lavandula angustifolia* essential oil against *Candida albicans* yeast and mycelial form. *Medical Mycology*, 43: 391-396.
- DeFries, G. H., Konrad, T. R., Woomert, A., Norburn, J. E. K., Bernard, S. (1994). Self-care and quality of life in old age. In R. P. Abeles, F. C. Gift, & M. G. Ory (Eds). *Ageing and Quality of Life*. New York: Springer, pp. 99-117.
- Delmar, C., Bøje, T., Dylmer, D., Forup, L., Jakobsen, C. Møller, et al., (2006). Independence/dependence-a contradictory relationship? Life with a chronic illness. *Scandinavian Journal of Caring Sciences*, 20: 261-268.
- Diego, M. A., Jones, N. A., Field, T., Hernandez-Reif, M., Schanberg, S., & Kuhn, C. et al. (1998). Aromatherapy positively effects mood, EEG patterns of alertness and math computations. *International Journal of Neuroscience*, 96:217-24.
- Dunning, T. (2005). Applying a quality use of medicines framework to using essential oils in nursing practice. *Complementary Therapies in Clinical Practice*. 11(3): 172-181.

- Dwivedi, A., Rahul, M., & Chaturvedi, M. (2010). Aromatherapy a holistic cure: current approaches and future concerns. *International Journal of Pharmacy & Life Science*, 1:23-29.
- Edge, J. (2003). A pilot study addressing the effect of aromatherapy massage on mood, Anxiety and relaxation in adult mental health. *Complementary Therapies in Nursing and Midwifery*, 9(2): 90-97.
- Enteen, S. (2005). Essential oils for pain relief. *Massage Therapy*. 5:1-3.
- Ernst, E. (2002). Complementary therapies in palliative cancer care. *Cancer*, 91:2181-2185.
- Essential Oils Pocket Reference [EOPR]*. (2004). 3rd Ed. USA: Essential Science Publishing.
- Evandri, M. G., Batinelli, L., Daniele, C., Mastrangelo, S., Boile, P., & Mazzanti, G. (2005). The antimutagenic activity of *Lavandula angustifolia* (lavender) essential oil in the bacterial reverse mutation assay. *Food and Chemical Toxicology*. 43:1381-1387.
- Fellowes, D., Barnes, K., & Wilkinson, S. (2004). Aromatherapy and massage for symptom relief in patients with cancer. *Cochrane Database of Systematic Reviews*. 2(3). accessed on 07/18/08 @ <http://www.ncbi.nlm.nih.gov/pubmed/15106172>
- Ferrell, B. R., & Coyle, N. (2008). *The Nature of Suffering and the Goals of Nursing*. Oxford: Oxford University Press, Inc.
- Fischer-Rizzi, S. (1990). *Complete Aromatherapy Handbook: Essential Oils for Radiant Health*. NY: Sterling Publishing Co.

- Franchomme, P., & Pénoel, D. (1990). *Aromathérapie exactment*, Paris: Roger Jollois.
- Freundlich, B., & Leventhal, L. (1997). The fibromyalgia syndrome. In Schumacher, H. R. Jr., Klippel, J. H., Koopman, W. J. (Eds). *Primer on the Rheumatic Diseases*, 11th Ed. Atlanta: Atlantic Foundation.
- Galdi, E., Perfetti, L., Calcagno, G., Marcotulli, M. C., & Moscato, G. (2003). Exacerbation of asthma related to Eucalyptus pollens and to herb infusion containing Eucalyptus. *Monaldi Archieve of Chest Disease*, 59:220-221.
- Gallant, M. P. (2003). The influence of social support on chronic illness self-management: a review and directions for research. *Health Education & Behavior*, 30:170-195.
- Garg, S. C. (2005). Essential oils as therapeutics. *Natural Product Radiance*. 4:18
- Gedney, J., Glover, T. L., & Fillingim, R. B. (2004). Sensory and affective pain discrimination after inhalation of essential oils. *Psychosomatic Medicine*. 66:599-606.
- Georges, J. M. (2002). Suffering: Toward a contextual praxis. *Advances in Nursing Science*, 25, 79-86.
- Ghelardini, C., Galeotti, N., Salvatore, G., & Mazzanti, G. (1999). Local anaesthetic activity of the essential oil of *Lavandula angustifolia*. *Planta-Medicine*, 65:700-703.
- Gilani, A. H., Aziz, N., Khan, M. A., Shoheen, F., Siddiqui, B. S., & Herzig, J. W. (2000). Ethnopharmacological evaluation of the anticonvulsant, sedative and antispasmodic activities of *Lavandula stoechas* L. *Journal of Ethnopharmacology*. 71:161-67.

- Glasgow, R. E., & Anderson, R. M. (1999). In diabetes care, moving from compliance to adherence is not enough. *Diabetes Care*, 22: 2090-2092.
- Göbel, H., Fresenius, J., Heinze, A., Dworschak, M., & Soyka, D. (1996). Effectiveness of oleum menthae piperitae and paracetamol in therapy of headache of the tension type [German]. *Nervenarzt*, 67:672-681.
- Göbel, H., Schmidt, G., & Soyka, D. (1994). Effect of peppermint and eucalyptus oil preparations on neurophysiological and experimental algometric headache parameters. *Cephalgia*, 14:228-34.
- Goel, N., Kim, H., & Lao, R. P. (2005). An olfactory stimulus modifies nighttime sleep in young men and women. *Chronobiology International*, 22:889-904.
- Goldenberg, D. L., Felson, D. T., Dinerman, H. (1986). A randomized controlled trial of amitriptyline and naproxen in the treatment of patients with fibromyalgia. *Arthritis and Rheumatology*, 29:1371-1377.
- Exacerbation of asthma related
to Eucalyptus pollens and to herb infusion containing Eucalyptus. *Monaldi
Archieve of Chest Disease*,
- Grigoleit, H. G. & Grigoleit, P. (2005). Peppermint oil in irritable bowel syndrome. *Phytomedicine*, 12:601-606.
- Guillemain, J., Rousseau, A., & Delaveau, P. (1989). Neurodepressive effects of the essential oils of *Lavandula angustifolia* Mill. *Annals of Pharmaceuticals of France*. 47:337-43.
- Gunther, V., Mur, E., Kinigadner, U., Miller, C. (1994). Fibromyalgia-the effect of relaxation and hydrogalvanic bath therapy on the subjective pain experience.

Clinical Rheumatology, 13:573-578.

Haanen, H. C., Hoenderdos, H. T., van Romunde, L. K., Hop, W. C., Malle, C., Terwiel, J. P., et al. (1991). Controlled trial of hypnotherapy in the treatment of refractory fibromyalgia. *Journal of Rheumatology*, 18:72-75.

Hadfield, N. (2001). The role of aromatherapy massage in reducing anxiety in patients with malignant brain tumours. *International Journal of Palliative Nursing*, 7(6): 279-285.

Hakkinen, A., Hakkinen, K., Hannonen, P., Alen, M. (2001). Strength training induced adaptations in neuromuscular function of premenopausal women with fibromyalgia: comparison with healthy women. *Annals of the Rheumatic Diseases*, 60:21-26.

Halm, M. A. (2008). Essential oils for management of symptoms in critically ill patients. *American Journal of Critical Care*. 17(2): 160-163.

Hammer, K. A., Carson, C. F., & Riley, T. V. (2003). Antifungal activity of the components of *Melaleuca alternifolia*. 95:853-860.

Hang, M. R., Akiyama, H., Tryban, G., Sonoda, K., & Wykle, M. (1991). Self-care: Japan and the US compared. *Social Science Medicine*, 33: 1011-1022.

Harris, R. (2008). The risks of drug and essential oil interactions. *Alliance of International Aromatherapy Teleconference Summary*: 17th December 2008, pp. 1-9.

Harvey, C. K. (1993). Fibromyalgia. Part II. Prevalence in the podiatric patient population. *Journal of American Podiatric Medicine Association*, 83:416-417.

Hedayat, K. M. (2008). Reduction of benzodiazepine requirements during mechanical

- Ventilation in a child by topical application of essential oils. *EXPLORE*. 4(2): 136-138.
- Helms, J. E. (2006). Complementary and alternative therapies: a new frontier for nursing education? *Journal of Nursing Education*, 45: 117-123.
- Henderson, M., Glozier, N., & Elliot, K. H. (2005). Long term sickness absence. *British Medical Journal*, 330: 802-3.
- Hills, J. M. & Aaronson, P. I. (1991). The mechanisms of action of peppermint oil on gastrointestinal smooth muscle. *Gastroenterology*, 101:55-65.
- Holdcraft, L. C., Assefi, N., & Buchwald, D. (2003). Complementary and alternative medicine in fibromyalgia and related syndromes. *Best Practice & Research Clinical Rheumatology*, 17: 667-683.
- Holman, H. R., & Lorig, K. R. (2000). Patients as partners managing chronic disease. *British Medical Journal*, 320: 526-527.
- Holmes, C., & Ballard, C. (2004). Aromatherapy in dementia. *Advances in Psychiatric Treatment*, 10: 296-300.
- Holmes, C., Hopkins, H., Hensford, C., MacLaughlin, V., Wilkinson, D., & Rosenvinge, H. (2002). Lavender oil as a treatment for agitated behaviour in severe dementia: a placebo controlled study. *International Geriatric Psychology*. 17: 305-308.
- Holtmann, G., Haag, S., Adam, B., Funk, P., Wieland, V., & Heydenreich, C. J. (2003). Effects of a fixed combination of peppermint oil and caraway oil on symptoms and quality of life in patients suffering from functional dyspepsia. *Phytomedicine*. 10:(suppl. 4):56-7.
- Hudson, R. (1996). The value of lavender for rest and activity in the elderly patient.

Complementary and Therapeutic Medicine, 4:52-57.

Hummel, F. I. (2009). Powerlessness. In P.D. Larsen and I.M. Lubkin *Chronic Illness: Impact and Intervention* (7th Ed). Sudbury, MA: Jones and Bartlett Publishers, pp. 255-276.

Ilmberger, J., Heuberger, E., Mahrhofer, C., Dessovic, H., Kowarik, D., & Buchbauer, G. (2001). The influence of essential oils on human attention. I: alertness. *Chemical Senses*. 26:239-245.

Imanishi, J., Kuriyama, H., Shigemori, I., Watanabe, S., Aihara, Y., Kita, M., et al. (2007). Anxiolytic effect of aromatherapy massage in patients with breast cancer. *Evidence-based Complementary and Alternative Medicine*, 6:123-128.

Inoue, T., Sugimoto, Y., Masuda, H., Kamei, C. (2001). Antiallergic effect of flavonoid glycosides obtained from *Mentha piperita* L. *Biological & Pharmaceutical Bulletin*, 25:256-259.

Institute of Medicine (2005). Use of complementary and alternative medicine (CAM) by the American public. Consensus Study. Accessed on 01/02/11
<http://iom.edu/Activities/PublicHealth/CAMUse.aspx>

Itai, T., Amayasu, H., Kurigbayashi, M., Kawamura, N., Okada, M., Momose, A. et al. (2000). Psychological effects of aromatherapy on chronic hemodialysis patients. *Psychiatry and Clinical Neurosciences*, 54:393-7.

Jager, W., Buchbauer, G., Jirovetz, L., & Fritzer, M. (1992). Percutaneous absorption of lavender oil from massage oil. *Journal of the Society of Cosmetic Chemists*, 43:49-54.

Janzen, V. D., & Scudds, R. (1997). Sphenopalatine blocks in the treatment of pain in fibromyalgia and myofascial pain. *Laryngoscope*, 107:1420-1422.

- Jokic, M. (2004). University of Toronto, 4th year Human Biology HMB499 Research Report, 12-04-04, pp. 23-26.
- Juergens, U. R. (2001). Reducing the need for cortisone. Does eucalyptus oil work in asthma? *MMW Fortschritte der Medizin*, 143:14.
- Kahn, D. L., & Steeves, R. H. (1996). An understanding of suffering grounded in clinical practice and research. In B. R. Ferrell (Ed.), *Suffering*. pp. 3-28. Sudbury, MA: Jones & Bartlett.
- Kaplan, K. H., Goldenberg, D. L., Galvin-Nadeau, M. (1993). The impact of a meditation-based stress reduction program on fibromyalgia. *General Hospital Psychiatry*, 15:284-289.
- Karagulle, M. Z., & Karagulle, M. (2004). Balneotherapy and spa therapy of rheumatic diseases in Turkey: a systematic review. *Forsch Komplementarmed Klass Naturheilkd*, 11:33-41.
- Keel, P. J., Bodoky, C., Gerhard, U., & Muller, W. (1998). Comparison of integrated group therapy and group relaxation training for fibromyalgia. *Clinical Journal of Pain*, 14:232-238
- Keita, S. M., Vincent, C., Schmidt, J., Arnason, J. T., & Belanger, A. (2001). Efficacy of essential oil of *Ocimum basilicum* L. and *O. gratissimum* L. applied as an insecticidal fumigant and powder to control *Callosobruchus maculatus*. *Journal of Stored Product Research*, 37:339-349.
- Keysor, J. J., DeVellis, B. M., DeFries, G. H., DeVellis, R. F., Jordan, J. M., Konrad, T. R., et al. (2003). Critical review of arthritis self-management strategy use. *Arthritis & Rheumatism (Arthritis Care & Research)*, 49: 724-731.

- Kim, M. A., Sakong, J.K., Kim, E. J., & Kim, E. H. (2005). Effect of aromatherapy massage for the relief of constipation in the elderly. *The Journal of Allergy and Clinical Immunology*, 35:56-64.
- Kim, J. T., Wajda, M., Cuff, G., Serota, D., Schlame, M., & Axelrod, D. M. (2006). Evaluation of aromatherapy in treating postoperative pain: pilot study. *Pain Practice*, 6:273-277.
- Kin, H. M. & Cho, S. H. (1999). Lavender oil inhibits immediate-type allergic reaction in mice and rats. *Journal of Pharmacy and Pharmacology*, 51:221-6.
- Kite, S. M., Maher, E. J., Anderson, K., Young, T., Young, J., Wood, J., et al. (1998). Development of an aromatherapy service at a Cancer Centre. *Palliative Medicine*, 12:171-180.
- Kligler, B. & Chaudhary, S. (2007). Peppermint oil. *American Family Physician*. 75:1027-1030.
- Klipa, D., & Rousseau, J. C. (2009). Pain and its management. In M. A. Koda-Kimble, L.Y. Young, B. K. Alldredge, R. L. Corelli, B. J. Guglielmo, W. A. Kradjan, et al., *Applied Therapeutics: The Clinical Use of Drugs*. (9th Ed.). Philadelphia, PA: Walters Kluwer| Lippincott Williams & Wilkins.
- Ko, G. D., Hum, A., & Traitses, G. (2006). Do topical herbal agents provide pain relief? *Practical Pain Management*, Jan/Feb:2-7.
- Ko, G. D., Hum, A., Traitses, G. & Berbrayer, D. (2007). Effects of topical O24 essential oils on patients with fibromyalgia syndrome: a randomized, placebo controlled pilot study. *Journal of Musculoskeletal Pain*, 15:11-19.
- Ko, G., Whitmore, S., Gottfried, B., Hum, A., Rahman, M., Traitses, G. (2005).

Fibromyalgia/chronic pain syndrome: an alternative medicine perspective.

Critical Reviews™ in Physical and Rehabilitation Medicine, 17:1-30.

Komori, T., Fujiwara, R., Tanida, M., Nomura, J., & Yokoyama, M. M. (1995). Effects of citrus fragrance on immune function and depressive states.

NeuroImmunoModulation, 2: 174-180.

Kosek, E., Ekholm, J. & Hansson, P. (1995). Increased pressure pain sensibility in fibromyalgia patients is located deep to the skin but not restricted to muscle tissue. *Pain*, 63:335-339.

Kralick, D., Koch, T., Price, K., & Howard, N. (2004). Chronic illness management: Taking action to create order. *Journal of Clinical Nursing*, 13: 259-267.

Kravitz, K., & Berenson, S. (2010). Complementary and alternative therapies in palliative care. In B. R. Ferrell and M. Coyle (Eds) *Oxford Textbook of Palliative Nursing* (3rd ed.). Oxford, NY: Oxford University Press, pp. 545-565.

Kwiecinski, J., Eick, S., & Wojcik, K. (2008). Effects of tea tree (*Melaleuca alternifolia*) oil on *Staphylococcus aureus* in biofilms and stationary growth phase.

International Journal of Antimicrobial Agents, 33:343-347.

Lannersten, L., & Kosek, E. (2010). Dysfunction of endogenous pain inhibition during exercise with painful muscles in patients with shoulder myalgia and fibromyalgia. *Pain*, 151:77-86.

Lapossy, E., Gasser, P., Hrycaj, P., Dubler, B., Samborski, W., & Muller, W. (1994). Cold-induced vasospasm in patients with fibromyalgia and chronic low back pain in comparison to health subjects. *Clinical Rheumatology*, 13:442-445.

Larsen, P. D. (2009a). Illness behavior. In P.D. Larsen and I.M. Lubkin *Chronic Illness: Impact and Intervention* (7th ed). Sudbury, MA: Jones and Bartlett Publishers,

pp. 25-41.

- Larsen, P. D., & Hummel, F. I. (2009). Adaptation. In P.D. Larsen and I.M. Lubkin *Chronic Illness: Impact and Intervention* (7th ed). Sudbury, MA: Jones and Bartlett Publishers, pp. 67-83.
- Lawrence, D. M. (2005). Chronic disease care: rearranging the deck chairs. *Annals of Internal Medicine*, 143:458-459.
- Lawson, M. J., Knight, R. E., Tran, K., Walker, G., Roberts-Thompson, A. (1988). Failure of enteric-coated peppermint oil in the irritable bowel syndrome: a randomized. double-blind crossover study, *Journal of Gastroenterology & Hepatology*. 3:235-8.
- Lee, Y. H., Choi, S. J., Ji, J. D., & Song, G. G. (2010). Candidate gene studies of fibromyalgia: A systematic review and meta-analysis. *Rheumatology International*, DOI 10.1007/s00296-010-1678-9. Retrieved on 05/06/11 @ pubmed.gov
- Lewin, R. (1999). Return to work after MI, the roles of depression, health beliefs and rehabilitation. *International Journal of Cardiology*, 72:49-51.
- Lewis, C. R., de Vedia, A., Reuer, B., Schwan, R., & Tourin, C. (2003). Integrating complementary and alternative medicine (CAM) into standard hospice and palliative care. *American Journal of Hospice & Palliative Care*, 20: 221-228.
- Lin, P. W., Chan, W. C., Ng, B. F., & Lam, L. C. (2007). Efficacy of aromatherapy (*Lavandula angustifolia*) as an intervention for agitated behaviours in Chinese older persons with dementia: a cross-over randomized trial. *International Journal of Geriatric Psychiatry*, 22:405-410.
- Lis-Balchin, M. (2006). *Aromatherapy Science: A Guide for Healthcare Professionals*.

London: Pharmaceutical Press.

Logan, A. C. & Beaulne, T. M. (2002). The treatment of small intestinal bacterial overgrowth with enteric-coated peppermint oil: a case report. *Alternative Medicine Review*, 7:410-417.

Lukaczer, D., Darland, G., Tripp, M., Liska, D. A., Lerman, R. H., Schiltz, B. et al (2005). A Pilot trial evaluating meta050, a proprietary combination of reduced iso-alpha acids, rosemary extract and oleanolic acid in patients with arthritis and fibromyalgia. *Phytotherapy Research*, 19:864-869.

Maddocks-Jennings, W., & Wilkinson, J. M. (2004). Aromatherapy practice in nursing: Literature review. *Journal of Advanced Nursing*, 48(1): 93-103.

Madisch, A., Holtmann, G., Mayr, G., Vinson, B., & Hotz, J. (2004). Treatment of functional dyspepsia with a herbal preparation, a double-blind, randomized, placebo-controlled, multicenter trial. *Digestion*, 69:45-52.

Maizes, V., Rakel, D., & Niemie, C. (2009). Integrative medicine and patient-centered care. Commissioned for the Institute of Medicine (IOM) Summit on Integrative Medicine and the Health of the Public.

Mannerkorpi, K., Nyberg, B., Ahlmen, M., Ekdahl, C. (2000). Pool exercise combined with an exercise program for patients with fibromyalgia syndrome. A prospective randomized study. *Journal of Rheumatology*, 27:2473-2481.

Mariano, C. (2006). Holistic integrative therapies in palliative care. In *Palliative Care Nursing: Quality Care to the End of Life*. (2nd ed). Matzo, M. L., & Sherman, D. W. Editors. NY: Springer Publishing Company, Inc., pp. 51-86.

Marriott, P. J., Shellie, R., & Cornwell, C. (2001). Gas chromatographic technologies for the analysis of essential oils. *Journal of Chromatography A*, 936:1-22.

- Martin, L., Nutting, A., MacIntosh, B. R., Edworthy, S. M., Butterwick, D., & Cook, J. (1996). An exercise program in the treatment of fibromyalgia. *Journal of Rheumatology*, 23:1050-1053.
- Martins, A. P., Salgueiro, L., Goncalves, M. J., da Cunha, A. P., Vila, R., Canigual, S. et al., (2001). Essential oil composition and antimicrobial activity of three Zingiberaceae from S. Tome e Principe. *Plantica Medica*, 67(6): 580-584.
- Masago, R., Matsuda, T., Kikuchi, Y., Miyazaki, Y., Iwanaga, K., & Harada, H. et al. (2000). Effects of inhalation of essential oils on EEG activity and sensory evaluation. *Journal of Physiological Anthropology and Applied Human Science*, 19:35-42.
- Matsui, M. S., Declercq, L., Sparacio, R., Voight, A., Marenus, K. D., Maes, D. (2002). The use of specific aromatherapy fragrance oils reduces the perception of psychological stress and significantly improves physiological parameters associated with stress. 22nd IFSCC International congress, cosmetic science for a global marketplace, pp. 23-26. September, 2002, Edinburgh, Scotland, United Kingdom, Poster Presentation P 128, 27 REFS Document Type Poster. [Abstract] Accessed on 07/14/08 @ <http://www.scentralaire.com/abstracts>
- Matzo, M. L., & Sherman, D. W. (2006). *Palliative Care Nursing*. (2nd ed). NY: Springer Publishing Company, Inc.
- McCaffrey, R., Thomas, D. J., & Kinzelman, A. O. (2009). The effects of lavender and rosemary essential oils on test-taking anxiety among graduate nursing students. *Holistic Nursing Practice*, 23:88-93.
- McCain, G. A., Bell, D. A., Mai, F. M., Halliday, P. D. (1988). A controlled study of the effects of a supervised cardiovascular fitness training program on the

manifestations of primary fibromyalgia. *Arthritis & Rheumatology*, 31:1135-1341.

McClatchey, W. (1996). The ethnopharmacopoeia of Rotuma. *Journal of Ethnopharmacology*, 50:147-156.

Mease, P. J., Russell, I. J., Arnold, L. M., Florian, H., Young, J. P., Martin, S. A., et al. (2008). A randomized, double-blind, placebo-controlled, phase III trial of pregabalin in the treatment of patients with fibromyalgia. *Journal of Rheumatology*, 35: 502-514.

Melis, K., Bochner, A., & Janssens, G. (1989). Accidental nasal eucalyptol and menthol instillation. *European Journal of Pediatrics*, 148:786-788.

Messenger, S., Hammer, K. A., Carsen, C. F., & Riley, T. V. (2005). Assessment of the antibacterial activity of tea tree oil using European EN 1276 and EN 12054 standard suspension tests. *Journal of Hospital Infections*, 59:113-125.

Micklefield, G. H., Greving, I., & May, B. (2000). Effects of peppermint oil and caraway oil in gastroduodenal motility. *Phytotherapy Research*, 14:20-23.

Minero, F. J. G. & Fernandez-Mensaque P. (1994). Variations of airborne summer pollen in southwestern Spain. *Journal of Investigative Allergol Clininical Immunology*, 4: 277-82.

Moldofsky, H., Lue, F. A., Mously, C., Roth-Schechter, B., & Reynolds, W. J. (1996). *Journal of Rheumatology*, 23:529-533.

Mukerji, B., Mukerji, V., Alpert, M. A., & Selukar, R. (1995). The prevalence of rheumatologic disorders in patients with chest pain and angiographically normal coronary arteries. *Angiology*, 46:425-430.

Murray, M. A. (2008). A question of evidence: decision-making in palliative nursing. *International Journal of Palliative Nursing*, 14: 45-47.

- Muzzarelli, L., Force, M., & Sebold, M. (2006). Aromatherapy and reducing preprocedural anxiety: a controlled prospective study. *Gastroenterology Nursing*, 29: 466-471.
- Neeck, G. (2000). Neuroendocrine and hormonal perturbations and relations to the Serotonergic system in fibromyalgia patients. *Scandinavian Journal of Rheumatology*, 29:8-12.
- Nehr, A., Gstöttner, M., Thaurer, M., Augustijns, P., Reinelt, M., & Schobersberger, W. (2008). Influence of essential and fatty oils on ciliary beat frequency of human nasal epithelial cells. *American Journal of Rhinology*, 22:130-134.
- Nelson, R. R. (1997). In-vitro activities of five plant essential oils against methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *Enterococcus faecium*. *Journal of Antimicrobial Chemotherapy*, 40:305-306.
- Nemeroff, C. B., Schatzberg, A. F., Goldstein, D. J., Detke, M. J., Mallinckrodt, C. & Lu, Y. (2002). Duloxetine for the treatment of major depressive disorder. *Psychopharmacology Bulletin*, 36:106-132.
- Newman, A., Steed, L., & Mulligan, K. (2004). Self-management interventions for chronic illness. *Lancet*, 364: 1523-37.
- Nicolodi, M., & Sicuteri, F. (1996). Fibromyalgia and migraine, two faces of the same mechanism. *Advances in Medical Biology*, 398:373-379.
- Nightingale, F. (1859). *Notes on Nursing: What it is and what it is not*. London: Harrison & Sons.
- Norregaard, J., Volkmann, H., & Danneskiold-Samsoe, B. (1995). A randomized controlled trial of citalopram in the treatment of fibromyalgia. *Pain*, 61:445-449.

- Norton, L. (1995). Complementary therapies in practice: the ethical issues. *Journal of Clinical Nursing*, 4:343-348.
- Opalchenovaa, G. & Obreshkovah, D. (2003). Comparative studies on the activity of basil an essential oil from *Ocimum basilicum* L.- against multidrug resistant clinical isolates of the genera *Staphylococcus*, *Enterococcus* and *Pseudomonas* by using different methods. *Journal of Microbiological Methods*, 54:105-110.
- Orem, D. (1985). *Nursing Concepts of Practice*. New York: McGraw-Hill Book Company.
- Ory, M. G., DeFrieze, G. H., & Duncker, A. P. (1998). Introduction: the nature, extent, and modifiability of self-care behaviors in later life. In M. G. Ory, G. H. DeFrieze (Eds). *Self-care in Later Life*. New York: Springer, pp xv-xxvi.
- Osborn, C. E., Barlas, P., Baxter, G. D., & Barlow, J. H. (2001). Aromatherapy: a survey of current practice in the management of rheumatic disease symptoms. *Complementary Therapies in Medicine*, 9:62-67.
- Ough (2008). Soap-scented oil skin patch in the treatment of fibromyalgia: A case series. *Journal of Multidisciplinary Healthcare*, 1:59-62.
- Paira, S. O. (1994). Fibromyalgia associated with female urethral syndrome. *Clinical Rheumatology*, 13:88-89.
- Papadopoulos, C. J., Carson, C. F., Hammer, K. A., & Riley, T. V. (2006). Susceptibility of pseudomonads to *Melaleuca alternifolia* (tea tree) oil and components. *Antimicrobial Chemotherapy*, 58:449-451.
- Perez, C. (2003). Clinical aromatherapy. Part I: An introduction into nursing practice. *Clinical Journal of Oncology Nursing*, 7:595-598.

- Pittler, M. H., & Ernst, E. (1998). Peppermint oil for irritable bowel syndrome: a critical review and meta-analysis. *American Journal of Gastroenterology*, 93: 1131-1135.
- Plesh, O., Wolfe, F., & Lane, N. (1996). The relationship between fibromyalgia and temporomandibular disorders: prevalence and symptom severity. *Journal of Rheumatology*, 23:1948-1952.
- Prashar, A., Locke, I. C., & Evans, C.S. (2004). Cytotoxicity of lavender oil and its major components to human skin cells. *Cell Proliferation*, 37: 221-229.
- Pushpangadan, G., & Sobti, S. N. (1977). Medicinal properties of *Ocimum* (Tulsi) species and some recent investigation of their efficacy, *Indian Drugs*, 14: 207
- Rabelo, M., Souza, E. P., Soares, P. M. G., Miranda, A. V., Matos, F. J. A., & Criddle, D. N. (2003). Antinociceptive properties of the essential oil of *Ocimum gratissimum* L. (Labiatae) in mice. *Brazilian Journal of Medicine & Biological Research*, 36:521-524.
- Rakel, D. (2007). *Integrative Medicine*. 2nd Ed. Philadelphia, PA: Saunders Elsevier.
- Redondo, J. R., Justo, C. M., Moraleda, F. V., Velayos, Y. G., Puche, J. J., Zubero, J. R., et al., (2004). Long-term efficacy of therapy in patients with fibromyalgia: a physical exercise-based program and a cognitive-behavioral approach. *Arthritis Care & Research*, 51:184-192.
- Richards, K. C., Gibson, R., & Overton-McCoy, A. L. (2000). Effects of massage in acute and critical care. *Complementary and Alternative Therapies*, 11(1): 77-96
- Richards, S. C., & Scott, D. L. (2002). Prescribed exercise in people with fibromyalgia parallel group randomized controlled trial. *British Medical Journal*, 325:185-189.
- Rooks, D. S. (2007). Fibromyalgia treatment update. *Current Opinion in Rheumatology*,

19:111-117.

Rooks, D. S., Silverman, C. B., & Kantrowitz, F. G. (2002). The effects of progressive strength training and aerobic exercise on muscle strength and cardiovascular fitness in women with fibromyalgia: a pilot study. *Arthritis Care Research*, 47:22-28.

Rose, J. (2006). Aromatic solutions: herbs & aromatherapy for pain. *Massage & Bodywork*, 21(3): 52-56.

Rubert, R., Long, D. L., & Hutchinson, M. L. (2007). Chapter 3, Creating a healing environment in the ICU. In R. Kaplow and R Sonya (Eds.) *Critical Care Nursing: Synergy for Optimal Outcomes*. Sudbury, MA: Jones and Bartlett Publishers. Accessed on line on 01/05/11 @ http://www.jblearning.com/sample/0763738638_CH03_027

Russell, I. J., Orr, M. D., Littman, B., Vipraio, G. A., Alboukrek, D., Michalek, J. E., et al. (1994). Elevated cerebrospinal fluid levels of substance P in patients with the Fibromyalgia syndrome. *Arthritis & Rheumatism*, 37:1593-1601.

Saeki, Y. (2000). The effect of foot-bath with or without the essential oil of lavender on the autonomic nervous system: a randomized trial. *Complementary Therapies in Medicine*, 8: 2-7.

Satoko, Y. & Yuka, S. (2000). Effects of fragrances on autonomic nervous system. *Journal of Japanese Society of Nursing Research*, 23:11-17.

Schaller, M. & Korting, H. C. (1995). Allergic contact airborne dermatitis from essential oils used in aromatherapy. *Clinical and Experimental Dermatology*, 20:145-5.

- Schelz, Z., Hohmann, J., & Molnar, J. (2010). Recent advances in research of antimicrobial effects of essential oils and plant derived compounds on bacteria. *Ethnomedicine: A Source of Complementary Therapeutics*, 37/661:179-201.
- Schiller, D., & Schiller, C. (2001). *556 Aromatherapy Formulas for Mind & Body*. NY: Sterling Publishing Co., Inc.
- Sego, S. (2008). Alternative meds update: Peppermint. *The Clinical Advisor*, 11: 111-112.
- Selvakkumar, C., Gayathri, B., Vinaykumar, K. S., Lakshmi, B. S., & Balakrishnan, A. (2007). Potential anti-inflammatory properties of crude alcoholic extract of *Ocimum basilicum* L. in human peripheral blood mononuclear cells. *Journal of Health Science*, 53:500-505.
- Sierpina, V. S., & Carter, R. (2002). Alternative and integrative treatment of fibromyalgia and chronic fatigue syndrome. *Clinics in Family Practice*, 4:853-872.
- Sinaii, N., Cleary, S.D., Ballweg, M. L., Nieman, L. K., & Stratton, P. (2002). High rates of autoimmune disorders, fibromyalgia, chronic fatigue syndrome and atopic diseases among women with endometriosis: a survey analysis. *Human Reproduction*, 17:2715-2724.
- Singh, S. (1999). Mechanism of action of anti-inflammatory effect of fixed oil of *Ocimum basilicum* L. *Indian Journal of Experimental Biology*, 37:248-252.
- Sivri, A., Cindas, A., Dincer, F., Sivri, B. (1996). Bowel dysfunction and irritable bowel syndrome in fibromyalgia patients. *Clinical Rheumatology*, 15:283-286.
- Skidmore-Roth, L. (2006). *Mosby's Handbook of Herbs & Natural Supplements*. (3rd ed.)

- St. Lois, MO: Elsevier Mosby: p. 482.
- Smith, L. L. (2003). *Healing Oils, Healing Hands – Discovering the Power of Prayer, Hands on Healing and Anointing*, Arvada, CO: HTSM Press Book.
- Smith, L. L. (2009). How to use essential oils for self healing. *Energy Magazine*. December 2008/January 2009:18-19.
- Soden, K., Vincent, K., Craske, S., Lucas, C., & Ashley, S. (2004). A randomized controlled trial of aromatherapy massage in a hospice setting. *Palliative Medicine*, 18: 87-92.
- Sorensen, J., Bengtsson, A., Ahlner, J., Henriksson, K. G., Ekselius, L., & Bengtsson, M. (1997). Fibromyalgia: are there different mechanisms in the processing of pain? A double blind crossover comparison of analgesic drugs. *Journal of Rheumatology*, 24:1615-1621.
- Spanier, J. A., Howden, C. W., & Jones, M. P. (2003). A systematic review of alternative therapies in the irritable bowel syndrome. *Archives of Internal Medicine*, 163:265-74.
- Spencer, J. W., & Jacobs, J. J. (1999). *Complementary/Alternative Medicine: An Evidenced Based Approach*. St. Lois, MO: Mosby.
- Spoerke, D. G., Vanderberg, S. A., Smolinske, S. C., Kulig, K., Rumack, B. H. (1989). Eucalyptus oil: 14 cases of exposure. *Veterinary and Human Toxicology*, 31:166-168.
- Staud, R. (2006). Review: biology and therapy of fibromyalgia: pain in fibromyalgia syndrome. *Arthritis Research & Therapy*, 8:208-214.
- Stewart, D. (2003). *Healing oils of the bible*. Marble Hill, MO: Care Publications.

- Stewart, D. (2005). *The Chemistry of Essential Oils Made Simple: God's Love Manifest in Molecules*. Marble Hill, MO: Care Publications.
- Stuenkel, D. L., & Wong, V. K. (2009). Stigma. In P.D. Larsen and I.M. Lubkin *Chronic Illness: Impact and Intervention* (7th Ed). Sudbury, MA: Jones and Bartlett Publishers.
- Takarada, K., Kimizuka, R., Takahashi, N., Honma, K., Okuda, K., & Kato, T. (2004). A comparison of the antibacterial efficacies of essential oils against oral pathogens. *Oral Microbiology & Immunology*, 19:61-64.
- Tate, S. (1997). Peppermint oil: a treatment for postoperative nausea. *Journal of Advanced Nursing*, 26:543-549.
- Taylor, B. A., Luscombe, D. K., & Duthie, H. L. (1983). Inhibitory effect of peppermint oil on gastrointestinal smooth muscle. *Gut*, 24:A992
- Taylor, B. A., Luscombe, D. K., & Duthie, H. L. (1984). Inhibitory effect of peppermint oil and menthol on human isolated colon. *Gut*, 25:A1168-1169.
- Tisserand, R. & Balacs, T. (1995). The skin. In *Essential Oil Safety: A Guide for Health Care Professionals*. Edinburgh: Churchill Livingstone, pp. 77-89.
- Tofferi, J. K., Jackson, J. L., & O'Malley, P. G. (2004). Treatment of fibromyalgia with cyclobenzaprine: a meta-analysis. *Arthritis and Rheumatology*, 51:9-13.
- Vaeroy, H., Helle, R., Forre, O., Kass, E., & Terenius, L. (1998). Elevated CSF levels of substance P and high incidence of Raynaud's phenomenon in patients with fibromyalgia: new features for diagnosis. *Pain*, 32:21-26.
- Vidal, C. & Calbeza, N. (1992). Contact urticaria due to eucalyptus pollen. *Contact Dermatitis*, 26:265-268.
- Vierck, C. J. (2006). Mechanisms underlying development of spatially distributed

- chronic pain (fibromyalgia). *Pain*, 124: 242-263.
- Wigers, S. H., Stiles, T. C., Vogl, & P. A. (1996). Effects of aerobic exercise versus stress management of fibromyalgia. A 4.5 year prospective study. *Scandinavian Journal of Rheumatology*, 25:77-86.
- Wilkinson, S., Aldridge, J., Salmon, I., Cain, E., & Wilson, B. (1999). An evaluation of aromatherapy massage in palliative care. *Palliative Medicine*. 13: 409-417.
- Wilkinson, S. M., Love, S. B., Westcombe, A. M., Gambles, M. A., Burgess, C. C., Cargill, A., et al. (2007). Effectiveness of aromatherapy massage in the management of anxiety and depression in patients with cancer: a multicenter randomized controlled trial. *Journal of Clinical Oncology*, 25(5): 532-539.
- Williams, D. A., Cary, M. A., Groner, K. H., Chaplin, W., Glazer, L. J., Rodriguez, A. M., et al., (2002). Improving physical functional status in patients with fibromyalgia: a brief cognitive behavioral intervention. *Journal of Rheumatology*, 29:1280-1286.
- Wan, J., Wilcock, A., & Coventry, M. J. (1998). The effect of essential oils of basil on the growth of *Aeromonas hydrophila* and *Pseudomonas fluorescens*. *Journal of Applied Microbiology*, 84:152-158.
- Wolfe, F., Smythe, H. A., Yunus, M. B., Bennett, R. M., Bombardier, C., & Goldenberg, D. L., et al, (1990). The American Rheumatology 1990 criteria for classification of fibromyalgia: report of the Multicenter criteria committee. *Arthritis & Rheumatology*, 33:160-172.
- Woolf, A. (1999). Essential oil poisoning. *Clinical Toxicology*, 37: 721-727.
- World Health Organization (WHO): Noncommunicable Diseases and Mental Health

(2002). *Innovative Care for Chronic Conditions: Building Blocks for Action*, Global Report. Retrieved on 11/07/10 @ <http://www.who.int/en/>

Worwood, V. A. (1996). *The Fragrant Mind*. Novato, CA: New World Library.

Yin, R. K. (2009). *Case study research: Design and Methods (4th Ed)*. Los Angeles, CA:SAGE Inc.

Yunus, M. B., Masi, A. T., & Aldag, J. C., (1989a). A controlled study of primary Fibromyalgia syndrome: clinical features and association with other functional syndromes. *Journal of Rheumatology*, 16:(suppl. 19):62-71.

Yunus, M. B., Masi, A. T., & Aldag, J. C., (1989b). Short term effects of ibuprofen in Primary fibromyalgia syndrome: a double blind, placebo controlled trial. *Journal of Rheumatology* 16:52-532.

TABLE 1
AROMATHERAPY MASSAGE RESEARCH

Aromatherapy Massage Research

Aim, Purpose & Method	Sample Size	Essential Oil(s)	Results	Researchers & Year
Standardized 1 hr AT massage x 6 wks. Hospital Anxiety and Depression Scale (HADS) prior to 1 st & last massage. VAS pre/post massage. 8 mo. study.	N = 8	Blended for each session & individual client	Improved 6/8 HADS scores & all VAS results. 50% improvement in mood between rating scales pre/post massage.	Edge, 2003
Search retrieved 1322 references. 10 met inclusion criteria representing 8 RCTs.	N = 357 patients	Varied	Massage w/wo EOs might ↓ anxiety in cancer patients short term; insufficient data for firm conclusion.	Fellowes, Barnes, Wilkinson, 2004
Psychological & immunologic parameters in open semi-comparative trial using State Trait Anxiety Inventory (STAI) test & HADS. Data collected 1 mo. pre/post before & after 1 st , 5 th , & 8 th 30 min AT massage 2 x/wk for 4 wks.	12 breast cancer patients	Sweet Orange Lavender Sandalwood	Anxiety ↓ in 1-30 min AT massage in STAI test. ↓ in 8 sequential AT massage sessions in HADS test. Results suggest further research to confirm anxiolytic effects.	Imanishi, Kuriyama, Shigemori, 2007
Weekly massage w/wo EO x 4 wks. Evaluate impact on physical & psychological symptoms. Outcomes: VAS Verran & Snyder-Halper (VSH); HADS & Rotterdam Symptom Checklist (RSCL)	N = 42 patients w advanced cancer	Lavender	Unable to demonstrate long term benefit of AT of massage to improve pain, Anxiety, or QOL. Sleep scores improved in both groups. Suggest patient with high psychological distress respond best.	Soden, Vincent, Craske, Lucas, Ashley, 2004

TABLE 2
RESEARCH ON ESSENTIAL OILS' PHYSIOLOGICAL EFFECTS

Research on Essential Oils' Physiological Effects

Aim, Purpose & Method	Sample Size	Essential Oil(s)	Results	Researchers & Year
Verify effects of AT massage on constipation. RCT pretest/posttest design w placebo. Constipation Assessment Scale (CAS) & # if BMs/wk x 10 days. Data analysis: ANOVA	Not specified in abstract Elderly	Rosemary Lemon Peppermint	Experimental group CAS significantly lower than control. Effects of AT lasted 2 wks post treatment. Findings suggest that AT helps relieve constipation.	Kim, Sakong, Kim, Kim, 2005
Evaluate use of AT to ↓ anxiety prior colonoscopy or esophogastroduodenoscopy. STAI pretest/posttest. Controlled, prospective study w convenience sample.	N = 188 patients	Lavender	Pre STAI raw scores: 99 th ♀ & 96 th ♂ percentiles for anxiety. No difference in STAI pretest/Posttest placebo inhalation.	Muzzarelli, Force, Sebold, 2006
Effect of foot-bath w/wo EO on ANS. RCT crossover. Measured outcomes: EKG, finger tip blood flow evaluated using spectral analysis: HR, RR	Young women	Lavender	No change in HR, RR. Significant ↑ blood flow. Parasympathetic activity ↑ significantly for 10 min w/wo EO.	Saeki, 2003
Double study using placebo, EO, Dimenhydrinate w motion simulator to induce motion sickness	N = 36	Ginger	Ingestion of 1Gm ginger root pretest were able to tolerate motion several moments longer wo N/V than control or drug wo anticholinergic effects.	Skidmore-Roth, 2006

APPENDIX A
PRINCIPLES OF INTEGRATIVE MEDICINE

PRINCIPLES OF INTEGRATIVE MEDICINE

Maizes, V., Rakel, D., Niemiec, C. (2009), pp. 6-8.

1. Patient and Practitioner are partners in the healing process.
2. All factors that influence health, wellness, and disease are taken into consideration, including mind, spirit, and community, as well as body.
3. Appropriate use of both conventional and alternative methods facilitates the body's innate healing response.
4. Effective interventions that are natural and less invasive should be used whenever possible.
5. Good medicine is based in good sciences. It is inquiry-driven and open to new paradigms.
6. Ultimately, the patient must decide how to proceed with treatment based on values, beliefs, and available evidence.
7. Alongside the concept of treatment, the broader concepts of health promotion and the prevention of illness are paramount.
8. Practitioners of integrative medicine should exemplify its principles and commit themselves to self-exploration and self-development.

APPENDIX C

INFORMED CONSENT

**University of San Diego
Institutional Review Board
Research Participant Consent Form**

For the research study entitled:
“Fibromyalgia Self-Care Management: Use of Essential Oils”

I. Purpose of the research study

Regina Izu is a doctoral student in the Hahn School of Nursing at the University of San Diego. You are invited to participate in a research study she is conducting. The purpose of this research study is to look at how people who have fibromyalgia use essential oils to help their symptoms and what that's like for them.

II. What you will be asked to do

If you decide to be in this study, you will be asked to:

- 1) Meet with me twice at a location and time convenient to you, where privacy can be assured. During the first meeting, you will complete four questionnaires that ask you questions about how severe and frequent your fibromyalgia symptoms are, how well you are able to function and perform activities of daily living, and how effective using essential oils has been for your fibromyalgia symptoms. This will take about an hour.
- 2) At the second meeting about a week later, you will participate in a private interview about your experience of using essential oils for your fibromyalgia, and what that's been like for you. You will be audiotaped during the interview. This will take about an hour and a half.

Your participation in this study will take about a total of 2 hours and 30 minutes.

III. Foreseeable risks or discomforts

Sometimes when people are asked to think about their feelings about a health concern like fibromyalgia, they feel sad or anxious. If you would like to talk to someone about your feelings at any time, you can call toll-free, 24 hours a day: San Diego Mental Health Hotline at 1-800-479-3339

Another risk is that you might feel fatigued while filling out the questionnaires and doing the interview. You can stop and rest at any time. You can re-schedule our meeting(s), or you can decide to quit altogether.

IV. Benefits

While there may be no direct benefit to you from participating in this study, the indirect benefit of participating will be in knowing that you helped researchers better understand how people with fibromyalgia use essential oils.

V. Confidentiality

Any information provided and/or identifying records will remain confidential and kept in a locked file and/or password-protected computer file in the researcher's office for a minimum of five years. All data collected from you will be coded with a number or pseudonym (fake name). Your real name will not be used. The results of this research project may be made public and information quoted in professional journals and meetings, but information from this study will only be reported as a group, and not individually.

VI. Compensation

You will receive no compensation for your participation in the study.

VII. Voluntary Nature of this Research

Participation in this study is entirely voluntary. You do not have to do this, and you can refuse to answer any question or quit at any time. Deciding not to participate or not answering any of the questions will have no effect on any benefits you're entitled to, like your health care, employment, or any other social services. **You can withdraw from this study at any time without penalty.**

VIII. Contact Information

If you have any questions about this research, you may contact either:

1) Regina Izu

Email: rizu@sandiego.edu

Phone: 619-260-4196

2) Dr. Jane Georges

Email: jgeorges@sandiego.edu

Phone: (619) 260-4566

I have read and understand this form, and consent to the research it describes to me. I have received a copy of this consent form for my records.

Signature of Participant

Date

Name of Participant (**Printed**)

Signature of Investigator

Dat

APPENDIX D

Chronic Symptom Frequency Scale

Chronic Symptom Frequency Scale

Research ID: _____

Date: _____

Directions: Please circle the number which best answers how frequently you experience a symptom within a 24 hour day related to your chronic conditions of rhinitis (nasal breathing conditions) and fibromyalgia (fatigue and sore muscles). You may write additional brief comments under the question.

Answer Key: How often do you experience these symptoms on a daily basis (24 hour)?

0 = inconsistently, *not experienced on a daily basis.*

1 = 10% of the time

2 = 20% of the time

3 = 30% of the time

4 = 40% of the time

5 = 50% of the time

6 = 60% of the time

7 = 70% of the time

8 = 80% of the time

9 = 90% of the time

10 = 100% of the time

1. I have nasal congestion.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

2. I have sinus congestion.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

3. I have a runny nose.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

4. I have teary eyes.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

5. I have sinus headaches.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

6. I have muscular headaches.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

7. I have trouble concentrating (thinking).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

8. I have jaw pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

9. I have neck pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

10. I have generalized musculoskeletal pain and discomfort.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

11. Exposure to cold makes my pain worse.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

12. My body feels like it is stiff.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

13. I have morning fatigue (tiredness).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

14. I have generalized fatigue (tiredness).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

15. I have increased sensitivity to touch.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

16. I have shoulder and/or upper back pain/discomfort.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

17. I have chest pain, discomfort, and/or heaviness (noncardiac).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

18. I have lower back pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

19. I have hip pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

20. I have knee pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

21. I have heel pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

22. I have irregular bowel problems.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

23. I have problems sleeping.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

24. I have feelings of anxiety related to my symptoms or diagnosis.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

25. I have felt overwhelmed by my symptoms.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

26. I have feelings of sadness related to living with fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

27. I have suffered from my symptoms related to fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

28. I have felt frustrated because of living with fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

29. I have felt angry because of living with fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

APPENDIX E

Chronic Symptom Severity Scale

Chronic Symptom Severity Scale

Research ID: _____

Date: _____

Directions: Please circle the number which best answers the *usual severity of the symptom* you experience related to your chronic condition of fibromyalgia (fatigue and sore muscles). You may write additional brief comments under the question.

Answer Key: How often do you experience these symptoms on a daily basis (24 hour)?

0 = No symptom experienced

1 = Barely Noticeable

2 = Very Minimal

3 = Minimal

4 = Bothersome

5 = Moderate discomfort

6 = Increasing Moderate Discomfort

7 = Moderately Severe, Discomfort

8 = Increasing Intensity and Discomfort

9 = Severe, Consistent Discomfort

10 = Worse Severity Imaginable

1. I have nasal congestion.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

2. I have sinus congestion.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

3. I have a runny nose.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

4. I have teary eyes.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

5. I have sinus headaches.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

6. I have muscular headaches.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

7. I have trouble concentrating (thinking).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

8. I have jaw pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

9. I have neck pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

10. I have generalized musculoskeletal pain and discomfort.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

11. Exposure to cold makes my pain worse.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

12. My body feels like it is stiff.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

13. I have morning fatigue (tiredness).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

14. I have generalized fatigue (tiredness).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

15. I have increased sensitivity to touch.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

16. I have shoulder and/or upper back pain/discomfort.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

17. I have chest pain, discomfort, and/or heaviness (noncardiac).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

18. I have lower back pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

19. I have hip pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

20. I have knee pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

21. I have heel pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

22. I have irregular bowel problems.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

23. I have problems sleeping.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

24. I have feelings of anxiety related to my symptoms or diagnosis.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

25. I have felt overwhelmed by my symptoms.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

26. I have feelings of sadness related to living with fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

27. I have suffered from my symptoms related to fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

28. I have felt frustrated because of living with fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

29. I have felt angry because of living with fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

APPENDIX F

FUNCTION AND ACTIVITIES OF DAILY LIVING SCALE

Function and Activities of Daily Living Scale

Research ID: _____

Date: _____

Directions: Please circle the number which best answers *how symptoms* related to your chronic condition of fibromyalgia *interfere with your activities of daily living and functional status*. You may write additional brief comments under the question.

Answer Key: How do your symptoms impact your daily life in the following activities and functions?

0 = No Interference

1 = Barely Noticeable Interference 6 = Increasingly Moderate Interference

2 = Very Minimal Interference 7 = Moderately Severe Interference

3 = Minimal Interference 8 = Increasing and Intense Interference

4 = Bothersome Interference 9 = Severe and/or Consistent Interference

5 = Moderate interference 10 = Worse Imaginable Interference

1. Personal daily hygiene activities (bathing, dressing, brushing hair and teeth, etc.)

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

2. Cooking.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

3. Cleaning and/or complete housework activities.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

4. Complete repetitive actions.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

5. Gardening, doing outside chores, and/or hobbies.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

6. Driving.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

7. Shopping.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

8. Caring for others (friends, family, and pets).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

9. Completing work and job role expectations.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

10. Energy to complete job and/or work related expectations.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

11. Energy to go out with others to socialize.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

12. Walking.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

13. Running, jogging and/or exercising.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

14. Lifting objects.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

15. Pulling objects.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

16. Pushing objects.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

17. Grasping and holding on to objects.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

18. Carrying objects.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

19. Joint and muscle flexibility (range of motion).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

20. Maintaining balance.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

21. Walking.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

22. Organizing your daily activities or what you do each day.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comments: _____

23. Organizing your social calendar and activities.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

24. Eating patterns.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

25. Sleeping patterns.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

APPENDIX G

ESSENTIAL OIL EFFICACY SCALE

Essential Oil Efficacy Scale

Research ID: _____

Date: _____

Directions: Please circle the number which best answers *how essential oils affect your experiences and symptoms* related to fibromyalgia. You may write additional brief comments under the question. **Please put N/A under comments if you do NOT experience symptom.**

Answer Key: When I use essential oils there is:

- 0 = No Difference/Improvement
- 1 = Barely Noticeable Difference/Improvement
- 2 = Very Minimal Difference/Improvement
- 3 = Minimal Difference/Improvement
- 4 = More than Minimal Difference/Improvement
- 5 = Moderate Difference/Improvement
- 6 = Moderate Plus Difference/ Improvement
- 7 = Significant Difference/Improvement
- 8 = Significant Plus Difference/Improvement
- 9 = Remarkable, Consistent Difference/Improvement
- 10 = Best Difference/Improvement Imaginable

1. in my nasal congestion.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

2. in my sinus congestion.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

3. in my runny nose.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

4. in my teary eyes.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

5. in my sinus headaches.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

6. in my muscular headaches.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

7. in my trouble concentrating (thinking).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

8. in my jaw pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

9. in my neck pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

10. in my musculoskeletal pain and discomfort.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

11. in the feeling that cold makes my pain worse.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

12. in my body feeling stiff.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

13. in my morning fatigue (tiredness).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

14. in my generalized fatigue (tiredness).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

15. in my increased sensitivity to touch.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

16. in my shoulder and/or upper back pain/discomfort.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

17. in my chest pain, discomfort, and/or heaviness (noncardiac).

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

18. in my lower back pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

19. in my hip pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

20. in my knee pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

21. in my heel pain.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

22. in my irregular bowel problems.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

23. in my problems sleeping.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

24. in my feelings of anxiety related to my symptoms or diagnosis.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

25. in my feeling of becoming overwhelmed by my symptoms.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

26. in my feelings of sadness related to living with fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

27. in my feelings of suffering from my symptoms related to
 fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

28. in my feelings of frustration because of living with fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

29. in my feelings of anger because of living with fibromyalgia.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Comment: _____

APPENDIX H

INDEPTH INTERVIEW QUESTIONS

Indepth Interview Questions

Interview questions may include, but not be limited to the following:

Inception of Self-Care Practice

1. How did you manage your chronic condition symptoms before your medical diagnosis and treatment?
2. How long ago were you diagnosed with fibromyalgia?
3. Why did you seek medical care?
4. How did you feel after receiving the medical diagnosis of fibromyalgia?
5. How did your medical physician decide on your plan(s) of care for your chronic conditions?
6. How did the doctor explain your treatment/medications to you?
7. Why did you decide to try treatment other than the physician's medical prescription(s)?
8. How did this original medical diagnosis affect your QOL?
9. How did you learn about treatments other than medical interventions?
10. How did you learn about essential oils and their affects?
11. Why did you decide to try essential oils?
12. How did you obtain the EOs at this stage?
13. How did you mix the EOs and decide which ones to use?
14. How did you store the EOs?
15. How did the EOs affect you?
16. How often did you use the EOs?
17. How much of the EOs (dose) did you use? Whys did you choose this dose?

18. How did you apply the EOs and where did you apply them?
19. Why did you choose to use this much oil and apply it the way you did?
20. How did you feel when you used the EOs?
21. How did you feel when you didn't use the EOs?
22. Why did you continue to use the EOs?
23. How did your physician react to your use of EOs?
24. How did the addition of EOs affect your medically prescribed treatment?
25. Why did you make the choice to try different health care interventions to control
your symptoms of chronic conditions?
26. How often did you get colds or illness after you started using EOs?

Self-Care Practice: Midpoint

1. Why did you continue to use EOs?
2. How did the use of EOs fit into your lifestyle?
3. How did EOs affect your symptoms from chronic conditions?
4. How has your medical care changed? (Medications, treatments)
5. How did your physician react to your continued use of EOs?
6. How did the continued use of EOs affect your drug doses (OTC or prescribed?)
7. How did you maintain your highest level of functioning?
8. How did you feel when you did or didn't use the EOs?
9. How did you obtain the oils?
10. How did you store the oils?
11. How did you use the EOs, singly? Combined? For different symptoms?
12. How did you mix the EOs?

13. Why did you choose particular EOs to use?
14. How and why did you choose the EO doses, frequency, application, and locations?
15. How did your symptoms respond to the use of EOs?
16. Why do you feel your disease has or has not improved?
17. How often did you get colds or illness after you started using EOs?

Currently Lived Self-Care Experience

1. How long have you been using EOs?
2. How have you changed which EOs you use from the beginning of your use to now?
3. Why did you make those changes?
4. How have you changed the dose, frequency, application, and/or locations EO use?
5. Why did you make those changes?
6. How are you obtaining your EOs?
7. How do you mix your EOs?
8. Why do you mix them the way that you do?
9. How do you store your EOs? Why do you store them that way?
10. Why do you continue to use EOs?
11. How does your physician feel about your continued use of EOs?
12. How has the use of EOs been adapted into your lifestyle?
13. Why would you continue to use EOs as a self-care management intervention?

APPENDIX I
DILUTED FIBROMYALGIA BLENDS

DILUTED FIBROMYALGIA BLENDS

EO	Species	Dose	Revision1 Mixed by Sister	Revision 2 Self-Mixed 10/24/10
Rosemary	<i>Rosmarinus officinalis</i>	3 gtts	15 gtts	15 gtts
Peppermint	<i>Mentha x piperita</i>	15 gtts	30 gtts	30 gtts
Helichrysm Organic	<i>Helichrysm italicum</i>	13 gtts	15 gtts	
Clove Bud	<i>Eugenia caryophyllata</i>	15 gtts	25 gtts	25 gtts
Sweet Birch	<i>Betula lenta</i>	10 gtts	21 gtts	
German Chamomille Organic	<i>Matricaria recutita</i>	10 gtts	15 gtts	
Rose Otto	<i>Rosa damascena</i>	5 gtts	10 gtts	
Black Pepper	<i>Piper nigrum</i>	6 gtts		
Oregano	<i>Origanum compactum</i>	8 gtts		
Rose Geranium	<i>Pelargonium roseum</i>		10 gtts	
Frankincense	<i>Boswellia carterii</i>		5 gtts	5 gtts
Lavender	<i>Lavandula angustifolia</i>		5 gtts	15 gtts
Blue Tansy	<i>Tanacetum annuum</i>			10 gtts
Basil	<i>Ocimum basilicum</i>			8 gtts
Wintergreen	<i>Gaultheria procumbens</i>			

APPENDIX J

DILUTED RESPIRATORY BLENDS

PREVIOUS SINUS BLEND DURING UPPER RESPIRATORY INFECTION

(Resolved without antibiotics and/or antivirals. Original blend by Sandi's sister)

Tea Tree (*Malaleuca alternifolia*) 15 gtts

Peppermint (*Mentha x piperita*) 15 gtts

Rose Otto (*Rosa damascena*) 3 gtts

Eucalyptus (*Eucalyptus radiata*) 36 gtts

Eucalyptus (*Eucalyptus globulus*) 7 gtts

Eucalyptus (*Eucalyptus citradora*) 10 gtts

Spikenard (*Nardostachys jatamansi*) 2 gtts

Hyssop (*Hyssopus officinalis*) 5 gtts

Thyme (*Thymus vulgaris*) 7 gtts

Mandarin Red (*Citrus reticulata*) 10 gtts

Mandarin Green (*Citrus reticulata blanco*) 10 gtts

Sage (*Salvia officinalis*) 12 gtts

Myrtle (*Myrus communis*) 10 gtts

Ravinsara (*Cinnamomum camphora*) 12 gtts

SELF-MIXED SINUS BLEND

10/24/10 mixed in a 10 mL amber bottle

Tea Tree (*Malaleuca alternifolia*) 15 gtts

Peppermint (*Mentha x piperita*) 20 gtts

Eucalyptus (*Eucalyptus globulus*) 25 gtts

Ravinsara (*Cinnamomum camphora*) 12 gt