Title

Age Related Differences in Smoking Cessation Outcomes For Women Hospitalized With Cardiovascular Disease

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Age Related Differences in Smoking Cessation Outcomes For Women Hospitalized With Cardiovascular Disease

by

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DISSERTATION

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This dissertation includes a chapter (Chapter 3) that was published in *Nursing Research Journal*. Chapters 2, 4, and 5 will be submitted for publication. Dissertation committee members will be listed as co-authors when Chapter 5 is submitted for publication. The work that Daniel Doolan completed on chapter 5, and all of the other dissertation chapters, was sufficient to meet all UCSF, Graduate Division, and School of Nursing dissertation requirements relating to the use of published data and relating to the requirements associated with the graduating student having been primarily responsible for writing and revising the dissertation material.

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Erika Froelicher
(Dissertation Committee Chair)

Age Related Differences in Smoking Cessation Outcomes For Women Hospitalized With Cardiovascular Disease

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ABSTRACT

Background: Smoking is the number one preventable cause of death and disease. Smoking cessation has immediate health benefits, even among those who have smoked for many years. Despite the known risks of smoking and the benefits of cessation, the efficacy of smoking cessation interventions among older adults and women has received limited research attention.

Objectives: To determine if there are age related clinical and demographic differences between older versus younger women with cardiovascular disease who smoke, and to determine if these two groups differ in their smoking cessation outcomes.

Method: An existing data set from The Women's Initiative for Nonsmoking (WINS) is used for this study. The original WINS study was an RCT that tested the efficacy of a smoking cessation intervention for Bay Area women hospitalized with cardiovascular disease. The current study compares WINS participants who were 62 and older with those younger than 62.

Results: The sample (n=277) contained 136 older smokers and 141 younger smokers. Older smokers were significantly more likely to be living alone, widowed, poorer, retired, have hypertension, and have multiple comorbidities. Older women were significantly less likely to be obese. Stanford Dependence Index scores showed older women had significantly lower levels of nicotine addiction. Older women were significantly less likely to have one or more housemates who smoke. At the 6 month follow-up, 52.1% of older smokers had quit smoking compared with 40.6% of younger smokers. At the 12

month follow-up, 52.0% of older smokers had quit smoking compared with 38.1% of younger smokers. The difference at 12 months was statistically significant. A Kaplan-Meier Survival Analysis found older women were significantly less likely to relapse over 12 months than younger women.

Discussion: Older women with cardiovascular disease demonstrated extremely high rates of smoking cessation, higher even than younger women with cardiovascular disease. Further research is needed to determine how to optimize smoking cessation rates for older smokers. Clinicians should be sure to also include older smokers in smoking assessments and smoking cessation interventions.

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CHAPTER 1

Dissertation Introduction: Smoking Cessation and Older Women with Cardiovascular Disease

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Dissertation Introduction: Smoking Cessation and Older Women with Cardiovascular Disease

Smoking is the number one preventable cause of death and disease in the United States (U.S.). Since the 1950s, high proportions of women have become addicted to smoking (CDC, 2005). Because smoking related diseases often have long latency periods, many of the most severe smoking related health consequences are experienced by older smokers. Quitting smoking, even well into old age, can greatly benefit women's health (Critchley & Capewell, 2003; U.S. Surgeon General, 1990, 2001, 2004). Despite these facts, smoking cessation research has only recently begun to focus on women's responses to smoking cessation interventions. Even less research has focused on the response of older adults to smoking cessation interventions.

The literature review that spawned this dissertation work identified articles about the smoking cessation responses of women, older adults, and numerous other special populations [psychiatrically diagnosed; drug and alcohol addicted; gay, lesbian, bisexual, and transgender (GLBT); American Indian/Alaska Native; African American; Hispanic/Latino; and Asian American]. The findings of this literature review can be found in Chapter 3 of this dissertation and were also published in *Nursing Research* (Doolan & Froelicher, 2006).

Due to the serious paucity of research related to older adults and smoking cessation interventions, an additional review of the literature focused on older adult smokers. This review included not only articles related to the efficacy of smoking cessation interventions, but also research about the health benefits of older adults quitting and the frequency of clinicians providing evidence-based cessation interventions to older smokers. The findings of this review can be found in Chapter 2.

The results of this dissertation were obtained using the existing data set from the Women's Initiative for Nonsmoking (WINS). Certain methodological research challenges are specific to research that involves using another researcher's existing data set. Chapter 4 focuses on successful approaches to these challenges.

Chapter 5 reports the results of the following hypotheses. In a population of women hospitalized with CVD:

Hypothesis 1: There is no difference between older (≥62) versus younger (<62) women in the proportion of short term (6 months) and long term (12 months) smoking cessation.

Hypothesis 2: There is no difference between older versus younger women in time to relapse over 12 months.

Hypothesis 3: The independent contribution of a set of variables [race/ethnicity, income, cigarettes per day, years smoking, duration of longest quit attempt, SDI score, housemate(s) smoke, current diagnosis (MI v. other), self-efficacy score, Cohen's Perceived Stress score, and Burnam's Depression Screener score] on smoking cessation status at 12 months, while controlling for age group and treatment group status, are zero.

Hypothesis 4: There is no difference between the intervention group (IG) and the usual care group (UG) in the short (6 months) and long term (12 months) efficacy of a smoking cessation intervention in the subset of older women (≥ 62 years) hospitalized with CVD.

Chapter 6 concludes the dissertation. This final chapter briefly reviews key findings and discusses research and practice implications.

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CHAPTER 2

Smoking Cessation Interventions and Older Adults

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Abstract:

Older adults suffer a large proportion of the health consequences from smoking and can greatly benefit their health by quitting smoking. Despite this, very little of the smoking cessation literature has focused on older adults. This article examines the current state of research and practice for older adults and smoking cessation interventions. Approximately 9% of older adults smoke. For over 15 years, the health care literature has mandated that people of all ages be provided with smoking cessation interventions. However, smoking cessation interventions are offered to older adults at low, suboptimal rates. Older adults, and to a more limited extent, health care providers, often have a knowledge deficit regarding the high health benefits associated with older adults quitting smoking. Although smoking cessation interventions have tended not to focus on older smokers, some studies suggest that older smokers may quit smoking at high rates when provided with an intervention. Smokers of all ages, including older adults, should regularly have their smoking addiction status assessed and treated. Greater research is needed to inform health care providers and the scientific community how to optimally intervene for older smokers.

Smoking Cessation Interventions and Older Adults

Smoking is the number one preventable cause of death and disease (U.S. Surgeon General, 2004). In the United States, 440,000 people die each year from a smoking attributable disease (U.S. Surgeon General, 2004); those over 65 years old (hereafter older adults) are already at increased risk for a variety of diseases, and approximately 70% of smoking related deaths occur among older adults (Bergman & Falit, 1997; Husten et al., 1997). Men and women smokers on average lose 13.2 and 14.5 years of life, respectively, due to smoking (CDC, 2002). Comprehensive smoking cessation intervention guidelines advise that smokers of all ages receive smoking cessation interventions (Fiore, Bailey et al., 2000). This review assesses the status of the smoking cessation intervention literature pertaining to older adults. Also included is information about smoking risks, cessation benefits, and smoking prevalence.

Methods of Bibliographic Search and Review

Longitudinal studies, cross-sectional studies, review articles, and randomized clinical trials were sought from the PsychInfo, PsychArticles, Cochrane Library, CINAHL, and United States (U.S.) National Library of Medicine's Medline databases using the key words: ‘geriatric,’ ‘smoking cessation,’ ‘elderly or older adult,’ ‘age,’ and ‘interventions.’ The results yielded 496 studies, of which 25 articles were relevant and thus included in this review (Table I). Over the last 10 years, major advances in societal smoke-free environment policies and tobacco research have occurred. One result of these changes is that today’s smokers are likely to have different perceptions related to smoking and smoking cessation interventions. Because of this, only articles published in or beyond 1995 were included in this review. Other sources included are publications

from the U.S. Center for Disease Control and Prevention (CDC) and the U.S. Surgeon General's Office.

Historical Perspective of Older Adults Smoking

It was not until the 1964 Surgeon General's Report on smoking that the harmful effects of smoking and the addictive nature of smoking became widely recognized (U.S. Surgeon General, 1964). The vast majority of smokers initiate smoking during adolescence. Therefore, for approximately the next 10 to 15 years, older adults addicted to smoking will mostly be smokers who initiated smoking before the health consequences and addictive nature of tobacco were well understood.

Risks of Tobacco Smoking

Smoking is a major risk factor for 7 of the 14 leading causes of death for the elderly (Ossip-Klein, Carosella, & Krusch, 1997). Eighty to 90 percent of lung cancer and chronic obstructive pulmonary disease (COPD) cases are attributable to smoking, and 140,000 annual premature coronary heart disease (CHD) deaths are smoking related (Burns, 2003). Furthermore, disabled older adult smokers suffer fire related injury and death (Schmitt, Tsoh, Dowling, & Hall, 2005). Older adults who continue to smoke are at a greater risk of dying (Critchley & Capewell, 2003; Houston, Allison et al., 2005).

Relative risks are sometimes used to show the effect a particular risk factor, such as smoking, has on a clinical outcome, such as all cause mortality. When considering the relative risk of mortality associated with smoking, the relative risk is the incidence rate of death among smokers divided by the incidence rate of death among nonsmokers (Last & International Epidemiological Association, 2001). Thus, for smoking and older adults, the relative risk of all cause mortality is heavily dependent on the incidence of death for

older adult nonsmokers. The problem with using relative risks to demonstrate the health consequences of smoking among older adults (Figure I) is that older adult nonsmokers are at increased risk for death due to age related risk factors. However, when differences in the number of deaths among older adult smokers and nonsmokers in selected age ranges are shown (Figure I), the effect smoking has on health is more meaningfully revealed (Burns, 2003; Burns et al., 1997). Even these data may underestimate the health harms of smoking, as many current nonsmokers were former smokers.

In addition to the increased risk of death, older adult smokers are at heightened risk for a variety of quality of life problems. Smoking causes diseases that result in disability, and smoking exacerbates problems associated with diseases common in older adults, such as diabetes mellitus, osteoporosis, and respiratory problems (Andrews, Heath, & Graham-Garcia, 2004). Also, smoking interferes with the metabolism of medications that older adults are commonly prescribed (Carosella, Ossip-Klein, Watt, & Podgorski, 2002; Husten et al., 1997). Older adult smokers are more likely to report mental health problems, such as depression, and report being in poorer health compared with older adult former smokers and non-smokers (Almeida & Pfaff, 2005; Froelicher, Christopherson, Miller, & Martin, 2002).

Other serious health problems caused by smoking are still being discovered. The most recent U.S. Surgeon General's Report on smoking determined smoking causes a variety of health ailments not previously thought to be caused by smoking, such as cataracts, periodontintis, hip fractures, and cancer of the uterine cervix, stomach, kidney, and pancreas (2004). Convincing evidence demonstrates that smoking is extremely detrimental to the health of older adults (U.S. Surgeon General, 1990, 2002, 2004).

Health Benefits of Smoking Cessation

Prior to 1990, comprehensive reporting had not occurred about the health benefits of older adults quitting smoking (Orleans, 1997; U.S. Surgeon General, 1990). The 1990 Surgeon General's Report on the benefits of smoking cessation provided initial details of such benefits. The findings demonstrated that smoking cessation benefits smokers of all ages, including those who have already been diagnosed with a smoking related illness (U.S. Surgeon General, 1990). Since that time, subsequent reports and studies have consistently found health benefits to quitting for older adults (Table II).

A large cross-sectional study (n=1030) found that quitters were less likely to report being depressed or in poor health as compared with continuing smokers (Almeida & Pfaff, 2005). A randomized control trial found, at the 11-year follow-up, that the lung health of quitters, as measured by forced expiratory volume over one second, was much higher than that of sustained smokers (Anthonisen, Connett, & Murray, 2002).

Smoking cessation for 10 years can reduce the risk of lung cancer by approximately 50% (Burns, 2003), and the benefits of cessation associated with cardiovascular disease occur much more quickly (Burns, 2003; Critchley & Capewell, 2003). A meta-analysis of 20 studies found that subjects with CHD who quit smoking could greatly reduce their risk of all cause mortality (RR 0.64, 95% CI .58, .71) perhaps in as little as two years (Critchley & Capewell, 2003). CHD risk for quitters may reduce to that of never-smokers in as little as 10 to 15 years (Burns, 2003).

Prevalence of Smoking

Smoking prevalence rates are listed in Table III. Overall smoking prevalence rates have consistently decreased since 1965; however, this has not been the case for

older adult women, of whom 9.6% smoked in 1965 and 11.1% smoked in 1994 (Husten et al., 1997). Due to the aging of the baby boomers, the total number of older adult smokers and older adult women smokers will likely continue to increase, despite the reduction in overall smoking prevalence (Falit, 1997; Husten et al., 1997; Ossip-Klein et al., 1997). Due to differences in life expectancies, women outnumber men in older age. Specifically, among those (smokers and nonsmokers) aged 65 to 74 years old, there are 127 women for every 100 men. Among those at least 85 years old, there are 220 women for every 100 men (Siegler, Bastian, Steffens, Bosworth, & Costa, 2002). This suggests that the number of older adult women who smoke may be similar to the number of older adult male smokers, despite the slightly higher proportion of older men who smoke.

The 2004 Surgeon General's Report on smoking investigated the effect population reductions in smoking prevalence would have on the number of smokers in specific age groups. Even a modest reduction in smoking prevalence to 7.9% among older adults, would result in 550,000 fewer older adult smokers projected by the year 2010; a large reduction in smoking prevalence to 5.5% of older adult smokers would result in 1,518,000 fewer older adult smokers (U.S. Surgeon General, 2004).

Findings About Older Adult Smokers

Older smokers are less likely than older non-smokers to believe that smoking has serious health consequences and that smoking cessation can benefit their health (Andrews et al., 2004; Carosella et al., 2002; Schmitt et al., 2005). Overall, older adult smokers tend to be receptive to smoking cessation advice from health care providers (Conroy et al., 2005; Ossip-Klein et al., 2000).

Providing Cessation Interventions

As with younger smokers, current guidelines recommend that older adults have their smoking status regularly assessed and be provided with comprehensive smoking cessation interventions, and that those unwilling to quit should be encouraged to consider smoking cessation in the future (Fiore, Bailey et al., 2000). For over 15 years, the mandate for health care providers to advise older adult smokers to quit smoking has been in place (U.S. Surgeon General, 1990); despite these calls to action, studies have consistently shown that smokers, and particularly older adult smokers, are advised to quit at rates that are very suboptimal (Brown et al., 2004; M. E. Burns & Fiore, 2001; Carosella et al., 2002; Doescher & Saver, 2000; Fiore, Thompson et al., 2000; Houston, Allison et al., 2005; Orleans, 1997; Schmitt et al., 2005).

This review identified two studies reporting cessation advice rates specific to older adult smokers. These two large studies by Brown (n=788) and Houston (n=16,743) examined the charted cessation advice rates for Medicare patients over 65 years old who were admitted to the hospital with an acute myocardial infarction and discharged alive (2004, 2005). In both studies, the medical records review found that about 40% had received documented smoking cessation advice. Both of these studies found that, of these older adult smokers, those in the worst health and those who were older were less likely to receive smoking cessation advice. One notable exception involved COPD patients, who in both studies were more likely to receive cessation advice (Brown et al., 2004; Houston, Allison et al., 2005). This suggests that symptoms strongly perceived to be smoking related might be more likely to result in cessation advice.

A large study (n=8229) including smokers over 18 years old with at least one physician visit within the year found that 48% reported receiving cessation advice from

their health care provider (Doescher & Saver, 2000). However, this study found that participants at least 65 years old and in poorer health were more likely to receive cessation advice. Thus, the research provides mixed results as to the likelihood of smokers in poorer health receiving cessation advice. The data show that smoking cessation advice for older adult smokers occurs at rates that are suboptimal.

Barriers and Facilitators Associated with Providing Cessation Interventions

This review identified numerous factors contributing to whether or not older adults receive smoking cessation advice. Such factors can be considered by providers and organizations when planning and implementing smoking cessation interventions for older adults.

Numerous barriers, or perceived barriers, to intervening were identified by those working with older adults. In a study by Bergman, managers of facilities that served older adults (such as senior centers) often believed, incorrectly, that older smokers would never quit and that older adults are knowledgeable about the health harms of smoking (Bergman & Falit, 1997). Health care providers are also uninformed about the receptivity of older adults to smoking cessation, the health benefits associated with older adults quitting, and the efficacy of intervening.

Several studies (Table IV) investigated health care providers' cessation intervention practices (Schmitt et al., 2005; Watt, Carosella, Podgorski, & Ossip-Klein, 2004). One involved interviews with Case Managers (n=48) who served homebound seniors. While Case Managers had numerous safety concerns about seniors who smoke and who also have dementia, use oxygen therapy, or smoke while in bed, they often reported encouraging cessation only when specific fire hazards, such as these, were

present and did not report intervening due to health concerns (Schmitt et al., 2005). In addition to reporting inadequate organization support for cessation interventions, Case Manager reasons for not routinely intervening included perceptions that clients were uninterested in quitting, might be defensive, would be unwilling to quit, that intervening might harm the nurse/patient relationship, that quitting would not benefit the patients' health, that it is wrong to take away their last pleasure, and that quitting might harm the patients' health (Schmitt et al., 2005). As previously reported, these rationales against providing cessation interventions do not reflect adequate knowledge of the existing research evidence.

Another study interviewed nursing staff at a skilled nursing facility and found similar barriers to advising patients to quit smoking (Watt et al., 2004). Nursing homes tend to have fewer smoking restrictions as compared with other health care settings (Watt et al., 2004). The nursing staff (n=115) included licensed nurses (n=62) and nursing assistants (n=53). Surveys of the nursing staff found that most of the staff never advised residents to quit smoking, although licensed staff reported having advised smoking cessation (54.8%) more often than unlicensed staff (34.6%). Staff perceptions only moderately endorsed the concept that smoking harmed residents' health. Eighty-eight percent of the nursing staff reported that none of the residents were interested in quitting. Surveys of the residents at the same facility found that 32% were interested in quitting within 6 months, and 28% had made at least one quit attempt within the previous year. Nursing staff who were not smokers were more likely than staff who smoked to advise patients about smoking cessation and to have correct perceptions about the health risks of smoking (Watt et al., 2004).

Six other studies contained findings that support the feasibility of providing smoking cessation advice for older adults (Bergman & Falit, 1997; M. E. Burns & Fiore, 2001; Fiore, Bailey et al., 2000; Husten et al., 1997; Molinari et al., 2003; Ossip-Klein et al., 2000). Older adults tend to have more frequent physician visits, on average 10 or 11 times per year (Husten et al., 1997), so this group has numerous health care contact opportunities during which interventions could occur. Increasingly, public and private insurers are reimbursing smoking cessation treatment costs (M. E. Burns & Fiore, 2001; Fiore, Bailey et al., 2000). Because smokers often cite cost as their reason for not participating in cessation interventions, greater reimbursement could increase the proportion of smokers willing to receive an intervention. Health care providers often do not advise cessation due to misconceptions about the benefits of advising. Therefore, advice rates might be enhanced by educating providers about older adults' receptivity to advice and the efficacy of such advice (Bergman & Falit, 1997; Molinari et al., 2003; Ossip-Klein et al., 2000). Areas such as skilled nursing facilities, which tend to have higher proportions of unlicensed staff, may require additional efforts to ensure that less-educated staff understand the importance of intervening.

Response of Older Adults to Interventions

The concept that older adults have special health care related considerations has become widely accepted, and many researchers and health care providers seek to gain expertise within the area of gerontology (Molinari et al., 2003). Because many of the most severe harms to health caused by smoking have long latency periods, older adult smokers suffer a high proportion of smoking attributable death and disease. However, the smoking cessation research to date has not included a gerontological focus despite the

large health benefits associated with older adults quitting smoking. Older adults selected for smoking cessation intervention research are predominantly selected because they meet a disease-related criteria and not specifically because of their age. The results of such studies have not reported comprehensive analysis relating to age, and the reporting methods used preclude an assessment of how the older adults within the sample responded to the intervention (Andrews et al., 2004).

This review identified two smoking cessation intervention studies that included older adult samples (Dale et al., 1997; Orleans, Boyd, Noll, Crosette, & Glassman, 2000). The Dale study (n=613) involved an intensive behavioral and pharmacological intervention which included follow-up cessation counseling at 1, 3, and 6 months (Table V). The six month follow-up assessment found that 25% reported smoking cessation. The Orleans study (n=470) involved 470 smokers at least 65 years old who received nicotine replacement therapy. They were randomized into an intervention and control group, with the intervention group receiving a tailored guide for older adult smoking cessation and follow-up tailored cessation mailings for six months. At the 12 month follow-up, the reported cessation rates between the intervention (33%) and control (31%) groups were similar (Orleans et al., 2000). Neither study used biochemical confirmation to verify self-reported cessation (Orleans et al., 2000).

Numerous researchers have commented that the older smokers within their sample were significantly more likely to quit than the younger participants (Dale et al., 2001; Grandes, Cortada, Arrazola, & Laka, 2003; Hajek, Taylor, & Mills, 2002; Hyland et al., 2004; Smith, Kraemer, Miller, DeBusk, & Taylor, 1999). The studies by Grandes and Smith found that smokers over age 35 and 45 respectively were more likely to quit

than their younger counterparts (2003, 1999). The study by Hajek, which contained an older sample with a mean age of 56 (±10), found that age was a positive predictor of cessation (2002). The Dale study also found that older age was a positive predictor of cessation (Dale et al., 2001). When the Dale study controlled for other predictors, the effect of age was no longer significant (Dale et al., 2001). This suggests that the effect of age on cessation rates might be the result of other influences. The cessation literature about older adults has tended not to control for possible interactions between years smoked and/or higher addiction levels among older adult smokers. The manner in which these results were reported makes it unclear if the higher quit rates among the older sample was the result of the intervention or if older adults quit at higher rates regardless of intervention status. Overall, the literature suggests cessation interventions are efficacious for older adults.

One longitudinal cohort study that surveyed older adult smokers over a period of 6 years found that 46% of initial smokers self-reported quitting by six years (Salive et al., 1992). This study apparently did not include a cessation intervention, suggesting that older adult smokers may be likely to quit even in the absence of an intervention. A study by Falba suggests that the occurrence of a major health event often precipitates cessation for older adults (2005). Because recent studies contain samples with many older adults, the current lack of knowledge regarding the efficacy of smoking cessation interventions administered to older adults can be evaluated further using existing data sets.

Evidence shows that older adults who receive smoking cessation interventions quit at relatively high rates. Smoking cessation interventions may have similar cessation

results among older adults as compared with younger smokers; however, further age related analysis of the data is needed.

Conclusion

Smoking is extremely harmful to the health of older adults, and smoking cessation among older adults leads to a reduction in the risk of smoking related morbidity and mortality. Older adult smokers tend to be poorly informed about the health consequences of smoking. Health care systems often do not facilitate cessation interventions, and health care providers do not have adequate awareness of the health detriments resulting from older adults smoking, of the health benefits for older adults who quit, and of the importance of providing cessation interventions. Consequently, smoking cessation interventions occur at suboptimal levels. The data suggest that older adults are particularly receptive to smoking cessation interventions and that when those interventions are administered to hospitalized older adults, the quit rates are high. Given the relationship between older age, risk of disease, and health risks from smoking, surprisingly little research has focused on older adults and smoking cessation interventions.

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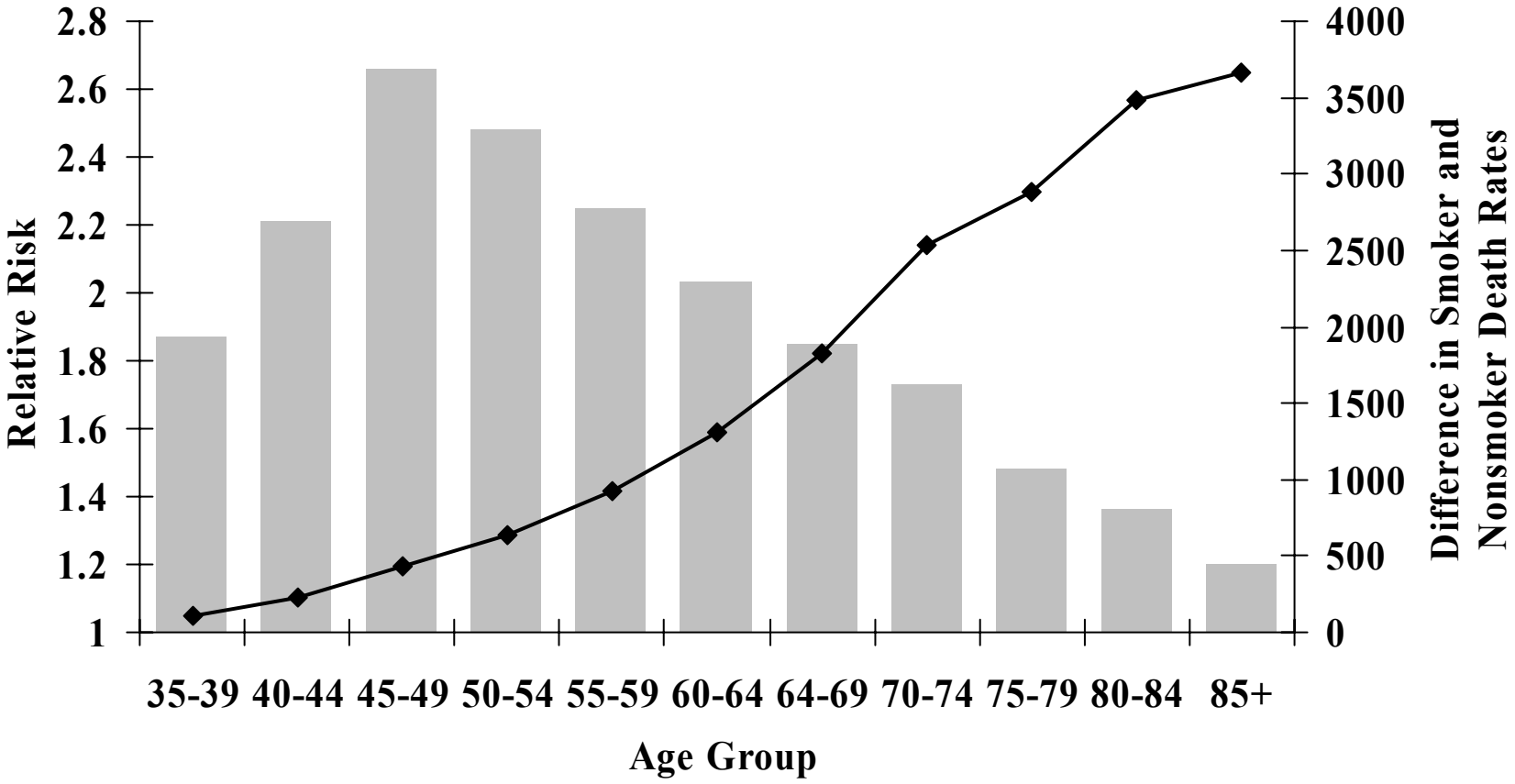
Table I: Reasons articles in literature search were excluded

Reason For Exclusion Among Articles Identified in Search That Were Not Used		
1. Focus not on older adults	(45%)	n= 212
2. Out of date range (1995-2007)	(24%)	n= 113
3. Not focused on smoking/smoking cessation	(22%)	n= 104
4. Article not in English	(9%)	n= 42

Figure 1: All cause mortality relative risk and death rate differences between smokers and nonsmokers by age group for white men



Grey bars represent all cause mortality relative risk; dots and corresponding line represent death rate differences by age group
Burns, 2003; Burns et al., 1997; the American Cancer Society Cancer Prevention Study I; permission to use Figure obtained from Elsevier, Appendix 1

Table II: Tobacco and health

Investigator	Year	Sample	N	Design Details	Key Findings
Bergman	1997	Michigan facilities serving the elderly	141	Facility managers phone interviewed and asked about smoking policies	85% prohibit indoor smoking. Smoke free policies rarely complained about & aided recruitment. Some stated (false perception) that older adults know tobacco harms, aren't interested in quitting, and/or won't ever quit.
Anthonisen	2002	35-60yo smokers with airway obstruction but without serious disease (at baseline)	5887-4,192	Group followed over 11 years, lung and cessation status assessed	Lung function (FEV_1) consistently better for quitters vs. smokers, and this difference increased over time.
Carosella	2002	Rochester, NY SNF residents ≥50yo, smokers (n=25) and non-smokers (n=70)	95	Participants surveyed about their views on smoking	SNF resident smokers less likely than non-smokers to report smoking is detrimental to health and that quitting would benefit health. ~50% of smokers & nonsmokers unaware that second hand smoke is harmful. Most smokers not advised to quit smoking.
Critchley	2003	20 Studies of smokers with CHD	20 (studies)	Comparison of smoker vs. nonsmoker all cause mortality ≥2 years	Throughout the studies, quitters consistently reduced their rate of all cause mortality (RR 0.64, 95% CI 0.58-0.71); results were stable despite samples varying in age.
Almeida	2005	OP Australians ≥60yo, included smokers, ex-smokers, non-smokers	1,030	Consecutive OP asked to complete survey	Never smokers, ex-light smokers, ex-heavy smokers, and current smokers respectively have higher depression rates (7.7%, 8.5%, 13.8%, & 17.4%) and fair or poor health (25.7%, 29.0%, 36.5%, & 43.1%, respectively).
Houston	2005	≥65yo Medicare beneficiary smokers admitted with AMI and discharged home	16,743	Verified if IP quit advice charted, 1m, 2m, & 2 year mortality status	41% advised to quit. Mortality rates lower for those advised at 1m (2.0% vs. 3.0%), 2m (3.7% vs. 5.6%), and 2 years (25.0% vs. 30.0%), p<.0001. Sicker patients advised less to quit.

Sample abbreviations- yo: Years old; CHD: Coronary heart disease; SNF: Skilled nursing facility; OP: Out-patient; AMI: Acute myocardial infarction
Design detail abbreviations- IP: Inpatient; m: Month(s)
Key findings abbreviations- FEV: Forced expiratory volume over 1 second; RR: Risk ratio; CI: Confidence interval

Table III: Smoking prevalence of selected groups

Population	% of U.S. population	Overall smoking prevalence	Men smoking prevalence	Women smoking prevalence
Overall U.S. population	100.0%	21.6%	24.1%	19.2%
Older adults (≥65)	12.0% [a]	9.1%	10.1%	8.3%

Items without reference mark are based on CDC, 2005
a: Census Bureau, 2004

Table IV: Frequency of smoking cessation interventions

Investigator	Year	Sample	N	Design Details	Key Findings
Doescher	2000	Smokers with ≥ 1 MD visit in previous year ≥18yo who took nationwide survey	8,229	Smokers asked if MD advised them to quit smoking in last year	Overall, 48% received advice. Of those ≥65yo, 61% advised to quit. Higher advice also for those in poor health and with more MD visits.
Ossip-Klein	2000	≥50yo, ≥1 MD visit within year	1,454	Surveyed regarding if quit advice occurred	81% reported getting quit advice. Men & women received advice equally. Positive advice predictors: poor health, hospitalization, and being married.
Burns	2001	Wisconsin's on FFS Medicaid during the year of 1999	261,435	Number of beneficiaries compared with number receiving Rx cessation Tx	Only 2% (1,131) of the eligible smokers (~62,744) filled a cessation related prescription in 1999.
Brown	2004	≥65yo Medicare beneficiary smokers admitted with AMI and discharged alive	788	Verified if IP quit advice charted & 5 year mortality status	40% received cessation advice. Of those given cessation advice, 31% less likely to die within 5 years.
Watt	2004	Nursing staff in SNF	115	Surveyed about providing cessation advice	Less than half the nursing staff (46%) reported ever advising residents to quit smoking.
Conroy	2005	Out-patient Boston region smokers	765	Survey mailed to patients after office visit, smokers included in analysis	Recipients of smoking "5 'A's" (ask, advise, assess, assist, and/or arrange follow-up) were significantly more satisfied with the quality of care.
Schmitt	2005	20 homebound seniors and 68 Case Managers (of seniors)	68	All interviewed about older adult smoking views	Case Manager's views: concern about clients smoking with dementia, oxygen, or in bed. Intervention rare unless specific fire hazard. (Falsely) skeptical about client receptivity to quitting & quitting benefits. Client's views: unaware of health benefits of quitting.

Sample abbreviations- yo: Years old; AMI: Acute myocardial infarction; FFS: Fee for service; SNF: skilled nursing facility
Design detail abbreviations- IP: Inpatient; Rx: Prescription; Tx: Treatment

Table V: Tobacco treatment efficacy

Investigator	Year	Sample	N	Design Details	Key Findings
Dale	1997	65-82yo given Mayo Clinic cessation intervention 1988-1992	613	Find 6 month cessation predictors post-intervention (self report)	Overall, 25% quit. Multivariate positive cessation predictors were hospitalized at consultation (OR 0.80), non-smoking spouse (OR 0.62), motivated to quit (OR 0.57), all $p<0.01$.
Orleans	2000	Older adult outpatients	470	Cessation intervention 6m & 12m follow-ups	6 months: IG & CG cessation rates 40 & 33%. At 12 months: IG & CG cessation rates 33 and 31% (ns).
Hyland	2004	Residents of 22 small & medium size US communities	6,603	Survey data gathered for all in 1988, 1993, and 2001	By 2001, 42% had quit. Male, older, and low nicotine dependence were associated with increased cessation.
Falba	2005	Interviews of those born between 1931 & 1941 and their spouses	9,481	Baseline info in 1991, then follow-up in 1994, 1996, & 1998 assessed smoking	Cessation highly correlated with having a recent major health event.

Sample abbreviations- yo: Years old
Design detail abbreviations- m: Months
Key findings abbreviations- OR: Odds ratio; IG: Intervention group; CG: Control group; ns: Non-significant

CHAPTER 3

Efficacy of Smoking Cessation Interventions Among Special Populations: Review of the Literature From 2000 to 2005

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Abstract

The Department of Health and Human Services' 2000 Clinical Practice Guideline for Treating Tobacco Use and Dependence acknowledges that certain special populations have unique needs and considerations in regards to smoking cessation interventions. A review of the current smoking cessation literature identified the following special populations: women; older adults; gay, lesbian, bisexual, and transgender smokers; smokers with a psychiatric diagnosis; smokers with drug or alcohol addiction; American Indians and Alaska Natives; African Americans; Hispanics; and Asian Americans. Existing smoking cessation research pertaining to these special populations is assessed and an agenda for future research is proposed. The available smoking cessation randomized clinical trials for efficacy and other research relevant to these groups is insufficient. Some recent research progress has been made in the areas of smoking cessation and women, smokers with a psychiatric diagnosis, smokers addicted to drugs or alcohol, and African American smokers. There is, however, a paucity of research evaluating smoking cessation interventions and older adults, gay, lesbian, bisexual and transgender smokers, American Indians and Alaskan Natives, Hispanics, and Asian Americans. Further research relevant to the smoking cessation needs of these special populations can enable nurses and other health care providers to administer culturally adequate and efficacious smoking cessation interventions to these groups.

Efficacy of Smoking Cessation Interventions Among Special Populations: Review of the Literature From 2000 to 2005

The most comprehensive evidence-based document about smoking cessation interventions is the 2000 United States Public Health Service (USPHS) Clinical Practice Guideline for treating tobacco dependence (Fiore et al.). The guideline is based on a meta-analysis of 192 studies of mainly middle-class white males volunteering for smoking cessation interventions (Benowitz, 2002; Mazas & Wetter, 2003). The lack of published research relevant to various special populations hinders the authors' ability to make clear recommendations specific to the following groups: women; older adults; smokers with a psychiatric diagnosis; smokers with illicit drug and/or alcohol addiction; gay, lesbian, bisexual, and transgender (GLBT) populations; American Indians and Alaska Natives (AIAN); African Americans; Hispanics; and Asian Americans. The United States continues to become more diverse (Census Bureau, 2000), and the negative health effects of smoking are often disproportionately high for these special populations (Benowitz, 2002; U.S. Department of Health and Human Services, 1998, 2001, 2004). Furthermore, (Table II) according to the Center for Disease Control and Prevention (CDC), many of these special populations have smoking prevalence rates much higher than that of the general population (2005). Reducing tobacco related harms among these groups requires better understanding of what smoking cessation treatments would most benefit these special populations. This review identifies gaps in the literature, evaluates important findings of recent clinical trials that study the efficacy of smoking cessation interventions pertaining to these special populations, and concludes with a discussion of appropriate goals for future nursing research.

Methods of Bibliographic Search and Review

Clinical trials were sought from the United States (U.S.) National Library of Medicine's Medline database using the key words: smoking cessation and women, female, geriatric, senior citizen, older adult, psychiatric disorder, schizophrenia, bipolar, affective disorder, alcoholic, drug addiction, alcohol addiction, gay, lesbian, homosexual, bisexual, transgender, Native American, American Indian, Alaska Native, African American, black, Hispanic, Chicano, Latino, Mexican American, Spanish speaking, Puerto Rican, Cuban American, Asian, Asian American, Korean American, Chinese American, Vietnamese American, or Japanese American. Other information sources included the databases PsycINFO and PsycARTICLES as well as the U.S. Center for Disease Control and Prevention (CDC) and the U.S. Surgeon General's Office. Several review articles obtained during the search were used, including a 2003 comprehensive review by Lawrence et al. that pertains to AIAN, African Americans, Hispanics, and Asian Americans. Studies focusing on smoking cessation during pregnancy were excluded from this analysis. All English language clinical trials containing the keywords, including smoking cessation outcomes specific to one of the special populations, and published between January 2000 and May 2005 were included. Fifteen such articles were identified (Table II). Whenever feasible (given the reporting methods), a two tailed alpha level of 0.05 was used to determine statistical significance, and participants lost to follow-up were considered relapsers.

Women

Smoking prevalence is 19.2% (Table II) among women (CDC, 2005). All four of the large smoking cessation studies found (some of which had multiple publications)

focusing specifically on women (Table I) occurred within the period of this review (Cooper et al., 2005; Froelicher & Christopherson, 2000; Froelicher, Christopherson, Miller, & Martin, 2002; Froelicher & Kozuki, 2002; Froelicher, Li, Mahrer-Imhof, Christopherson, & Stewart, 2004; Froelicher, Miller et al., 2004; Froelicher, Sohn, Max, & Bacchetti, 2004; Mahrer-Imhof, Froelicher, Li, Parker, & Benowitz, 2002; Martin et al., 2000; McKee, O'Malley, Salovey, Krishnan-Sarin, & Mazure, 2005; Secker-Walker, Holland, Lloyd, Pelkey, & Flynn, 2005; Spring et al., 2004). The McKee study obtained demographic information of 573 participants; about half were women (McKee et al., 2005). Women were found to smoke fewer cigarettes per day, have fewer lifetime quit attempts and shorter quit attempts, have lower Fagerstrom Nicotine Dependence test scores, and be more concerned about post-cessation weight gain (McKee et al., 2005).

In three of the four clinical trials, the final follow-up smoking cessation rates of the intervention groups were not significantly different than the smoking cessation rates of the control groups (Cooper et al., 2005; McKee et al., 2005; Spring et al., 2004). Only the study reported by Froelicher et al. had a significant difference in continuous smoking cessation over one year (2004). The Spring study also examined the efficacy of dietary intervention to prevent weight gain; however, none of the three groups in that study's final follow-up differed significantly in weight gain (Spring et al., 2004). Since only one in four of these studies documented efficacy in smoking cessation and relapse prevention for women, further research is needed. Even small strides in this area could make a large difference since such a high proportion of U.S. smokers are women (Census Bureau, 2004).

Older Adults

Twenty-two percent of adults aged 45 to 65 years and 9.1% of adults over 65 are smokers (CDC, 2005). Reduction in the prevalence rate with increasing age is due in part to competing mortality since smokers, on average, die 13 to 14 years earlier than nonsmokers (CDC, 2002). Older adults are more likely to have one or more preexisting medical conditions, be on medications, have economic hardships, and have sensory or cognitive impairments that limit the effectiveness of some types of educational presentations (Andrews, Heath, & Graham-Garcia, 2004; Brown et al., 2004). Older adults who quit smoking reduce their risk of disease or death from a smoking-related disease (Brown et al., 2004; Critchley & Capewell, 2003) by almost 50% (U.S. Department of Health and Human Services, 2004).

This review found no clinical trials focusing on older adults and smoking cessation. Some samples contained high proportions of older adults due to the subjects meeting certain disease related clinical criteria (Bolman et al., 2002; Froelicher, Li et al., 2004; Hajek et al., 2002; Quist-Paulsen & Gallefoss, 2003; Tonstad et al., 2003). Because gerontological issues were not a focus of these studies, little or no analyses were reported specific to the older adults within the sample. Some studies have observed older age to be associated with improved smoking cessation outcomes (Ahluwalia, Harris, Catley, Okuyemi, & Mayo, 2002; Eichner et al., 2005; Hajek et al., 2002; Hyland et al., 2004); statistical methods used to determine the significance of age related cessation outcomes varied. Because age related analyses have not been a major focus of any clinical trial, little is known about possible interactions between older age, longer duration of smoking exposure, and cessation outcomes (Ahluwalia et al., 2002; Eichner et al., 2005; Hajek et al., 2002; Hyland et al., 2004).

Smokers With a Psychiatric Diagnosis

Smoking prevalence is approximately 41% for those with psychiatric conditions (Lasser et al., 2000) and is much higher among certain subsets of that population, such as those with schizophrenia and bipolar disorder (Rosen-Chase & Dyson, 1999). Because presence of a psychiatric condition is often an exclusion criterion for smoking cessation clinical trials, little is known about this population's response to cessation interventions (McFall et al., 2005; Prochaska et al., 2004).

Two clinical trials focusing on smokers with a psychiatric diagnosis were identified, one focusing on participants with post traumatic stress disorder (McFall et al., 2005) and the other on participants with schizophrenia (Dolan et al., 2004; George et al., 2002). Both of these studies initially were successful at significantly reducing the smoking rates within the intervention group as compared with the control group (George et al., 2002; McFall et al., 2005). However, in both cases this success was not sustained at the long term follow-up point (Table I). The diminished effect size occurring between the completion of the cessation intervention and the long term follow-up indicates that these smokers might require interventions of longer duration in order to attain successful long term smoking cessation.

Smokers with Illicit Drug and/or Alcohol Addiction

Those addicted to alcohol and/or illicit drugs have rates of smoking reaching approximately 80% (Miller & Gold, 1998; Shoptaw et al., 2002); health-care providers have long resisted using cessation interventions for smokers with these addictions (Burling, Burling, & Latini, 2001; Joseph, Willenbring, Nugent, & Nelson, 2004; Lemon, Friedmann, & Stein, 2003; McFall et al., 2005; Prochaska et al., 2004; Romberger & Grant,

2004; Shoptaw et al., 2002; Substance Abuse and Mental Health Services Administration, 2005). Resistance to providing smoking cessation interventions might be due to concern that smoking cessation interventions would overwhelm members of this group and result in poor outcomes related to their non-nicotine addiction and that many participants might be lost to follow-up.

This search identified five clinical trials (Burling et al., 2001; Gariti et al., 2002; Joseph et al., 2004; Rohsenow, Monti, Colby, & Martin, 2002; Shoptaw et al., 2002) involving smoking cessation in smokers with drug or alcohol addiction (hereafter SDAA) populations. Of these clinical trials, two focused on alcohol-abusing participants (Joseph et al., 2004; Rohsenow et al., 2002), two on those addicted to either alcohol or illicit drugs (Burling et al., 2001; Gariti et al., 2002), and one on patients in a methadone clinic (Shoptaw et al., 2002). Among these five clinical trials addressing SDAA, cessation interventions showed significantly better rates of smoking cessation for the IGs than for the CGs during or shortly after completion of the intervention (Table I), but long term follow-up review (≥6 months) consistently showed that the smoking cessation rates did not differ significantly between groups (Burling et al., 2001; Gariti et al., 2002; Joseph et al., 2004; Rohsenow et al., 2002; Shoptaw et al., 2002). This finding indicates that more efforts are needed to determine how best to facilitate long-term cessation for SDAA. Interventions of greater intensity or of longer duration may be needed. Showing significant effect sizes requires recruitment of large samples since this group has reported high losses to follow-up (Joseph et al., 2004).

Four of the five studies in this category support the concept that smoking cessation interventions are not detrimental to drug and/or alcohol treatment outcomes (Burling et al.,

2001; Gariti et al., 2002; Joseph et al., 2004; Lemon et al., 2003; Rohsenow et al., 2002; Shoptaw et al., 2002); however, this may be because those four studies (Table I) had inadequate sample sizes to detect differences in drug and/or alcohol related outcomes. The Joseph study, which was rigorous in its design and analysis, included self reports and biological confirmation for both nicotine and alcohol cessation outcomes; the study also showed the smoking cessation intervention, when administered concurrently with intensive alcohol abuse treatment, to have a significantly negative effect on alcohol treatment outcomes (Joseph et al., 2004). The Joseph results, which demonstrated insignificant IG smoking cessation outcomes in conjunction with poor alcohol related outcomes, draw into question the wisdom of providing intensive smoking cessation and alcohol cessation interventions concurrently. More clinical trials will have to occur for SDAA to verify the Joseph findings and to determine if smoking cessation interventions are detrimental to those being treated for other (non-alcohol) drug addictions.

Gay, Lesbian, Bisexual, and Transgender Smokers (GLBT)

A large study found smoking rates for lesbians, bisexual women, gay men, and bisexual men to be 25%, 27%, 33%, and 20% respectively (Tang, 2004). GLBT populations have been a target for tobacco industry marketing (Stevens et al., 2004). Despite high prevalence of smoking in GLBT populations, few studies have examined how they respond to cessation interventions (Harding, Bensley, & Corrigan, 2004). This review identified only one pilot study related to these groups. The study, which took place in England, consisted of a convenience sample of 69 gay men (Harding et al., 2004) who received a seven week smoking cessation intervention treatment addressing withdrawal and pharmacological therapy. At the end of therapy, 46% of those men were confirmed to have

quit smoking. While these results are somewhat encouraging, much more research is needed to determine the efficacy of smoking cessation interventions with these populations.

American Indians and Alaska Natives

AIAN smoking prevalence is 39.7% (CDC, 2005). Despite this extremely high smoking prevalence rate, no clinical trials for AIAN were identified within the search parameters. A review by Lawrence et al. (2003) identified three older clinical trials pertaining to AIAN in which cessation results never differed significantly between the IGs and CGs (Hensel et al., 1995; Hodge & Casken, 1999; Johnson, Lando, Schmid, & Solberg, 1997). Although it is hypothesized that tobacco related cultural practices may negatively impact AIAN smoking cessation intervention effect sizes, confirmatory clinical trials are needed (Barnes, 2005; Eichner et al., 2005; Gohdes et al., 2002).

African Americans

Although African American men (25.5%) and women (18.3%) smoke at rates similar to those of the general population (Table II), they suffer a disproportionately high amount of the health consequences associated with smoking, especially lung cancer and CVD (CDC, 2005; Davies et al., 2005; Fiore et al., 2000). As compared with non-Hispanic white smokers, African Americans smoke fewer cigarettes per day, smoke cigarettes that are more often mentholated and higher in tar and nicotine, make more attempts to quit per year, are less likely to quit successfully, tend to be less informed about the health consequences of smoking, and are less likely to receive smoking cessation interventions (Ahluwalia et al., 2002; Ahluwalia et al., 1998; Benowitz, 2002; Davies et al., 2005; Fiscella & Franks, 2005; Harris et al., 2004; Okuyemi et al., 2003).

Lawrence et al. (2003) identified 24 published smoking cessation studies with results for African Americans. Only seven showed a significant increase in the cessation rates for the IG as compared with the CG. The cessation rates in those seven studies ranged from 14.3% to 30% in the IG and from 0% to 19% for the CG. Two of the 24 studies showed significantly greater cessation rates for the CG than for the IG. The lack of consistent results among these studies may, in part, reflect inadequate sample sizes, interventions inconsistent with current guidelines, and an over-reliance on self reports without bioconfirmation.

Only one clinical trial (which included 3 publications) occurring later than the Lawrence review was found (Ahluwalia, 2002; Harris et al., 2004; Okuyemi et al., 2003). This large (n=600), well-designed randomized clinical trial (Table I) demonstrated cessation rates significantly higher for the IG compared with the CG for all follow-up points. While encouraging, further research is needed to better understand how genetic, pharmacologic, and cultural components interact with smoking cessation interventions (Benowitz, 2002).

Hispanic Populations

Smoking prevalence is 16.4% among Hispanics. Compared with non-Hispanic whites, Hispanics are less likely to be heavy smokers but are also less likely to receive smoking cessation advice from health care providers or to use nicotine replacement therapy to quit smoking (Bock, Niaura, Neighbors, Carmona-Barros, & Azam, 2005; Census Bureau, 2002; Levinson, Perez-Stable, Espinoza, Flores, & Byers, 2004). The Lawrence review discusses 10 older cessation clinical trials about Hispanics, of which only 2 found statistically significant results (2003).

This review identified one useful smoking cessation intervention study published from 2000 to 2005 (Bock et al., 2005). A second clinical trial was excluded since it had only a one week follow-up which was deemed inadequate to meaningfully gauge the success or failure of the intervention (Woodruff, Talavera, & Elder, 2002). Bock used a convenience sample (n=615) of less-acculturated Hispanics (LA), bicultural Hispanics (BC), and non-Hispanic whites (NH) from the New England region. All received the same smoking cessation interventions which included receiving nicotine patches (Table I). The intervention was administered in English or Spanish. At the six month follow-up review, cessation rates for the BC and NH were 9.2% and 12.9% respectively. The cessation rate of 21.3% for the LA was significantly higher ($p<0.05$). A weakness of this study is the exclusive reliance on self reports. That being the case, it is not known if results were confounded as a result of potential group differences in self reporting accuracy. If accurate, these results suggest that cessation interventions geared towards Hispanics should provide interventions specific to the acculturation level of the participant.

Asian Americans

Smoking rates (Table II) for Asian men (17.5%) are much higher than for Asian women (6.5%) (CDC, 2005). Between the date parameters, only one intervention study about Asian Americans was identified (Chen, 2001). This study, by Chen, was one of three studies reviewed by Lawrence et al. (2003). The Chen study did not have a significant cessation rate difference between the IG and CG. Although outside of the date parameters, the remaining 2 studies in the Lawrence review both demonstrated significantly worse cessation results in the IGs as compared with the CGs (Jenkins et al., 1997; McPhee et al.,

1995). At this time, evidence of efficacious smoking cessation treatments for Asian Americans is completely lacking.

Conclusion

This review demonstrates that little is known about how these special populations respond to smoking cessation interventions. In regards to older adults, GLBT, AIAN, Hispanics, and Asian Americans, there are very few, if any, studies to guide clinicians who provide smoking cessation interventions. In the case of smokers with psychiatric diagnoses and smokers addicted to other drugs and/or alcohol, none of the recent clinical trials demonstrated cessation rates statistically better than the control groups. This demonstrates that these special populations do have unique smoking cessation needs and that more research is highly needed. Of all of the special populations, women, African Americans, and Hispanics were the only ones who demonstrated statistically significant positive effects from the cessation intervention, and more research will be needed to confirm these results. The current state of the research is still inadequate to give clear guidelines regarding how to provide optimal smoking cessation interventions for these special populations. Future research should attempt to differentiate what approaches are most efficacious for these various special populations.

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Table I. Special Populations and Smoking Cessation Interventions 2000-2005

Investigator	Year	Design	N	Sample	Intervention	Bioconfirmation	Follow-up period (months unless annotated)	— IG — Intervention Group quit % (significance)	— CG — Control Group quit % (significance)
Special Population									
Women									
Spring et al.	2004	RCT	315	CB	2 IGs, 1 CG, all 3 received E, BI. IG#1 ED, IG#2 LD	expired CO	3, 9	IG#1:38.5,21.4 IG#2:39.4,19.5	29.9,18.2 (ns)
Froelicher et al.	2004	RCT	278	IP	E, Rx, BI	salivary cotinine	6,12,24,30	52,48,49,50	41,42,46,50 (ns)
Cooper et al.	2005	RCT	439	CB	2 IGs, 1CG, all 3 received E, BI, IG#1 PPA gum, IG#2 nicotine gum	expired CO	6, 12 months	IG#1: 15.0,15.0 IG#2: 11.6,11.6	10.8,10.1 (ns)
McKee et al.	2005	QE	93 ~50%♀	CB	Rx, BI,	expired CO	6 weeks	Overall women-34%, men 44% (ns)	
Older Adults (≥ 60 years old)									
no studies found									
Psychiatric Diagnosis (other than alcohol/drug addiction)									
George et al.	2002	RCT	32	OP, Schz	E, Rx, BI	expired CO	2.5, 6	50,18.8	12.5,6.3 (ns)
McFall et al.	2005	RCT	66	OP, PTSD	E, Rx, BI	expired CO	2,4,6,9	43,30,21,18	13,13,10,6 (ns)
SDAA									
Burling et al.	2001	RCT	150	IP drug/ alcohol rehab	all groups Rx IG#1:BI+E IG#2:BI CG:UC	expired CO	1,3,6,12	IG#1:27,12,11,13 IG#2:40,18,18,19	2,11,10,13 (ns)

Table I
(contin)

Shoptaw et al.	2002	RCT	175	OP on metha-done	2 IG, 2 CG, all groups:Rx. IG#1:CM IG#2: CM +E CG#1:E CG#2: UC	expired CO	3,6,12	IG#1:35,3,3 IG#2:27,5,3	CG#1:21,3,5 (ns) CG#2:14,10,10 (ns)
Gariti et al.	2002	RCT	64	IP drug rehab	BA, Rx, BI	expired CO & urine cotinine	6	6	0 (ns)
Rohsenow et al.	2002	RCT	126	IP alcohol rehab	IG: MI, Rx CG: BA, Rx	expired CO	3,6	13,2	35,13 (ns)
Joseph et al.	2004	RCT	499	IP/OP alcohol rehab	E, Rx, BI IG/CG: concurrent/ delayed cessation intervention	expired CO	3,6,12,18	15.5,10.8,12.8,12.4 (ns)	4.4,5.2,10.1,13.7 (ns)
Gay, Lesbian, Bisexual, and Transgender (GLBT) Populations									
Harding et al.	2004	QE	98	OP gay men	E, Rx, BI. No CG	expired CO	7 weeks	46	
American Indians and Alaska Natives (AIAN) ¥									
no studies found									
African Americans¥									
Ahluwalia et al.	2002	RCT	600	CB AA OP	BI, Rx (Bupropion)	Exp CO	1,3,6,26 weeks	36,31,36,21	16,14,19,14 (ss)
Hispanic¥									
Bock et al.	2005	QE	615	OP	groups LA,BC,NH E, Rx, BI	none	3,6	LA: 34,21 BC: 20,9	NH: 23.5,13 (ss)
Asian American¥									
Chen	2001	QE	146	CB	E	salivary cotinine	not stated	10	0 (ns)

Table I (continued) Legend:
Design codes- QE: Quasi-Experimental Design, RCT: Randomized Controlled Trial.
Sample codes- AA: African American, CB: community based, IP: in-patient, OP: out-patient, PTSD: Post-traumatic stress disorder, Schz: schizophrenia
Intervention Related Codes- BI: Behavioral Intervention, BC: bicultural, CG: control group, CM: contingency management (vouchers rewarding low exp. CO), E: Special education material provided, BI: brief advice, ED: weight gain prevention intervention at start of smoking intervention, IG: intervention group, LA: less acculturated, LD: weight gain prevention intervention at end of smoking intervention, MI: motivational interviewing, NH: non-Hispanic, PPA gum (now banned by FDA): phenyl-propanolamine gum, Rx= cessation medication provided, UC: usual care.
Significance codes- ss: statistically significant difference at final follow-up ($p<.05$), ns: not statistically significant at final follow-up.
¥: See Lawrence article for studies before 2000 about American Indian and Alaska Natives, African Americans, Hispanics, and Asian Americans

Table II. Overall Smoking Prevalence Among Special Populations in the United States

Population	% of U.S. population	Overall smoking prevalence	Men smoking prevalence	Women smoking prevalence
	%	%	%	%
Overall U.S. population	100.0	21.6	24.1	19.2
Women	51.1[a]	19.2		19.2
Older adults (≥65)	12.0[a]	9.1	10.1	8.3
Psychiatric Diagnosis	28.3[b]	41[b]		
Illicit Drug or Alcohol Addict.	9.4[c]	80[d]		
Gay/Lesbian	2.1[e]		33.2[e]	25.3[e]
Bisexual	1.8[e]		18[e]	27[e]
American Indian/ Alaska Native	0.8[a]	39.7	42.0	37.3
African American	12.2[a]	21.5	25.5	18.3
Hispanic	14.2[a]	16.4	22.1	10.3
Asian American	4.2[a]	11.7	17.5	6.5
Non-Hispanic White	70.0[f]	22.7	24.3	21.2

Items without reference mark are based on CDC, 2005
a: Census Bureau, 2004
b: Lasser, 2000
c: Substance Abuse and Mental Health Services Administration, 2005
d: Miller, 1998; Shoptaw, 2002
e: Tang, 2004: based on self reports in large random dialing tobacco questionnaire phone survey
f: Census Bureau, 2002

CHAPTER 4

Using an Existing Data Set to Answer New Research Questions

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Abstract

Background: The vast majority of the research methods literature assumes that the researcher designs the study subsequent to determining research questions. This assumption is not met for the many researchers involved in secondary data analysis. Researchers doing secondary data analysis need not only to understand research concepts related to designing a new study, but additionally must be aware of challenges specific to conducting research using an existing data set.

Approach: Appropriate steps to determine if secondary data analysis is appropriate, identifying, obtaining and evaluating a data set, refining research questions, managing data, calculating power, and reporting results are discussed. Examples from nursing research are provided.

Results and Discussion: If an existing data set is suitable for answering a new research question, then a secondary analysis is usually preferable since it can often be completed in less time, for less money, and with far lower risks to subjects. The researcher performing the secondary analysis must carefully consider if the existing data set is adequate to answer the proposed research questions. At times, refining the research questions to better match the available data set may be necessary; however, if this is done, a thorough review of the literature must confirm that the amended research questions are appropriate and have not already been answered within the

existing literature. In addition to determining if a data set contains needed measures, researchers doing a secondary analysis must determine if the data set is of sufficient quality and if the number of subjects provides adequate power to answer the proposed research question.

Using an Existing Data Set to Answer New Research Questions

Researchers often use existing data sets to answer important research questions (Clarke & Cossette, 2000; Mainous & Hueston, 1997). Existing data sets from cross sectional studies, randomized control trials, other longitudinal studies, case-control studies, and ecological studies can all potentially be used to answer research questions that the original study was not designed to answer. However, almost all of the literature about conducting research includes the presumption that the researcher will design the methods, including recruitment, data collection, and (if applicable) intervention procedures subsequent to the determination of the research questions (Shadish, Cook, & Campbell, 2002). A researcher who uses an existing data set requires knowledge of general research principles and techniques. Additionally, this researcher must understand concepts that are unique to the challenges associated specifically with analyzing an existing data set. This article will describe issues specific to using an existing data set and provide guidance for those analyzing an existing data set to answer new research questions.

Definition of Terms in Secondary Analysis

Secondary analysis involves the use of an existing data set to answer research questions. This article will refer to the study that first obtained the data set as the "parent study" and the primary investigator (PI) of the parent study as the "*original* PI". Otherwise, use of the term PI will refer to the new investigator analyzing the existing data set. If the secondary analysis involves answering the same research question asked of the data by the original PI, then the purpose of the secondary analysis is confirmatory in nature (Bjorner, Kosinski, & Ware, 2003). This article will focus specifically on secondary analysis that uses an existing data set to answer new research questions that are

different from those asked by the original investigator. A data set is information that has already been collected. Therefore, secondary analysis includes those doing research using existing medical records. The types of secondary analysis possible are as diverse as the types of research methodologies and samples.

Determining if Secondary Analysis is Appropriate

In the case of the parent studies, identification of the research question helps guide selection of the study design. Once a research question is formulated, the original PI further reviews the literature, decides on the study design, chooses measures, and determines what sample size is appropriate (Mainous & Hueston, 1997). Working with an existing data set requires researchers to work within the confines of whatever study design and measures were chosen for the parent study. However, it would be a mistake to conclude that the PI need not worry about decisions already made when the data was originally collected. Rather, the PI is faced with a new and different set of challenges associated with critically evaluating strengths and limitations of the data set as they relate to the proposed research question.

For secondary analysis to be appropriate, the PI must have an important research question and a data set that is adequate to address the question (Table I). If a particular data set is not appropriate for answering the proposed research question, the researcher may alter the research question so that it better fits the data, seek an alternative data set, or design a new study.

Benefits and Limitations of Secondary Analysis

Upon the completion of the literature review and formulation of a desired area of inquiry, the PI should consider if secondary analysis is advisable. To do this, benefits and limitations must be considered. Obvious advantages of secondary analysis are that

the PI can answer research questions in less time, with lower costs than when using other research approaches (Clarke & Cossette, 2000; Jacobson, Hamilton, & Galloway, 1993; Mainous & Hueston, 1997). This is especially true when answering the research question requires large numbers of subjects and/or following subjects over a long period of time. Furthermore, because performing research on a sample inevitably involves some degree of risk for the subjects, those performing secondary analysis have the benefit of answering important research questions without putting subjects at risk of adverse reactions or other harms associated with participation.

For example, in a 1981 randomized controlled trial (Table II), Sivarajan investigated the effects of exercise training after a myocardial infarction (Sivarajan et al., 1981). The data set contained rich information about predictor variables. Ten years later, Froelicher investigated subsequent mortality information among the original 258 subjects. This secondary analysis was able to identify numerous exercise test and clinical variables as predictors of ten year mortality for post-myocardial infarction patients (Froelicher, 1994). Furthermore, these results were obtained at a fraction of the cost and in far less time than would have been necessary had the study included data collection and a ten year wait to obtain follow-up outcomes.

A limitation of a secondary analysis is that by using a study that was planned for a different research question, methods used and measures chosen will inevitably differ from those that might have otherwise been selected. As a result, the PI will need to build a case in support of the data set. Because the data has already been compiled, changes that have occurred over time might limit the appropriate research questions. For example, clinical outcomes observed prior to current treatment protocols have much more limited research potential.

Preparatory Work to Be Done Prior to Identifying Data Set

If the PI anticipates doing secondary analysis, it is important to define the research question prior to identifying a data set (Clarke & Cossette, 2000). By formulating ideas about the research areas that are of interest, the PI will be able to narrow the range of possible data sets (Table III). This requires both introspection in terms of interest areas and familiarity with the research literature. As the PI narrows the focus of the desired line of inquiry, a comprehensive literature review occurs. Completing this literature review and maintaining open communication channels with informed scientists helps to ensure that the proposed research question is appropriate (Clarke & Cossette, 2000; Jacobson et al., 1993; Mainous & Hueston, 1997).

Identifying and Obtaining a Data Set

The PI should identify variables needed to answer the desired research question and seek data sets containing such variables. Data sets, some of which may include very large samples, can often be obtained at minimal costs (Clarke & Cossette, 2000; Mainous & Hueston, 1997). Some public sources of data are available through various government agencies, the National Center for Health Statistics, Medicare, Medicaid, the National Institute of Health, the Center for Disease Control and Prevention, and the Census Bureau (Jacobson et al., 1993; Mainous & Hueston, 1997). Some private sources of data sets are international agencies such as the World Health Organization, colleges and universities, colleagues with similar research interests, health insurance companies, and other private companies such as pharmaceutical companies (Jacobson et al., 1993; Mainous & Hueston, 1997). Shifts in research standards have occurred which favor the sharing of data sets (Berman, 2003). Press releases scrutinizing pharmaceutical

companies' concealment of data relevant to public health might facilitate policy trends that promote the sharing of data sets (Meier & Timmons, 2005).

If a data set is being sought from an individual, the proprietor of the data set will have legitimate concerns about how the data will be used. Original PIs who have obtained high quality data will want to ensure that it is used to answer important research questions during the secondary analysis (Clarke & Cossette, 2000). The PI requesting access to the data set should be prepared to discuss specific research aims and objectives with the original PI (Clarke & Cossette, 2000). The original PI may reserve certain types of analyses for another researcher and/or student. If this is the case, the PI requesting the data set must evaluate if the analytic options available are sufficient to perform the desired research (Jacobson et al., 1993).

A successful example of this involves a study Wong performed. Wong obtained a data set that was compiled by Kaiser of Northern California (Selby et al., 1996; Wong et al., 1997). The parent study determined that patients who experienced myocardial infarctions that met the guidelines for coronary angiography (CA) had better clinical outcomes if they went to hospitals that were more likely to perform CA (Selby et al., 1996). Wong used this same data set (Table IV) to look at gender related diagnostic and treatment decisions and to assess whether gender bias existed (Wong et al., 1997). Wong determined that women received CA and revascularization procedures at lower rates than men and that women had significantly higher crude cardiovascular disease mortality rates (Wong et al., 1997). Conversely, men tended to have procedures for the diagnosis of coronary artery disease even when there were no indications (Wong et al., 1997). Thus, a reasonable conclusion is that gender bias existed: for women, in the direction of fewer

diagnostic tests even when clear indications were present; for men, more diagnostic tests, even without indications.

Refining Research Questions and Evaluating the Data Set

Finding meaningful answers to research questions requires a good fit between the research question and the data set. The PI should only consider data sets for which there is evidence that the data are of a high quality. Additionally, the PI should determine if the parent study included a research proposal, a codebook, and a manual of operations. If review of this information does not suggest adequate data quality, the PI should not proceed using that data set.

If the data set is of sufficient quality, the PI then determines if the sample and measures used in the study are a good fit. This may require that research questions and hypotheses be refined to better fit the available data set. The research question may need to be modified depending on the data available. If the research question is modified, a review of the literature must determine if the modified research question is relevant and unanswered by prior research.

When the PI has verified the data quality and measurements are adequate, the PI must consider concerns such as the extent of missing data and possibly the loss of subjects to follow-up. Loss to follow-up is an important concern if the research question requires data collection over time to determine the outcome status. If missing data are excessive, use of the data set may not be appropriate. It is essential to determine this information early to avoid investing extensive time on a project that ultimately will not realize success.

Data Management Considerations

Decisions made during the parent study about how data are entered and stored can greatly influence how the PI must manage the data set (Jacobson et al., 1993). Data sets compiled in paper and pencil form or on software programs that are incompatible with the PI's software will need to have a database conversion. Technological advances have decreased the likelihood of facing problems such as needing to convert data kept in "machine readable data tape formats"; however, such problems do occasionally still arise (Clarke & Cossette, 2000).

When data is transferred into the desired software, it is important for the PI to verify that accurate transfer has occurred by computing descriptive statistics and comparing them with those reported in the analysis of the parent study (Clarke & Cossette, 2000). If this step is omitted, the researcher might not realize if data corruption occurred during the transfer. The PI should look for any obvious outliers, evaluate if any data are suspiciously beyond values that might reasonably be expected, and verify that the number of subjects claimed to be available indeed are present in the data set.

Ethical, Legal, and Data Security Considerations

It is likely that legal, regulatory, and ethical guidelines have changed since the time of the original study (Clarke & Cossette, 2000; Jacobson et al., 1993; Kneipp & Yarandi, 2002; Mainous & Hueston, 1997). For example, data sets containing health care information obtained and analyzed prior to the implementation of HIPPA occurred under standards less restrictive than current research protocols. The ultimate interpretation of the HIPPA regulations will likely emerge from case law that, as of yet, has not been thoroughly litigated. Therefore, the PI requires familiarity with both legal and conventional standards associated with managing such a data set. It is here that organizational Ethics Committees and Institutional Review Boards play a crucial role in

determining that the data are being used in a legal and ethical manner. Sensitive information about subjects must be diligently protected. Even if a loss of subject confidentiality is unlikely to harm a study's subjects, the scientific community's credibility with the public relies on the public's confidence that researchers will diligently safeguard and appropriately manage subjects' personal information.

Power Calculation and Statistical Issues

When planning a study that involves subject recruitment, a researcher must calculate the sample size needed to answer the research question(s) or, alternatively, the numbers needed to treat (Shadish et al., 2002). In the case of a secondary analysis, the sample size is predetermined. However, the PI must still consider the implications of the available number of subjects. The PI needs to determine that the sample size available in the data set provides enough power to investigate the new research question. This involves calculating the power, which requires the following four values: the alpha level, the effect size, the variability, and the number of subjects. The power, or the likelihood of correctly rejecting a false null hypothesis, is conventionally set at .80 (Clarke & Cossette, 2000; Shadish et al., 2002; Shott, 1990). Alpha, or the likelihood of rejecting a true null hypothesis (type I error), is conventionally set at .05. Because secondary analysis contains a fixed number of subjects, there is no remedy for a sample that is too small. Caldwell did a secondary analysis using the National Registry of Myocardial Infarction (NIRNI) data set (Table V). A lack of power was one possible explanation of why no effect was detected for the cost outcome variable (Caldwell, Froelicher, & Drew, 2000).

Some data sets used in secondary analysis have extremely large samples. Since large samples can demonstrate statistical significance with smaller effect sizes, it is

important to determine not only if results are statistically significant (Shott, 1990), but also if the effect size is clinically meaningful.

Presentation of the Methods Section for Current and Parent Study

The specific challenges that result from using an existing data set will vary from one research project to the next. When stating limitations, it is important to identify as precisely as possible the strengths and weaknesses the data set has that relate to the secondary analysis questions (Jacobson et al., 1993; Mainous & Hueston, 1997). When writing the methods section of the secondary analysis, information about the parent study should be briefly described. While it may be necessary to refer interested readers to a publication with further details about the parent study, the PI should at a minimum describe the basic aspects of recruitment and data collection since such information assists the reader in assessing potential problems or biases.

Just as the PI evaluated and determined the appropriateness of the data set prior to analysis, the PI must now present that case to the reader. The PI should be able to make a compelling case that the measures provide reliable, valid, and relevant data to address the research question. A secondary data set is not "good or bad"; rather, it does or does not have an adequate fit between the research question and the quality of the sample and measures (Mainous & Hueston, 1997). This requires that variables measured in the parent study are consistent with those necessary to answer the research question, and that the sample in the parent study reflects the population of interest and is large enough to detect a clinically meaningful effect size.

Conclusion

Secondary analysis is an excellent, less costly way for researchers to investigate and answer important research questions without waiting years to obtain results;

however, successful secondary analysis requires a methodological approach reflective of the inherent challenges. While the cost and the amount of time prior to analysis are reduced, other difficulties occur associated with refining the research questions and evaluating the appropriateness of the data set. It is important to be aware of distinct characteristics of secondary analysis so that foreseeable errors are avoided when selecting a data set and performing the analysis.

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CHAPTER 4

TABLES

Using an Existing Data Set to Answer New Research Questions

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Table I: Determining appropriateness of a data set for secondary analysis

The PI must be able to adequately confirm that the data is of sufficient quality
Given a particular research question, the data set must:
Contain an appropriate sample
Measure appropriate concepts
Include measures of sufficient detail and/or specificity
Contain data that is current enough to answer the research question
Not have excessive missing data
For research questions requiring a longitudinal design, the data set must:
Measure appropriate concepts in the necessary sequence
If repeated, have measures adequately sensitive to change over time
Not have excessive subjects lost to follow-up

Table II: Secondary analysis example one

Investigator/ Name of Parent Study	Year	Design/ N	Sample	Research Question	Intervention	Key Items Assessed	Results
Parent Study							
Sivarajan	1982	RCT/ 258	Patients admitted to Coronary care units in 7 Seattle hospitals	How does exercise started early after MI affect clinical outcomes?	IG: calisthenic and walking program CG: usual care	Patient demographic information, group; 3 & 6 month treadmill test and cardiac status follow-up	No homodynamic differences between the groups were found at 3 and 6 months. Overall subjects' resting heart rate and blood pressure improved significantly
Secondary Analysis							
Froelicher	1994	RCT/ 258	Same as above, with an added 10 year follow-up	Does exercise after acute MI predict 10 year mortality?	same as above	Mortality info collected for 10 year follow-up	Several risk predictors identified, including 3 exercise variables: hypotensive BP response, ST-seg. depression, & ST-seg elevation

Design codes- RCT: Randomized controlled trial
Research question codes- MI: Myocardial infarction
Intervention- IG: Intervention group, CG: Control Group,
Results codes- seg: Segment

Table III: Steps to take during secondary analysis

1. Perform literature review
2. Find gaps in the research and find research opportunities
3. Identify and obtain permission from the original PI to analyze a data set
4. Refine research questions
5. Evaluate the appropriateness of the original sample, design, and measures*
6. Establish appropriate safeguards to protect data, and consider legal and ethical implications of the analysis
7. Obtain approval from the organization's IRB or equivalent committee
8. Perform secondary analysis
9. Disseminate findings to the research community

* Existing publications and discussions with the original PI are useful here since access to the raw data will not occur until IRB approval is granted (step 7)
IRB: Institutional Review Board

Table IV: Secondary analysis example two

Investigator/ Name of Parent Study	Year	Design/ N	Sample	Research Question	Key Items Assessed	Results
Parent Study						
Selby et al.	1996	HPL/ 6,851	≥25 year old hospitalized post-MI patients from California HMO	Do clinical outcomes, as measured by post-MI mortality rates, differ depending on hospital CA rates?	Patient demographics, cardiac procedures performed, follow-up death or repeat cardiac event within 4 years	Those for whom angiography was clinically indicated who went to hospitals with higher angiography rates were less likely to die from heart disease or have further cardiac events within 4 years
Secondary Analysis						
Wong et al.	1997	HPL/ 1,133 377 ♀ 756 ♂	Stratified sub-sample from Selby et al. study	Do differences exist by gender in use of CA, RV?	Same as above	Among those for whom CA was highly indicated, women (35%) were significantly less likely than men (43%) to receive it. Women's crude CVD mortality was higher than men's (HR 1.72, 95% CI 1.22, 2.44)

Design codes- : Historical Prospective Longitudinal
Sample codes- MI: Myocardial infarction
Research question codes- CA: Coronary angiography, RV: Revascularization
Intervention related codes- CA: Coronary angiography, CVD: Cardiovascular disease

Table V: Secondary analysis example three

Investigator/ Name of Parent Study	Year	Design/ N	Sample	Research Question	Key Items Assessed	Results
Parent Study						
Rogers et al. / NERMI: National Registry of Myocardial Infarction	1994	PL/ 240,989	Hospital patients with an AMI, >10,000 hospitals included	Are current research Tx guidelines being implemented in a timely manner?	Patient demographics, MI Dx method, MI related meds & procedures, discharge status	Some invasive treatments over-used, while various medication treatments underused or delayed
Secondary Analysis						
Caldwell et al.	2000	PL/ 298	Subset of above study, 2 hospitals	Can decreasing pre-hospital delays speed time to discharge or decrease costs?	Same as above and information from hospital cost accounting systems	Improved clinical outcomes and reduced costs not significantly associated with pre-hospital delay, possibly related to low power or measures without high sensitivity. Additional cardiac procedures and complications were both significant predictors of high cost ($p<.001$)

Design codes- PL: Prospective Longitudinal,
Sample codes- AMI: Acute Myocardial Infarction
Research question codes- Tx: treatment
Key Items assessed codes- MI: Myocardial Infarction, Dx: Diagnosis, meds: Medications

CHAPTER 5

The Women's Initiative for Nonsmoking (WINS) XI: Age Related Differences in Smoking Cessation Responses For Women With Cardiovascular Disease

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The Women's Initiative for Nonsmoking (WINS) XI: Age Related Differences in Smoking Cessation Responses For Women With Cardiovascular Disease

Smoking is the leading cause of preventable death and disease in the United States, causing an estimated 440,000 premature deaths annually (CDC, 2002); approximately 70% of the deaths attributable to smoking occur among older adults (Husten et al., 1997). Since women began smoking in high proportions, the number of lung cancer deaths has surpassed the number of breast cancer deaths among women (U.S. Surgeon General, 2001). Nineteen point two percent of U.S. women smoke (Census Bureau, 2004). Quitting smoking during older adulthood can reduce the risk of dying from a smoking related illness by almost 50% (U.S. Surgeon General, 2004).

Despite the severe consequences of smoking and the known benefits of smoking cessation for older women, very little research has focused on confirming the efficacy of smoking cessation interventions for women, and even less research has focused on how older adults respond to smoking cessation interventions. This study investigates how older women's short term and long term responses to smoking cessation interventions compare to those of younger women. This study will also examine how known predictors of smoking cessation may explain age related smoking cessation response differences.

Methods

Original study design.

The current study uses the data set from the Women's Initiative for Nonsmoking (WINS) to investigate age related smoking cessation differences among older women hospitalized with cardiovascular disease. Women smokers with CVD (n=277) were recruited from 1996 to 2001 from 12 California Bay Area hospitals to participate in a smoking cessation intervention RCT (Froelicher & Christopherson, 2000). Consenting

subjects that met the inclusion criteria had a baseline assessment obtained by a Clinical Nurse Specialist. The following were inclusion criteria: at least 18 years old, have smoked within 6 months of hospitalization, willing to make a serious quit attempt, and have one of the following diagnoses: angina pectoris, MI, angioplasty, coronary artery bypass surgery, heart failure, valvular abnormalities, peripheral vascular disease, or cerebrovascular disease (Froelicher & Christopherson, 2000). Exclusion criteria were the following: unable to read or speak English, having a current alcohol or other substance abuse diagnosis, being medically unstable, and having a concurrent psychiatric problem, such as schizophrenia or dementia (Froelicher & Christopherson, 2000).

After the baseline assessment was obtained, subjects were randomized to either the usual care group (UG) or the intervention group (IG) (Froelicher & Christopherson, 2000). Subjects in the UG were advised to quit smoking; those in the IG received the same advice plus a multimedia, multi-component, comprehensive behavioral smoking cessation intervention. Further details of the intervention have been published elsewhere (Froelicher & Christopherson, 2000). Subjects had their smoking status confirmed via a structured telephone interview at 6 and 12 months; those reporting to have quit smoking at the follow-up were asked to provide a saliva sample for biochemical confirmation of self-reported status (Froelicher & Christopherson, 2000).

Current Study Hypotheses.

The following hypotheses will be tested. In a population of women hospitalized with CVD:

Hypothesis 1: There is no difference between older (≥62) versus younger (<62) women in the proportion of short term (6 months) and long term (12 months) smoking cessation.

Hypothesis 2: There is no difference between older versus younger women in time to relapse over 12 months.

Hypothesis 3: The independent contribution of a set of variables [race/ethnicity, income, cigarettes per day, years smoking, duration of longest quit attempt, SDI score, housemate(s) smoke, current diagnosis (MI v. other), self-efficacy score, Cohen's Perceived Stress score, and Burnam's Depression Screener score] on smoking cessation status at 12 months, while controlling for age group and treatment group status, is zero.

Hypothesis 4: There is no difference between the intervention group (IG) and the usual care group (UG) in the short (6 months) and long term (12 months) efficacy of a smoking cessation intervention in the subset of older women (≥ 62 years) hospitalized with CVD.

Current study variables overview.

This study will include 3 general categories of variables: clinical variables, predictor variables, and outcome variables. The category of predictor variables can be further subdivided into: treatment group, demographic predictors, smoking related predictors, and health/psychosocial predictors.

Clinical variables.

Clinical variables include: Cardiovascular (CV) risk factors, Charlson Co-morbidity index scores, self-reported health status, perceptions of quit benefits, education level, employment status, job category, marital status, living along, MOS (Medical Outcomes Study) current health perception score, MOS psychological well being score, MOS cognitive functioning score, and MOS pain severity score. Details of how these clinical variables (and predictor variables) were measured are shown in Table I.

Predictor variables.

The predictor variable treatment group is a dichotomous variable that includes the IG and UG. The demographic predictors are age group, race/ethnicity, and income. Smoking related predictors are subcategorized as cigarettes per day, years smoking, duration of longest quit attempt, SDI score, and housemate(s) smokes. Health/psychosocial predictors are current diagnosis (MI v. other), self-efficacy score, Cohen's Perceived Stress score, and Burnam's Depression Screener score.

Outcome variables.

The 6 and 12 month follow-up included biochemical confirmation of 7-day point prevalence smoking cessation status. Saliva samples were obtained from self-reported quitters. Salivary cotinine levels ≥14 ng/dl were indicative of smoking (Froelicher, Miller et al., 2004). For self-reported quitters who did not submit saliva samples, a family member or friend was contacted to confirm cessation status (Froelicher, Miller et al., 2004). Self-report was assumed accurate if salivary cotinine or family confirmation was unavailable; if no information was available for the subject, then the smoking status was classified as missing (Oka, Katapodi, Lim, Bacchetti, & Froelicher, 2006). Froelicher, Miller et al. described the method used to compute time to continuous smoking in 2004:

> On cotinine testing, women with cotinine levels <14 ng/dL were considered nonsmokers for their latest follow-up period. If a participant did not provide a saliva sample for cotinine verification, confirmation of her nonsmoking status was obtained from her family or friends instead; if they did not contradict her self-report of nonsmoking, then she was considered a nonsmoker for her latest follow-up period. If a participant's self-report of not smoking was contradicted by either cotinine testing or her family or friends, then we assumed she had started continuous smoking halfway into the follow-up period unless she provided an exact date when she resumed smoking. If the participant admitted to continuous smoking or to smoking during more than half of the days in the follow-up period, then we used the starting date she provided. If neither cotinine verification nor verification from family or friends could be obtained, then the participant's status was considered "missing," and she was not considered a nonsmoker or a smoker. For time-to-smoking, this measure was censured at time of last known smoking status.

Results

Baseline clinical characteristics.

Of the 277 women included in the original WINS Randomized Controlled Trial (RCT), 136 were older (≥62) and 141 were younger (<62). The age distribution of the two age groups are shown in Table II. Table III shows baseline characteristics of the 2 groups, and Table IV shows health characteristics of the 2 groups. Compared to younger women, older women were less likely to be married [OR=0.48 (95% CI 0.29, 0.78)] and more likely to be widowed [OR=6.89 (95% CI 3.55, 13.40)]. Divorce rates were similar for the 2 groups; however, divorced older women were more likely to live alone [OR=3.56 (95% CI 1.54, 8.24)] and less likely to live with someone [OR=0.26 (95% CI 0.12, 0.58)] compared with divorced younger women.

Both age groups had similar education levels, with approximately half of each group having completed at least some college. Reported race/ethnicity varied little between the groups; both age groups were predominately Caucasian. Older women were more likely to earn less than $40,000 per year [OR=3.40 (95% CI 1.88, 6.16)]. Older women were less likely to work full time [OR=0.14 (95% CI 0.08, 0.27)] compared with younger women. Older women were more likely to be retired compared with younger women (68.38% v. 7.80%).

Similar proportions of risk factors were reported by older and younger women for: physical inactivity, lipid abnormalities, and diabetes. Older women were more likely to have hypertension [OR=1.71 (95% CI 1.06, 2.78)], more likely to have multiple comorbidities [OR=2.58 (95% CI 1.58, 4.22)], less likely to have a family history of CVD

[OR=0.50 (95% CI 0.31, 0.81)], and less likely to be obese [OR=0.39 (95% CI 0.24, 0.64)] compared to younger women.

Baseline smoking behaviors and beliefs.

Table V indicates that older women had lower Stanford Dependency Inventory scores [separate variance procedure, difference= -1.22 (95% CI: -2.15, -0.29)] and were less likely to have housemate(s) that smoke [OR=0.48 (95% CI: 0.29, 0.80)].

Baseline psychosocial measures and health beliefs.

Older smokers reported similar perceptions of their overall health status. Older adults were less likely to have accurate beliefs about the "likelihood of avoiding future health problems if they stop smoking now," with more responding that this was "uncertain," "unlikely," or "very unlikely" [OR=2.30 (95% CI 1.10, 4.82)] and fewer disagreeing that after 20 years of smoking, there is little benefit to quitting [OR=0.45 (95% CI 0.24, 0.83)].

Table VI shows that older women reported statistically significantly lower stress scorers [difference= -2.63 (95% CI: -3.98, -1.28)], had lower depression scores [separate variance procedure; difference= -0.09 (95% CI: -0.17, -0.01)], and had lower pain scores [difference: -9.43 (95% CI: -15.53, -3.32)]. Older and younger women reported similar levels of psychological well being, cognitive functioning, and health perception.

Smoking cessation results.

At the 6 month follow-up, 52.1% of older women compared to 40.6% of younger women were confirmed to have quit smoking [OR=1.59 (95% CI: 0.91, 2.80)]. At the 12 month follow-up, the nonsmoking proportions were 52.0% for older women and 38.1% for younger women. The difference at 12 months was statistically significant [OR=1.77 (95%

CI 1.02, 3.06)]. The higher quit proportions among older smokers was confirmed with a Kaplan-Meier Survival analysis over 12 months (Figure 1), which showed that older women were significantly less likely to relapse (Generalized Wilcoxon test: p=0.04). The estimated time to relapse over 12 months was 249 days for older women compared to 197 days for younger women.

Predictors of smoking cessation.

Dichotomous predictor variables were used for logistic regression. Table XII shows how the predictor variables compared between the two age groups. Using a chi-square test, the following four predictor variables differed significantly between the two age groups: years smoked, SDI scores, other housemate(s) smoke, and stress. Specifically, older women were less likely to have smoked for less than 40 years [OR=0.11 (95% CI 0.06, 0.20)], more likely to have a Stanford Dependence Inventory score (indicating lower nicotine dependency) of less than 15 [OR=1.68 (95% CI: 1.04, 2.71)], more likely to live in a house without any other smokers [OR=2.08 (95% CI: 1.25, 3.46)], and more likely to have a stress score of 33 or less [OR=2.53 (95% CI: 1.53, 4.16)].

Logistic regression models were used to answer the third hypothesis. While controlling for age group and treatment group, the following 3 predictor variable groups: clinical predictor variables (race/ethnicity and income), smoking predictor variables [cigarettes per day, years smoking, duration of longest previously quit attempt, SDI score, and housemate(s) smoke], and health/psychosocial predictor variables (current diagnosis, self-efficacy score, Cohen's Perceived Stress score, and Depression Screener score) were tested in 4 models. The first model tested age group, treatment group, and the clinical predictor variables; in this model, age group was the only statistically significant predictor

of cessation at 12 months, with the older age group predicting cessation [OR=1.91 (95% CI: 1.02, 3.57)]. The second model tested age group, treatment group, and smoking predictor variables, of which housemate(s) smoking status was a significant predictor; those without a housemate who smoked were more likely to quit [OR=2.53 (95% CI 1.33, 4.82)]. The third model tested age group, treatment group, and the health/psychosocial predictor variables, of which age group, current diagnosis, and self-efficacy were significant predictors. Specifically, older age group [OR=1.91 (95% CI 1.05, 3.48)], having a current diagnosis of a myocardial infarction [OR=2.78 (95% CI 1.42, 5.43)], and having a (high) self-efficacy score ≥70 [OR=2.28 (95% CI 1.21, 4.27)] predicted successful smoking cessation at 12 months.

The fourth, final parsimonious model also controlled for age group and treatment group; plus, it contained those variables that were found to be statistically significant in the three prior models. Thus, the final model contained age group, treatment group, housemate(s) smoke, current diagnosis (MI v. other), and self-efficacy score. Variables that were statistically significant in the final model were housemate(s) smoke, current diagnosis (MI v. other), and self-efficacy score. Having no housemate(s) who smoke [OR=2.23 (95% CI 1.18, 4.21)], a current diagnosis of MI [OR=2.78 (95% CI 1.44, 5.36)], and (high) self-efficacy score ≥70 [OR=2.16 (95% CI: 1.15, 4.04)] predicted successful cessation at 12 months. This model correctly predicted smoking status at 12 months for quitters 48.9% of the time and for relapsers 79.5% of the time, with an overall correct prediction rate of 65.9%. This indicates that predictors of quitting, while controlling for age group and treatment group, are having no smoking housemate(s), a current diagnosis of

MI, and a high self-efficacy score. Interaction terms with age and each variable in the final model were tested and none were significant.

Subset of older smokers' treatment efficacy.

Looking only at the subset of those ≥ 62 years old, at 6 months 63.0% of older smokers in the IG had quit smoking, compared with 42.0% of older smokers in the UG. This difference was statistically significant [OR=2.36 (95% CI 1.04, 5.35)]. At the 12 month follow-up, 58.1% of older smokers in the IG had quit, compared with 47.3% of older smokers in the UG; this difference was not statistically significant. A survival analysis was done using only the subset of older smokers. The 12 month Kaplan-Meier Survival Analysis showed that among the sample subset of older women, those in the IG were significantly less likely to relapse compared with those in the UG (Generalized Wilcoxon test: p=0.02).

Among the subset of younger smokers, at 6 months 29.7% in the IG had quit smoking, compared with 28.4% of those in the UG (p=0.84). At 12 months, 32.4% of the younger smokers in the IG had quit smoking, compared with 28.4% of younger smokers in the UG (p=0.65).

Discussion

This study included 277 women smokers who were all hospitalized with cardiovascular disease and agreed to make a serious attempt to quit smoking. As would be expected, older women, compared to younger women, were more likely to live alone, be poorer, widowed, retired, hypertensive, and live with multiple comorbidities. Older women were less likely to be obese, less likely to have accurate views about the risks of smoking, and less likely to be knowledgeable about the benefits of smoking cessation.

Based on a variety of measures, older smokers tended to have smoking behaviors indicative of lower levels of nicotine addiction. Older smokers scored significantly lower on the SDI [separate variance procedure, difference= -1.22 (95% CI: -2.15, -0.29)], were more likely to not smoke for at least 15 minutes after awakening [OR=1.52 (95% CI: 0.94, 2.44)], and were less likely to have smoking housemate(s) [OR=0.48 (95% CI: 0.29, 0.80)].

There are several plausible explanations for older women smokers tending to have lower levels of nicotine addiction. Perhaps older women tend to reduce their smoking over time. Also, heavy smokers are more likely to die at younger ages, so survival bias cannot be ruled out.

The findings of this study are best generalized to women smokers hospitalized with CVD; however, little smoking cessation intervention research pertaining to women is available, and even less research exists for older adults. Because of this, researchers and clinicians should carefully consider if this evidence may pertain to other populations of interest.

This study demonstrates that a high proportion of older women smokers with CVD quit, even higher proportions than younger women with CVD. At the 12 month follow-up, 52.0% of the older women had quit, compared to 38.1% of the younger women. The comprehensive behavioral intervention with telephone follow-up calls was efficacious among the subset of older adults in this sample.

The higher quit proportions of older smokers, compared to younger smokers, is consistent with preliminary observations from other studies (Grandes, Cortada, Arrazola, & Laka, 2003; Hajek, Taylor, & Mills, 2002; Hyland et al., 2004; Salive et al., 1992). Other studies have found those without smoking housemate(s), MI patients, and people with high

self-efficacy to be more likely to quit smoking (Dale et al., 1997; Hajek et al., 2002). This is the first study to find these three attributes to independently predict cessation while controlling for age group and treatment group. Furthermore, the IG treatment was efficacious compared with the UG treatment among the subset of older smokers. These data suggest that lower levels of nicotine addiction and lower proportions of older smokers living with other smokers partially explains the higher quit rates among the older women.

This study has several limitations. The intervention was designed prior to several advancements in smoking cessation intervention research. Specifically, a study by Joseph that was published subsequent to the initiation of the WINS intervention indicated that greater use of nicotine replacement therapy may have been advisable (Joseph et al., 1996; Mahrer-Imhof, Froelicher, Li, Parker, & Benowitz, 2002). While WINS offered pharmacological interventions, the women tended to decline the NRT, and those who did acquiesce to use it as an adjunct to the education counseling and behavioral intervention accepted it only after they had relapsed (Mahrer-Imhof et al., 2002). Still, the intervention provided in the WINS study is similar to contemporary smoking cessation intervention recommendations (Fiore et al., 2000). Another limitation of this study is that the data set does not contain certain literature-based smoking cessation predictor variables. Specifically, this data set is not suitable to analyze the following predictor variables: gender, adherence to quit date, alcohol use, and recruitment location (hospital or outpatient). This is because all subjects were women, quit date adherence was mandated due to the non-smoking requirement within the hospital setting, those regularly using alcohol (CAGE score $\geq$3) were excluded from the study, and all subjects were recruited from the hospital setting. Another limitation is that, while this sample is reflective of ethnic

distribution in the San Francisco Bay area, this sample may not be diverse enough to effectively evaluate the predictor variable race/ethnicity. Only 24% of the sample was non-white. Also, data were unavailable about possible age related differences in participation refusal; however, the results are still generalizable to those populations meeting the inclusion and exclusion criteria for the study.

This study provides important new information about a geriatric population: namely, older women smokers with CVD receiving a smoking cessation intervention. Prior smoking cessation research has excluded older women with CVD, and no prior research was identified that compared older smokers' characteristics and intervention responses to those of younger smokers. Also, instruments used during this study have demonstrated excellent psychometric properties in previous studies and in the original WINS study (Froelicher & Christopherson, 2000; Froelicher, Li, Mahrer-Imhof, Christopherson, & Stewart, 2004). The similarity in cognitive function scores between older and younger women support the recruitment criteria that participants were cognitively competent to participate in an experiment that required accurate reporting and introspection. The methodological advantage is that all variables, predictors, covariates and outcomes were measured without knowledge of this secondary inquiry, thus making this study unbiased with respect to age-specific issues and thus making it free of observation bias.

The results of this study have implications for future research, clinical practice, and education programs for health care providers. The extent to which these findings are relevant to older men who smoke and how older men compare demographically and in terms of their smoking cessation intervention outcomes with younger men smokers is yet to

be determined. Also, longitudinal research could help determine why older women smokers tend to smoke less and have lower nicotine dependence than younger women smokers. Practice implications of the current study are that nurses and other health care providers should include older smokers in smoking cessation interventions. Nursing programs and health care education programs should emphasize the importance of providing cessation interventions to all smokers, including older adults. Even modest improvements in the administration and efficacy of smoking cessation interventions for older adults could positively influence the lives of tens of thousands of smokers each year.

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Table I: How clinical variables and predictor variables were measured

Measure Title (Clinical Variables)	**How it was measured in WINS Data set**
CV risk factors	Presence of the following conditions was ascertained: hypertension, family history of CV disease, physical inactivity, lipid abnormality, type I DM, type II DM, and obesity [d]
Charlson Co-morbidity index score	Subjects asked to report presence or absence of 19 diseases, including MI, CHF, PVD, dementia, & DM. Responses used to obtain Co-morbidity score [de]
Self-reported health status	Subjects asked to complete statement: "In general your health is" on 5-point scale ranging from excellent to poor [d]
Perceptions of quit benefits	On 5-point ordinal scales, subjects responded to questions: "How likely are you to avoid future health problems if you quit smoking now" and "If you have smoked more than 20 years, there is little benefit from quitting" [d]
Education level	7 response choices were: no high school attendance; attended high school but did not graduate; high school graduate; attended some college but did not graduate; college graduate; post-graduate; post-graduate education (1+ years); unsure or refusal to answer [d]
Employment status	9 response choices (not mutually exclusive) were: part time; full time; volunteer work; multiple jobs; disability; disabled but planning to return to work; homemaker; other; retired [d]
Job category	7 response choices were: executive, managerial or professional; technical, sales or clerical; service; farming, forestry or fishing; precision production, craft or repair; operators, fabricators, or laborers; other [d]
Marital status	9 response choices were: single (never married), single (lives with partner), common law marriage, married, widowed (lives alone), widowed (with housemate), divorced (lives alone), divorced (with housemate), separated, other
Living alone	Self-reported in a single item
MOS current health perception score (Cr= 0.63)	This 3-item measure asks subjects to rate their general health as excellent, very good, good, fair, or poor. The other 2 items use a 1 to 5 response ranging from definitely true to definitely false and asked they respond to the statements: "I am somewhat ill" and "I have been feeling bad lately"; higher score indicates better perceived general health [ac]
MOS psychological well being score (Cr=0.74)	This 17-item measure uses Likert responses (from all the time to none of the time) to assess perceptions of anxiety, depression, behavioral-emotional control, feelings of belonging and positive affect; higher score indicates greater psychological well being [ab]
MOS cognitive functioning score (Cr= 0.79)	This 6-item measure uses Likert responses (from all the time to none of the time) and assesses the self-reported frequency within the last month of confusion, reacting slowly, difficulty reasoning, forgetfulness, inattentiveness, and difficulty concentrating; higher score indicates better cognitive functioning [ab]
MOS pain severity score (Cr= 0.76)	This 5-item measure uses Likert responses to rate pain intensity (from1=no pain to 10=pain as bad as you can imagine), frequency (1=once or twice to 5=almost every day or every day), and duration (1=a few minutes to 6=very severe); higher score indicates more pain [ac]
Predictor Variables	**How it was measured in WINS Data set**
Treatment group (IG v. UG)	Randomized at baseline [f]
Age group	Date of birth via self-report at baseline and calculated age [f]
Race/ethnicity	Subjects selected: white, black, Hispanic, Asian, Native American, or other [f]

TABLE I CONTINUED	
Income	Subjects asked to select annual income for last year within increment of $5,000, or if over $50,000/yr then asked to select either $50,000-59,999, $60,000 to 69,999, or ≥$70,000 [f]
Cigarettes per day	Self-reported average cigarettes per day within last 6 months [fh]
Years smoking	Asked, "how many years have you smoked on a regular basis?" [f]
Duration of longest quit attempt	Asked to report in months or years longest quit duration [f]
SDI score	Measures level of nicotine addiction based on responses to the following 5 questions: how soon is first A.M. cigarette; do they smoke when ill in bed; do they smoke more in A.M. than the rest of the day; do they have difficulty refraining from smoking in places where it is prohibited; and how deeply do they inhale; higher score indicated greater dependence [fgh]
Housemate(s) smoke	Subjects asked, "how many people in your household besides yourself smoke?" [f]
Current diagnosis (MI v. other)	Obtained from medical record at baseline [f]
Self-efficacy score (Cr= 0.86)	This 14-item scale is based on subjects' self-report confidence (0=not confident at all, to 100=very confident) in resisting the urge to smoke in 14 high relapse risk situations; higher score indicates greater confidence [ij]
Cohen's Perceived Stress scale score (Cr=0.84)	This 14-item scale measures the degree of stress resulting from life situations over the previous month. Subjects responded on a 1 to 5 Likert scale ranging from never to very often. Some items asked about being unable to cope with all the things one has to do, being upset because of something that happened unexpectedly, being unable to control important things in life, and feeling nervous and stressed; higher score indicates higher stress [ik]
Burnam's Depression Screener score	This 8-item scale screens for high likelihood of depressive disorders. 6 items assess the frequency and severity of various depressive mood states; the remaining 2 items assess the presence of long term depressive symptoms; higher score indicates more likely to be depressed [ilm]

All measures taken at baseline unless otherwise noted; Cr: Sample Cronbach alpha score; all MOS scores were converted to a score having a possible range of 0 to 100, with higher scores indicating more of the attribute (psychological well being, cognitive functioning, and pain); MI: myocardial infarction; CHF: congestive heart failure; PVD: peripheral vascular disease; DM: diabetes mellitus; IG: intervention group; UG: Usual care group; SDI: Stanford Dependence Inventory; MI: Myocardial infarction; Cr: Sample Cronbach alpha score; (a) (Froelicher, Li et al., 2004); (b) (Stewart & Ware, 1992); (c) (Stewart, Ware, Sherbourne, & Wells, 1992); (d) (Froelicher, Christopherson, Miller, & Martin, 2002); (e) (Charlson, Pompei, Ales, & MacKenzie, 1987) (f) (Froelicher et al., 2002); (g) (Killen, Fortmann, Newman, & Varady, 1990); (h) (Fagerstrom, 1978); (i) (Froelicher, Li et al., 2004); (j) (Miller & Taylor, 1995); (k) (Cohen, Kamarck, & Mermelstein, 1983); (l) (Burnam, Wells, Leake, & Landsverk, 1988); (m) (Radloff, 1977)

Table II: Age distribution in quartiles within the older (≥62) and younger (<62) age groups

	Age Quartile 1	Age Quartile 2	Age Quartile 3	Age Quartile 4
Older Group	62.0 to 65.1	65.1 to 68.1	68.3 to 73.7	73.7 to 85.7
Younger Group	33.7 to 49.4	49.8 to 53.6	53.8 to 57.5	57.9 to 61.8

Table III: Demographics and employment status for older and younger women smokers hospitalized with CVD

Demographics	**Older** ≥ 62 years n=136	**Younger** < 62 years n=141	**Significance**
	%	**%**	
Age (mean, SD)	69.6 (±5.6)	53.1 (±6.0)	p<0.001
Lives alone	47.1	16.3	p<0.001
Marital Status			
Single, never married	0.7	5.7	N/A
Single, living w/partner	0	3.5	N/A
Married	30.9	48.2	p= 0.003
Widowed, alone	25.0	3.5	p<0.001
Widowed, live w/someone	16.2	5.7	p= 0.005
Divorced, alone	17.6	5.7	p= 0.002
Divorced, live w/someone	6.6	21.3	p<0.001
Separated	2.9	5.7	N/A
Other	0	0.7	N/A
Education			
Grade school	5.1	3.5	p=0.529
Some high school	14.0	12.1	p= 0.669
High school graduate	27.2	33.3	p= 0.234
Some college	37.5	34.8	p= 0.698
College graduate	9.6	10.6	p= 0.735
Post-graduate	6.6	4.3	p= 0.401
Missing	0	1.4	N/A
Ethnicity			
Caucasian	76.5	75.2	p= 0.802
African-American	11.0	14.9	p= 0.339
Latino and/or Hispanic	8.1	5.0	p= 0.292
Asian	4.4	2.8	N/A
Native American	0	1.4	N/A
Other	0	0.7	N/A
Income (annual)			
$0 to 9,999	22.0	15.6	p= 0.142
$10,000 to 19,999	22.0	10.7	p= 0.008
$20,000 to 29,999	8.8	6.3	p= 0.412
$30,000 to 39,999	12.5	12.1	p= 0.856
$40,000 to 49,999	7.4	8.5	p= 0.763
$50,000 to 59,999	2.9	5.7	p= 0.281
$60,000 to 69,999	2.9	9.9	p= 0.021
Over $70,000	2.9	13.5	p= 0.002
Don't know	13.2	12.1	p= 0.714
Refused	2.9	5.7	p= 0.281
Missing	2.2	0	N/A
Employment Status			
Full time	11.0	46.8	p<0.001

Table III Continued			
If full time, mean hours/wk (SD)	39.8 (±0.6)	41.7 (±7.6)	p<0.001^
Part time	5.1	10.6	p= 0.091
If part time, mean hours/wk (SD)	22.0 (±11.5)	30.6 (±9.6)	p= 0.028^
Volunteer	0.7	0	N/A
If volunteer, mean hours/wk	8 (±0)	N/A	N/A
Homemaker	5.9	11.3	p= 0.106
Other employment	2.9	4.3	p= 0.558
Retired	68.4	7.8	p<0.001

^ T-test equal variance not assumed; N/A indicates statistical test not applicable and not run due to assumptions not being met for procedure

Table IV: Health Characteristics of older and younger women hospitalized with CVD

Health Status	**Older** ≥ 62 years n=136	**Younger** < 62 years n=141	**Significance**
	%	**%**	
Cardiovascular Risk Factor			
Lipid abnormality	47.1	49.6	0.667
Hypertension	65.4	52.5	0.028
Type I Diabetes	10.3	8.5	0.611
Type II Diabetes	15.4	19.9	0.335
Obesity	35.3	58.2	<0.001
Physical Inactivity	50.0	48.9	0.859
Family History of CVD	47.8	64.5	0.005
Charlson Co-morbidity			
Score <1	5.1%	21.3%	p<0.001
Score =1	28.7%	36.9%	p= 0.215
Score >1*	61.7%	41.2%	p<0.001
Missing	4.4%	0.7%	N/A
Medical History			
Myocardial Infarction	42.6	44.0	0.908
Congestive heart failure	25.0	14.9	0.028
Peripheral vascular disease	30.1	15.6	0.003
Cerebrovascular Disease	14.7	10.6	0.276
Dementia	0.7	0.7	N/A
Chronic Pulmonary Disease	40.4	20.6	<0.001
Connective tissue disease	2.2	3.5	N/A
Ulcer disease	2.9	6.4	0.203
Mild liver disease	4.4	0.7	N/A
Moderate/severe liver dis.	0.7	0	N/A
Hemiplagia	1.5	0.7	N/A
Moderate/severe renal dis.	5.9	3.5	0.330
DM w/ end organ damage	2.2	1.4	N/A
Tumor (any)	8.1	2.8	0.048
Luekemia or lymphoma	0	0	N/A
Metastatic solid tumor	1.5	0	N/A
AIDS	2.2	0.7	N/A

* More than 1 for Charlson Co-morbidity indicates multiple co-morbidities

Table V: Smoking behaviors and beliefs of older and younger women hospitalized with CVD

	Older				Younger				
Measure	**Mean**	**SD**	**Range**	**(n)**	**Mean**	**SD**	**Range**	**(n)**	**P-value**
No. of daily cigarettes (last 6 mo)	17.6	10.8	2-60	136	19.6	13.0	1-90	141	0.155
Stanford Dependency Index (SDI)	13.5	3.4	6-21	133	14.7	4.3	6-25	141	0.010^
Self-efficacy	65.1	19.4	24-100	136	60.9	19.0	10-100	141	0.070
Years smoked regularly	46.0	10.8	10-75	126	33.7	8.4	10-49	134	<0.001
Longest months quit	21.6	45.1	0.1-204	88	12.7	19.3	0.1-96	108	0.085^
Smokes within 15 minutes of awakening	48%			65	58%			82	0.084
Mean # of follow-up interventions completed (IG only)	3.6	0.8	0-4	68	3.6	1.0	0-4	74	0.590
Housemate(s) who smoke	26%			35	42%			59	0.005

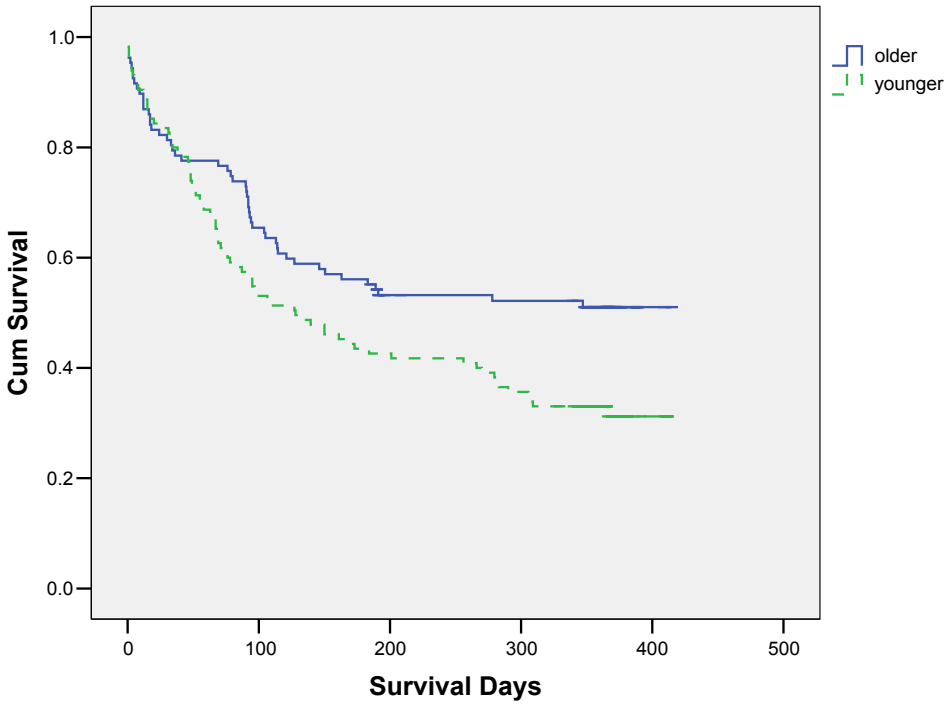
^ T-test equal variance not assumed

Table VI: Depression, stress, and MOS scores for older and younger women smokers hospitalized with CVD

	Older ≥62				Younger <62				
Instrument	**Mean**	**SD**	**Range**	**(n)**	**Mean**	**SD**	**Range**	**(n)**	**P-value**
Cohen's perceived stress scale	32.8	(5.6)	17-50	132	35.4	(5.6)	13-53	136	<0.001
Burnam's depression screener	0.23	(0.3)	0.002-.97	131	0.32	(0.3)	0.003-0.99	139	0.022^
MOS scores									
Pain severity	54.64	(27.6)	0-100	131	64.1	(23.3)	0-100	139	0.003
Psychological well being	70.2	(17.5)	18-100	129	65.2	(19.4)	13-97	139	0.026
Cognitive functioning	78.4	(17.2)	27-100	129	74.9	(20.0)	20-100	139	0.122
Health perception	31.0	(22.5)	0-92	131	27.8	(21.3)	0-92	139	0.223

Higher scores indicate more of attribute (i.e. higher stress score indicates more stress, etc.); ^ T-test equal variance not assumed

Figure I: Smoking cessation survival curves for older smokers and younger smokers over 12 months



General Wilcoxon test: p=0.04; solid line: older smokers, dotted line: younger smokers

TABLE VII: Logistic regression predictor variables

Predictor	Older IG %	Older UG %	Older Total %	Older proportion	Younger IG %	Younger UG %	Younger Total %	Younger proportion
Age group (1: ≥62)	100.0	100.0	100.0	136/136	0.0	0.0	0.0	0/141
Treatment group (1: IG)	100.0	0.0*	50.0	68/136	100.0	0.0*	52.5	74/141
Race/ethnicity (1: Caucasian)	75.0	77.9	76.5	104/136	74.3	76.1	75.2	106/141
Income (1: ≥$10,000 per year)	64.9	81.5*	73.0	81/111	60.8	73.1	81.0	94/116
Cigarettes per day (1: <1 pack/day)	48.5	44.1	46.3	63/136	47.3	38.8	43.3	61/141
Years smoked (1: <40 years)	26.6	17.7	22.2	28/126	75.4	67.7	71.6	96/134*
Longest quit attempt (1: ≥1 month)	47.1	50.0	48.5	66/136	59.5	50.7	55.3	78/141
SDI Score (1: <15)	69.7	53.7	61.7	82/133	54.1	43.3	48.9	69/141*
Housemate(s) smoke (1: none)	73.5	75.0	74.3	101/136	62.2	53.7	58.2	82/141*
Current Dx MI (1: yes)	20.6	26.5	23.5	32/136	28.4	31.3	29.8	42/141
Self-efficacy score (1: ≥70)	33.8	38.2	36.0	49/136	31.1	31.3	31.2	44/141
Stress score (1: <34)	57.8	48.5	53.0	70/132	28.2	33.8	30.9	42/136*
Depression score (1: <0.06)	44.6	47.0	45.8	60/131	31.5	45.5	38.1	53/139

Items in parentheses under "predictor" show what attribute was coded as a 1 for logistic regression models. IG: Intervention group; 10K: $10,000 per year; SDI: Stanford Dependence Inventory; Dx: Diagnosis; MI: Myocardial infarction. Predictor variable cut points based on a review of the literature and WINS determination of optimal cut points (Froelicher, Li, et. al., 2004); for self-efficacy, stress, and depression measures, higher scores indicate higher self-efficacy, stress, and depression.

* in the UG column means that this proportion is significantly different to that listed in the column immediately to its left (IG column)

* in the younger proportion column indicates that the proportion of older and younger smokers differs significantly for this variable

CHAPTER 6

Dissertation Conclusion: High Smoking Cessation Rates For Older Women With Cardiovascular Disease

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Dissertation Conclusion: High Smoking Cessation Rates For Older Women With Cardiovascular Disease

The review of the research literature identified many demographic groups, including women and older adults, for whom smoking cessation outcomes have not been adequately researched. The Women's Initiative for Nonsmoking (WINS) includes an all women sample with a large proportion of older adult (n=136) and younger (n=141) smokers. This data set was used to learn more about older women's responses to a smoking cessation intervention.

The WINS data set was determined to be a good fit for the proposed research because it contained an appropriate sample, measured many research-based predictors of smoking cessation, had low amounts of missing data, and low loss to follow-up (Froelicher & Christopherson, 2000; Froelicher, Christopherson, Miller, & Martin, 2002; Froelicher, Li, Mahrer-Imhof, Christopherson, & Stewart, 2004; Froelicher, Miller et al., 2004). By using this existing data set, this research was able to be completed in much less time, at a lower cost, and with minimal risks to subjects who participated in the study. A power analysis determined that the sample was sufficiently large. Approval for this study was obtained from the University of California, San Francisco's Committee on Human Research (CHR #: H7556-29106-01A).

The results showed that older women, compared with younger women, were more likely to be widowed, live alone, have no housemate(s) who smoke, be poorer, weigh less, have hypertension, have multiple comorbidities, have lower stress, lower depression, and lower pain severity. Smoking cessation outcomes demonstrated that older women quit in higher proportions than younger women. This can be partially

explained by older smokers tending to have more advantageous attributes in regards to their smoking cessation predictor variables. Specifically, older smokers tended to be less addicted to cigarettes, be more confident in their ability to quit, and not live with other smokers. Logistic regression demonstrated that, while controlling for age and treatment group, having no housemate(s) that smoke, having a primary diagnosis of a myocardial infarction, and having high self efficacy were significant independent predictors of successful smoking cessation. Among the subset of older women, the intervention was efficacious as compared with the usual care treatment.

This research demonstrates that older women smokers differ substantially from younger women smokers in terms of clinical attributes, demographic attributes, and smoking cessation outcomes. The results strongly support the concept that older adults need to regularly be offered smoking cessation interventions. More research is needed to confirm if similar age-related findings occur among men who smoke. Also, because older adults have developmental needs associated with age-related changes, further research is needed as to what types of interventions are optimal for older smokers.

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