Review Article

Approaches to Smoking Cessation

Abstract

Smoking cessation is a critical public health issue. Smoking cessation techniques are essential in reducing the burden of tobacco-related diseases and deaths. Medical practitioners have the potential to assist patients in quitting smoking, but deficits exist in the amount and type of training received in smoking cessation counseling.

Smoking cessation is not a single event but a process that involves a change in a person's lifestyle, values, social circles, thinking and feeling patterns, and coping skills. Overcoming the hurdles associated with smoking cessation can increase an individual's self-efficacy in their ability to succeed at their quit attempt, which in turn acts to reduce the likelihood of a relapse and increase the likelihood of long-term sustained smoking cessation. Innovative techniques of treatment are necessary to provide effective smoking cessation intervention, especially for difficult cases.

The use of pharmacotherapy, including nicotine replacement therapy and other medications, is an effective smoking cessation technique. Behavioral therapy is also a useful approach, including motivational interviewing, cognitive-behavioral therapy, and contingency management. The combination of pharmacotherapy and behavioral therapy can enhance the success rate of smoking cessation.

Key words: Smoking cessation, pharmacotherapy, non-pharmacotherapy, nicotine replacement therapy (NRT).

Introduction

Approximately a billion people smoke cigarettes worldwide and 80% reside in low-income and middle-income countries. In the United States, smoking has been a major public health concern for several decades. According to the Centers for Disease Control and Prevention (CDC), cigarette smoking is responsible for more than 480,000 deaths annually in the country, making it the leading cause of preventable deaths [2]. While the prevalence of smoking has declined from 20.9% in 2005 to 12.5% in 2020 among adults in the United States; still an estimated 30.8 million adults in the United States currently smoke cigarettes [1]. Some studies have estimated that smoking may be responsible for an additional 60,000 to 120,000 deaths yearly [6]. Smoking-related diseases cost the United States over $600 billion in 2018, including more than $240 billion in healthcare spending and nearly $372 billion in lost productivity [2]. Although smoking prevalence has declined among adults, tobacco use remains a major public health threat among children and teenagers. In 2015, 9.3% of high school students reported smoking cigarettes in the last 30 days, down 74% from 36.4% in 1997, when rates peaked after increasing throughout the

first half of the 1990s. Furthermore, in 2015, 2.3% of middle school students smoked cigarettes in the last 30 days [5].

Efforts to control tobacco use in the United States have led to a significant decline in smoking prevalence over the years. A comparative modeling approach using four simulation models of the natural history of lung cancer projects reductions in tobacco use and lung cancer mortality from 2015 to 2065 due to existing tobacco control efforts [3]. Moreover, according to a report published by the American Cancer Society, cigarette smoking reached a historic low in 2019. Still, 14% of the US population (34 million people) continues to smoke, and smoking accounts for nearly 30% of all deaths from cancer. About 62% (55 million) of all people who had ever smoked had quit in 2019 [4]. In 2020, an estimated 12.5% (30.8 million) of U.S. adults were smokers [2]. Secondhand smoke alone accounts for $5.6 billion in annual productivity loss [6]. Smoking-related death and disease account for nearly one in five deaths in the United States, costing the country over $300 billion annually in direct healthcare spending [7].

Not only does smoking have significant health costs, but it also creates a substantial economic burden for the United States. The World Health Organization estimates that smoking causes over $500 billion in economic damage globally each year [8]. In the United States, smoking cost the country more than $600 billion in 2018, including more than $240 billion in healthcare spending and nearly $372 billion in lost productivity [1]. Smoking-related death and disease also result in significant economic costs to the United States, including lost productivity and increased healthcare spending [7]. Smoking has a particularly significant impact on vulnerable populations, including those living in public or subsidized housing. In these small, high-density communities, the negative externalities of smoking are amplified [2]. Additionally, smoking is a major public health issue among the youth, with nearly half a million Americans dying prematurely each year due to smoking or exposure to secondhand smoke [9]. Smoking has numerous health consequences, including inflammation and decreased immune function, and is a major cause of many serious medical conditions [10]. According to the Centers for Disease Control and Prevention (CDC), smoking is responsible for several types of cancer, heart disease, stroke, lung diseases, diabetes, and chronic obstructive pulmonary disease (COPD), including emphysema and chronic bronchitis [11]. Smoking is also known to increase the risk of tuberculosis, certain eye diseases, and immune system problems, including rheumatoid arthritis [2]. Furthermore, a report by the Surgeon General on the health effects of smoking states that smoking injures almost all bodily organs and can lead to incurable diseases and death [12]. Smoking causes 87 percent of lung cancer deaths, 32 percent of coronary heart disease deaths, and 79 percent of all cases of COPD in the United States, and one out of three cancer deaths is caused by smoking [13]. Smoking is also a leading cause of cardiovascular disease, responsible for 40 percent of all smoking-related deaths. It causes coronary heart disease, which is the leading cause of death in the United States [14]. In addition, smoking can contribute to bad breath, mouth and jaw cancer, recurrent pharyngitis, and a reduced sense of taste and smell, as well as stained, yellowed teeth and plaque. Smoking reduces the flow of saliva, which, because saliva cleanses the lining of the mouth and teeth and protects the teeth from decay, promotes infection [15].

Therefore, smoking has substantial health and economic burden in the United States. The costs of smoking-related death and disease include lost productivity and increased healthcare spending, with smoking-related healthcare costs exceeding $240 billion annually. To reduce the

burden of smoking, efforts to prevent smoking initiation and promote smoking cessation are critical. Policies such as tobacco taxation and smoke-free policies have effectively reduced smoking rates and mitigate the economic and health costs associated with smoking [9]. Tobacco dependence is a chronic, relapsing disorder that, like other chronic diseases, often requires repeated intervention and long-term support, which is only possible with self-determination and strong support from close friends and family. Many people may quit smoking, but staying off cigarettes requires maintenance, support, and additional techniques, such as relapse prevention. This literature review explores some of the methods and current recommendations for smoking cessation.

Discussion

A brief overview of current methods

Smoking cessation treatment may consist of three phases:

- Preparation: Preparation aims to increase the smoker's motivation to quit and to build confidence that he or she can be successful.
- Intervention: Intervention can take any number of forms (or a combination of them) to help smokers to achieve abstinence.
- Maintenance: Maintenance, including support, coping strategies, and substitute behaviors, is necessary for permanent abstinence.

Although most smokers who successfully quit do so on their own, many use cessation programs at some point during their smoking history. Moreover, many people act on a health professional's advice in quitting. Some are also aided by a smoking cessation kit from a public or voluntary agency, a book, a tape, or an over-the-counter product. Still, others receive help from mass-media campaigns.

Preparation phase: Healthcare professionals should be prepared to screen all patients for nicotine use, including those who use smokeless tobacco, and implement office-wide interventions to facilitate smoking cessation. The US Preventive Services Task Force (USPSTF) advises that clinicians ask all adults about tobacco use, advise them to quit, provide behavioral interventions, and offer FDA-approved medications. In addition to advising patients to quit, healthcare professionals should also provide evidence-based cessation treatments, such as counseling and pharmacotherapy. Motivational interviewing is a technique that can be used to encourage patients to describe positive reasons for quitting smoking and increase their confidence in their ability to do so. In addition, to support a successful quit attempt, healthcare professionals should arrange follow-up contacts and relapse prevention strategies. This process is often called the "5 A's approach" to smoking cessation [17-21]. During the initiation/preparation phase, cognitive-behavioral therapy (CBT) is an evidence-based approach that can be used as a short-term treatment for smoking cessation. CBT aims to help individuals gain awareness of their smoking behavior and focus on present thoughts and beliefs. Research suggests that cognitive therapies may improve smoking abstinence rates compared to other interventions up to 12 months after the end of the intervention. Combining cognitive therapies with medication can

result in higher smoking abstinence rates compared to medication alone. CBT can also be used in combination with pharmacological treatments as a current standard for smoking cessation [28].

Intervention phase: The interventional phase approach can be described as a pharmacologic or non-pharmacologic approach. Both methods can be used as a mutually exclusive approach or in combination. There is a paucity of data to support the superiority of either method. However, expert opinions have recommended a combination of both strategies to achieve a higher rate of adherence [22]. Non-medication-based treatments encompass various interventions like medical practitioner consultation, behavioral therapy, phone-based treatments, and either remote or in-person group/individual cessation programs to quit smoking. In some cases, such as in pregnancy, cognitive-behavioral therapy, a non-pharmacologic-based therapy, has been proven to be equally efficacious as nicotine replacement therapy. In a CADTH summary and report of smoking cessation approaches, various studies were identified that explored the effectiveness of pharmacological and non-pharmacological smoking interventions for youth. Evidence from one randomized controlled trial indicated that there were no significant differences in smoking cessation or smoking frequency outcomes between brief advice, nicotine patch therapy, and a 6-week text messaging intervention, and brief advice and nicotine patch therapy. In addition, three systematic reviews and eight randomized controlled trials examined a variety of different non-pharmacological smoking interventions for youth, with mixed results [22]. Several other comparisons via meta-analyses did find improved smoking cessation outcomes in favor of the intervention. The report also concluded that in some randomized controlled trials that examined smoking cessation outcomes, three studies found reductions in favor of the smoking cessation intervention, three did not find differences between groups, and one study found improvements at 3 months in favor of the intervention but not at 6-month follow-up. Mixed findings were found for other key clinical outcomes, such as smoking behavior and quitting outcomes [22].

Pharmacological intervention: Pharmacological interventions include nicotine replacement therapy (NRT) (gums, nasal spray, tablets, inhalers, and patches) and antidepressants like varenicline, nortriptyline and bupropion. These strategies aim to reduce the symptoms of nicotine withdrawal, thereby making it easier for a smoker to stop the habitual use of cigarettes. Many individuals who smoke cigarettes exhibit signs of nicotine addiction, which may include the development of tolerance and experiencing withdrawal symptoms when attempting to quit. Nicotine withdrawal typically reaches its maximum intensity within a couple of days and can persist for several weeks. Withdrawal symptoms may involve an increase in appetite, difficulty sleeping, weight gain, anxiety, irritability, restlessness, and trouble focusing. Non-toxic forms of nicotine delivery systems are used to provide nicotine to maintain stimulation of nicotine receptors, thereby eliminating withdrawal symptoms and the sensations of craving for nicotine during a smoking cessation attempt [23]. NRT are generally recommended for people who smoke more than 10 sticks of cigarette a day and has been found to be less effective for those who smoke a lesser amount. Likewise, in pregnant patients. Common side effects include gastrointestinal symptoms like nausea, vomiting, diarrhea, and abdominal pain or headache and has not been associated with an increased risk of a cardiovascular event within the first year of use.

Antidepressants like Bupropion (sustained release) and varenicline has been recommended by several expert bodies, including the USPTF. Bupropion, neuronal norepinephrine, and dopamine

reuptake inhibitor has been approved and shown to significantly increase the likelihood of quitting smoking in many clinical trials with results in some systematic reviews showing the relative risk [RR] to be 1.6 with a 95% confidence interval [CI] 1.49 to 1.76. Usually taken for 12 weeks, this oral medication is safe in patients with cardiovascular comorbidities; however, it may lower the threshold of seizures in certain neuropsychiatry patients and presents commonly with side effects similar to other antidepressants such as weight gain and dry mouth [25].

According to the American Thoracic Society in 2020, Varenicline has been favored over bupropion, nicotine patch, and other non-pharmacologic approaches for tobacco-dependence pharmacotherapy [25-26]. They recommended Varenicline as a simple practice change likely to increase the effectiveness of treatment. Varenicline is a neuropsychiatric medication available in oral form, taken for at least 12 weeks. It is thought to act as a partial agonist against the alpha-4-beta-2 subunit of the nicotinic acetylcholine receptor. A meta-analysis of randomized trials has shown that Varenicline is more effective than placebo and almost triples the chance of quitting smoking (OR 2.88; 95%CI 2.40 to 3.47) [26].

Clonidine is an FDA-approved medication for the treatment of high blood pressure and is sometimes used off-label for the treatment of opioid withdrawal symptoms. Nortriptyline is an FDA-approved tricyclic antidepressant for the treatment of depression. Both medications have also been studied as potential treatments for tobacco dependence. According to the AHRQ, second-line agents like Clonidine and nortriptyline may be considered for patients who cannot use first-line medications due to contraindications or for patients for whom first-line medications are not helpful [27].

Among the non-pharmacological treatments, Acupuncture and Psychological treatments, self-help, have stood out. Psychotherapy consists of counseling (Group, individual, brief, phone counselling and other long-term interventions), motivational interview, CBT and others.

Psychotherapy refers to a collaborative treatment between a trained therapist and an individual aimed at addressing unhealthy thoughts, emotions, and behaviors. While psychotherapy is not commonly used as the primary treatment for smoking cessation, it can be an effective adjunct therapy when used in combination with other treatments like medication.

Most psychotherapists use a step-by-step guide for smoking cessation, and this involves:

Assessment: The therapist conducts a thorough assessment to determine the individual's readiness to quit smoking, smoking history, triggers, and underlying psychological factors contributing to smoking.
Goal-setting: The therapist and the individual collaboratively set realistic and achievable goals for smoking cessation. This can include setting a quit date, reducing the number of cigarettes smoked per day, or gradually quitting over time.
Cognitive-behavioral therapy (CBT): The therapist uses CBT to help the individual identify and challenge negative thoughts and beliefs about smoking, develop coping strategies to manage cravings and withdrawal symptoms, and learn problem-solving skills to overcome obstacles to quitting smoking.
Motivational interviewing (MI): The therapist uses MI to enhance the individual's motivation and

commitment to quitting smoking by exploring their ambivalence about quitting, identifying their personal reasons for quitting, and building confidence in their ability to quit.
Relapse prevention: The therapist helps the individual identify high-risk situations for relapse and develop a plan to prevent relapse. This can include practicing self-care, seeking social support, and learning new ways to cope with stress.

Studies have shown that psychotherapy can effectively promote smoking cessation, particularly when combined with pharmacotherapy like nicotine replacement therapy (NRT). For example, a meta-analysis of 37 randomized controlled trials found that adding psychotherapy to NRT increased the likelihood of quitting smoking by 50% compared to NRT alone [28-30].

Alternative therapy (Acupuncture and hypnotherapy)

Acupuncture and hypnotherapy are two alternative therapies that have been used in smoking cessation. The role of these therapies in smoking cessation has been the subject of several studies, and the evidence is mixed. Acupuncture is a technique used in traditional Chinese medicine that involves the insertion of needles into specific points of the body. According to a Cleveland Clinic article, acupuncture has been shown to be effective in reducing cravings for tobacco [31]. However, a 2014 Cochrane review of 38 randomized trials concluded that there is no consistent, bias-free evidence that acupuncture has a sustained benefit on smoking cessation for six months or more [32]. The authors of the review called for further research to clarify the role of acupuncture in smoking cessation. Hypnotherapy is a technique that uses suggestion and relaxation to induce a trance-like state in which the patient is more open to suggestion. According to a PubMed article, hypnotherapy is widely promoted as a method for aiding smoking cessation [33]. The article goes on to state that a meta-analysis of randomized controlled trials found that hypnotherapy increased smoking abstinence [32-34]. However, the patient population in the analysis was small and reports of smoking cessation were not validated by biochemical means. The article also notes that further research is needed to evaluate the effectiveness of hypnotherapy for smoking cessation. While there is some evidence to suggest that both acupuncture and hypnotherapy may be effective in smoking cessation, it is important to note that these therapies are not a replacement for evidence-based treatments such as nicotine replacement therapy and behavioral counseling. According to the Centers for Disease Control and Prevention, quitting smoking reduces the risk of premature death, improves health, and enhances the quality of life [35]. Additionally, a combination of treatments is often more effective than a single treatment alone [36].

Maintenance phase

The maintenance phase is essential for the long-term success of smoking cessation programs. During this phase, individuals who have quit smoking must sustain their cessation efforts to avoid relapse. Several evidence-based interventions have been shown to be effective in maintaining smoking cessation. These interventions include reinforcing both behavioral and pharmacological treatments as outlined in previous paragraphs. A multidisciplinary approach if often recommended, guided by government policies on smoking cessation. In addition, to sustain smoking cessation, population-based support, including education programs and quit-lines, can help inform individuals who smoke of the harms of tobacco use and encourage them to quit by

providing information, resources, and support. Healthcare professionals also play a crucial role in helping people who use tobacco to quit, including providing ongoing support during the maintenance phase of smoking cessation programs [37].

Conclusion

Smoking cessation remains a critical public health priority due to the numerous health risks associated with tobacco use. Several evidence-based smoking cessation methods exist, including behavioral interventions and pharmacotherapy. Healthcare providers can play an essential role in encouraging smokers to quit by implementing quality measures, providing education, and connecting patients with cessation resources. Recent studies have shown that computer-based and web-based smoking cessation programs can be effective in helping adult smokers quit. Additionally, new approaches, such as electronic medical registration and peer-to-peer advice, are yet to be thoroughly studied and may show promise in increasing the success of smoking cessation attempts. Continued research and innovation in smoking cessation methods will be critical in reducing tobacco-related morbidity and mortality.

References

1. Centers for Disease Control and Prevention. CDC - fact sheet - current cigarette smoking among adults in the united states - smoking & tobacco use. Smoking and Tobacco Use. Published. 2020,
2. CDC. Burden of Tobacco Use in the U.S. Centers for Disease Control and Prevention. Published January 23. (2019). https://www.cdc.gov/tobacco/campaign/tips/resources/data/cigarette-smoking-in-united-states.html.
3. Jeon J, Holford TR, Levy DT, et al.: Smoking and Lung Cancer Mortality in the United States From 2015 to 2065. Annals of Internal Medicine. 2018, 169:684-10. 10.7326/m18-1250
4. American cancer society. Smoking Rates Historically Low, but Other Cancer-related Behaviors Need Improvement. www.cancer.org. Published. 2023,
5. American Lung Association: Tobacco Use among Children and Teens | American Lung Association. www.lung.org. Published April 3. 2020,
6. Ildemaro Gonzalez: The Economic Burden of Smoking. Stanford Journal of Public Health. Published May 2. 2015,
7. Xu X: U.S. healthcare spending attributable to cigarette smoking in 2014. Preventive Medicine. 2021, 150:106529.
8. Ekpu VU, Brown AK: The Economic Impact of Smoking and of Reducing Smoking Prevalence: Review of Evidence. Tobacco Use Insights. 2015, 8:15628. 10.4137/tui.s15628
9. CDC. Data and Statistics. Centers for Disease Control and Prevention. Published February 28, 2019. https://www.cdc.gov/tobacco/data_statistics/index.htm.
10. Centers for Disease Control and Prevention. CDC - Fact Sheet - Health Effects of Cigarette Smoking - Smoking & Tobacco Use. Smoking and Tobacco Use. Published

October 29. (2021). https://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/index.htm.
11. CDC. Health Effects. Centers for Disease Control and Prevention. Published April 28. (2020). https://www.cdc.gov/tobacco/basic_information/health_effects/index.htm.
12. Office of the Surgeon General (US, Office on Smoking and Health (US. The Health Consequences of Smoking. Nih.gov. Published. 2014,
13. Office of the Surgeon General, Assistant Secretary for Health (ASH. Health Consequences of Smoking, Surgeon General fact sheet. HHS.gov. Published January 16, 2014. https://www.hhs.gov/surgeongeneral/reports-and-publications/tobacco/consequences-smoking-factsheet/index.html.
14. Abuse NI on D: What are the physical health consequences of tobacco use? National Institute on Drug Abuse. Published May. 2022,
15. Gometz ED: Health Effects of Smoking and the Benefits of Quitting. AMA Journal of Ethics. 2011, 13:31-35. 10.1001/virtualmentor.2011.13.1.cprl1-1101
16. Marlow SP, Stoller JK: Smoking Cessation. Respiratory Care. 2003, 48:1238-1256.
17. Gaddey HL, Dakkak M, Jackson NM: Smoking Cessation Interventions. American Family Physician. 2022, 106:513-522.
18. Zarling KK, Burke MV, Gaines KA, Gauvin TR. Registered Nurse Initiation of a Tobacco Intervention Protocol: Journal of Cardiovascular Nursing. 2008, 23:443-448.
19. Olenik A, Mospan CM: Smoking cessation: Identifying readiness to quit and designing a plan. JAAPA : official journal of the American Academy of Physician Assistants. 2017, 30:13-19.
20. A Clinical Practice Guideline for Treating Tobacco Use and Dependence: 2008 Update. American Journal of Preventive Medicine. 2008, 35:158-176.
21. Choi HK, Ataucuri-Vargas J, Lin C, Singrey A: The current state of tobacco cessation treatment. Cleveland Clinic Journal of Medicine. 2021, 88:393-404.
22. Lachance C, Frey N: Non-Pharmacological and Pharmacological Interventions for Smoking Cessation Programs in Youth: A Review of Clinical Effectiveness and Guidelines. Canadian Agency for Drugs and Technologies in Health. 2020, Accessed: April 23, 2023: https://www.ncbi.nlm.nih.gov/books/NBK562834/.
23. Lam CY, Minnix JA, Robinson JD, Cinciripini PM: A Brief Review of Pharmacotherapies for Smoking Cessation. Journal of the National Comprehensive Cancer Network. 2006, 4:583-589.
24. Commissioner O of the: Want to Quit Smoking? FDA-Approved and FDA-Cleared Cessation Products Can Help. FDA. Published online July 21, 2022.
25. Limsuwat C, Saito S, Halvorson K: Review: Pharmacotherapy for smoking cessation. The Southwest Respiratory and Critical Care Chronicles. 2018, 6:31-37.
26. Leone FT, Zhang Y, Evers-Casey S, et al.: Initiating Pharmacologic Treatment in Tobacco-Dependent Adults. An Official. American Thoracic Society Clinical Practice Guideline. American Journal of Respiratory and Critical Care Medicine. 2020, 202:5-31.
27. (2012). https://www.ahrq.gov/prevention/guidelines/tobacco/prescrib.html.
28. García-Gómez L: Smoking Cessation Treatments: Current Psychological and Pharmacological Options | Revista de Investigación Clínica. clinicalandtranslationalinvestigation.com. Published. 2018198,

29. American Psychiatric Association: What is Psychotherapy?. Psychiatry.org. Published January. 2019,
30. American Psychological Association. Understanding psychotherapy and how it works. Apa.org. Published November 1, 2012. https://www.apa.org/topics/psychotherapy/understanding.
31. White AR, Rampes H, Liu JP, Stead LF, Campbell J: Acupuncture and related interventions for smoking cessation. The. Cochrane Database of Systematic Reviews. 2011, 1:000009.
32. Barnes J, McRobbie H, Dong CY, Walker N, Hartmann-Boyce J: Hypnotherapy for smoking cessation. Cochrane Database of Systematic Reviews. 2019, 6:
33. NIH. Complementary Health Approaches for Smoking Cessation: What the Science Says. NCCIH. Published. 2023,
34. Says.:2023-23.
35. Accessed: February 24, 2020: https://www.cdc.gov/tobacco/data_statistics/sgr/2020-smoking-cessation/fact-sheets/healthcare-professionals-health-sy....
36. Lhommeau N, Huchet A, Castera P: [Acupuncture and smoking cessation, a review of the literature]. Revue Des Maladies Respiratoires. 2020, 37:474-478.
37. CDC. Evidence-based cessation services can help make quit attempts more successful | CDC. www.cdc.gov. Published October 20. (2021). https://www.cdc.gov/globalhealth/stories/2021/evidence-based-cessation-services-can-help-make-quit-attempts-more-succ....