

Managing Comorbidities Through Smoking Cessation

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Summary

Health care providers need to recognize the impact of smoking cessation on the overall health of a patient and to identify methods to increase success in a smoking cessation program. Successful smoking cessation programs should include a combination of strategies such as pharmacotherapy, cognitive strategies, behavioral strategies, withdrawal management, and social support.

Key Points

- About 21 percent of adults in the United States smoke.
- Smoking is the primary preventable cause of death in the United States.
- The economic burden of smoking is quite substantial.
- Smoking harms people in all stages of life.
- Tobacco users expect health care professionals to encourage them to quit.
- Smoking cessation is a process of behavioral change, which cannot begin until the smoker is ready to quit.
- Successful smoking cessation programs include a combination of interventions.
- Abstinence rates for the pharmacotherapy medications range from 15 to 24 percent.
- Medication counseling is key to success with pharmacotherapy.
- Follow-up care is important for ensuring success and preventing relapse.

EXHIBIT 1 DEPICTS TRENDS IN ADULT smoking from 1955 to 2005.¹ Since about 1990, the decline in smoking prevalence amongst both males and females has been minimal. Thus, there is a need for enhanced control efforts. Currently, about 21 percent of adults in the United States smoke. About 70 percent of those surveyed do express a desire to quit completely.

In 2004, the Surgeon General published a report on the health consequences of smoking.² The major conclusion of this report was that smoking harms nearly every organ of the body, causes many different diseases, and reduces smokers' health in general. There is sufficient evidence to establish a causal relationship with tobacco use and numerous diseases (Exhibit 2).² Smoking harms people in all stages of life from the unborn child to senior citizens.

Smoking is the primary preventable cause of death in the United States.³ Annually, approximately 437,000

deaths are directly attributed to smoking (Exhibit 3). The leading causes of death secondary to smoking are cancers, cardiovascular disease, and respiratory diseases. Additionally, about 50,000 deaths each year are attributed to second-hand smoke exposure.⁴

The primary compound in tobacco smoke is nicotine. Nicotine is responsible for inducing the addictive behavior of smoking, but it is not the primary compound that causes the adverse health affects. There are more than 60 known carcinogens that have been identified in tobacco smoke.⁵ Some of them occur naturally in the tobacco while others are formed during the tobacco curing process. Others are generated during the combustion of the cigarette.

In addition to carcinogens, tobacco can contain compounds that are tumor promoters. These stimulate the development of tumors that are already established. Other compounds are co-carcinogens, which are compounds that are not directly carcinogenic

Exhibit 1: Trends in Adult Smoking, by Sex—U.S., 1955-2005

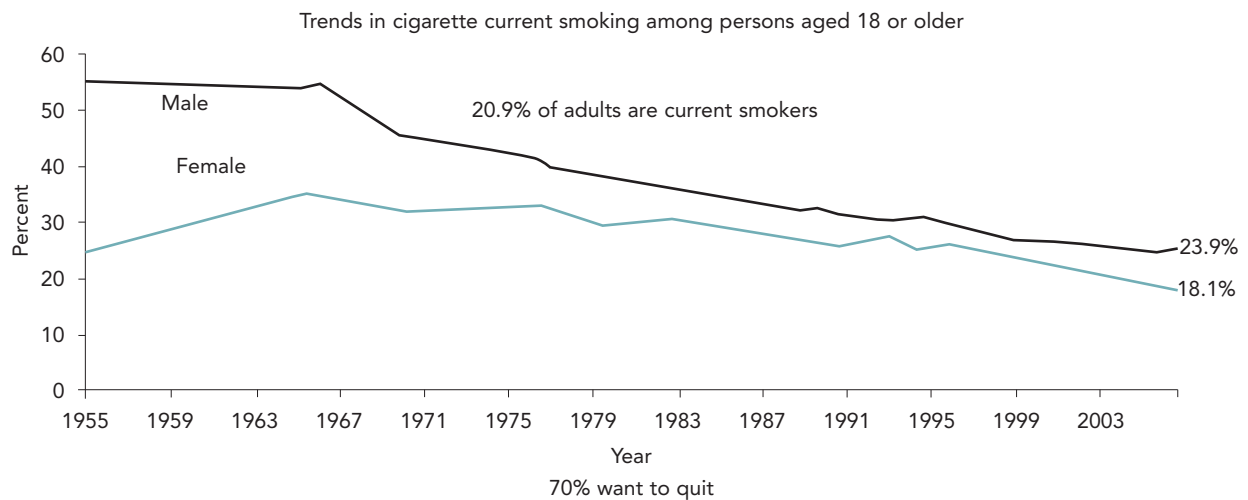


Exhibit 2: Health Consequences of Smoking

Cancers	Pulmonary Diseases	Cardiovascular Diseases	Reproductive Effects	Other Effects
Acute myeloid leukemia Bladder and kidney Cervical Esophageal Gastric Laryngeal Lung Oral cavity and pharyngeal Pancreatic	Acute (e.g., pneumonia) Chronic (e.g., COPD)	Abdominal aortic aneurysm Coronary heart disease Cerebrovascular disease Peripheral arterial disease	Reduced fertility in women Poor pregnancy outcomes (e.g., low birth weight, preterm delivery) Infant mortality	Cataract Osteoporosis Periodontitis Poor surgical outcomes

Reference: 2

themselves but enhance the mutagenic potential of other carcinogens. Compounds in tobacco smoke also are general irritants that cause a lot of inflammation and compromise tissue integrity.^{5,6}

In addition to cancer, one of the primary adverse effects of smoking is cardiovascular disease. There are many toxins in tobacco that promote arteriosclerosis, which is the primary pathophysiological feature of cardiovascular disease.^{7,8} Tobacco smoking can compromise endothelial function by inhibiting the release of nitrate oxide. Tobacco smoke also creates prothrombotic and inflammatory environments within the blood vessels and alters lipid metabolism. Smokers will generally have elevated levels of inflammatory compounds like C-reactive protein in their bloodstream. They usually have elevated levels of oxidized low-density lipoprotein, which is highly atherogenic.

Tobacco smoke can affect myocardial oxygen demand and supply. When someone smokes a cigarette, there is a release of catecholamines, such as norepinephrine, that increase heart rate and blood pressure throughout the day. The carbon monoxide content of tobacco smoke leads to higher levels of carboxyhemoglobin in the blood, which decreases oxygen-carrying capacity. The body tries to compensate by increasing production of red blood cells, which increases blood viscosity, and further increases the prothrombotic environment within the circulatory system. The risk of cardiovascular disease related to smoking is relatively unknown in the lay population.

Smoking is the single most important risk factor for chronic obstructive pulmonary disease (COPD).⁹ The mechanism behind which smoking induces COPD is through inflammatory mediators and

Exhibit 3: Annual U.S. Deaths Attributable to Smoking, 1997-2001

		Percentage of all smoking attributable deaths*
Cardiovascular diseases	137,979	32%
Lung cancer	123,836	28%
Respiratory diseases	101,454	23%
Second-hand smoke*	38,693	9%
Cancers other than lung	1,828	8%

TOTAL: 437,902 deaths annually

*In 2005, it was estimated that nearly 50,000 persons died due to second-hand smoke.
Reference: 3

production of inflammatory cells. The inflammatory cells release proteases, which break down elastin and lung tissue. This can eventually lead to emphysema and chronic bronchitis, especially if the smoker cannot neutralize the increased production of proteases with antiproteases. Tobacco smoke also contains reactive oxygen species. These reactive oxygen species are directly toxic to a number of organs in the body including the lung.

Osteoporosis is a condition that is sometimes overlooked in terms of smoking risks. There are many proposed mechanisms by which smoking harms bones. One is that nicotine and cadmium in tobacco smoke is directly toxic to osteoblasts, which are the cells that promote bone formation.¹⁰ In addition, smokers have reduced calcium absorption due to decreased parathyroid and vitamin D3 levels, which can increase bone resorption. Generally, women who smoke also will go through

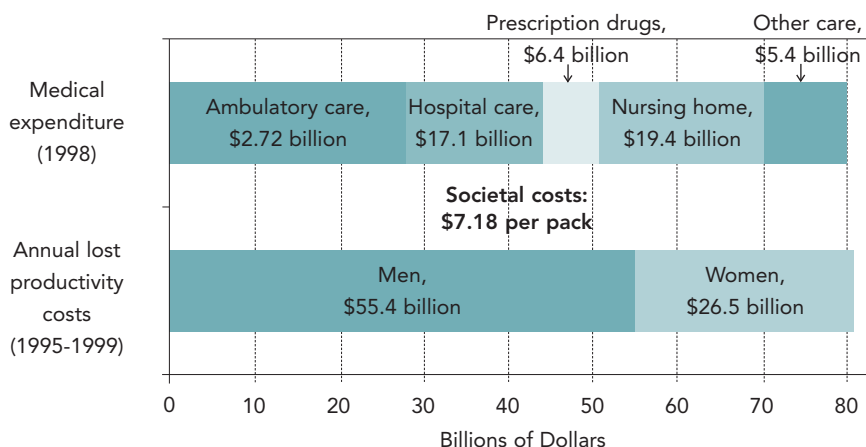
menopause at an earlier age. Thus, these women will experience postmenopausal bone loss beginning at an earlier age. Smokers in general tend to have a low body weight and have less physical activity, which can make their bones more susceptible to osteoporosis and fracture.

The economic burden of smoking is quite substantial. Patients who smoke incur a higher number of costs, either through direct personal health care medical expenditures or indirectly due to lost productivity. Absenteeism from work is usually higher in those who smoke. There is productivity loss by frequent smoke breaks that employees take. The societal cost of smoking is estimated at \$7.18 per cigarette pack smoked (Exhibit 4).¹¹ It is advantageous to employers to institute programs to help their employees quit smoking.

There are immediate and long-term benefits to quitting tobacco use. Within days to weeks of quitting, patients can have an improved quality of life. Their circulation improves so they are able to walk around more easily. Their lung functioning can increase up to 30 percent. Within a month, the lung cilia will regain normal function. This is critical because lung cilia are responsible for clearing mucous from the pulmonary system. They can clear tar and other components of tobacco smoke that have deposited in the lung during years of smoking. Within nine months, most former smokers will have decreases in shortness of breath, cough, infections, and generalized fatigue.

Within one year of smoking cessation, the excess risk of cardiovascular events decreases to half that of a continuing smoker. By 15 years, an ex-smokers' risk of cardiovascular disease is similar to that of people who have never smoked. Within five years, the risk of

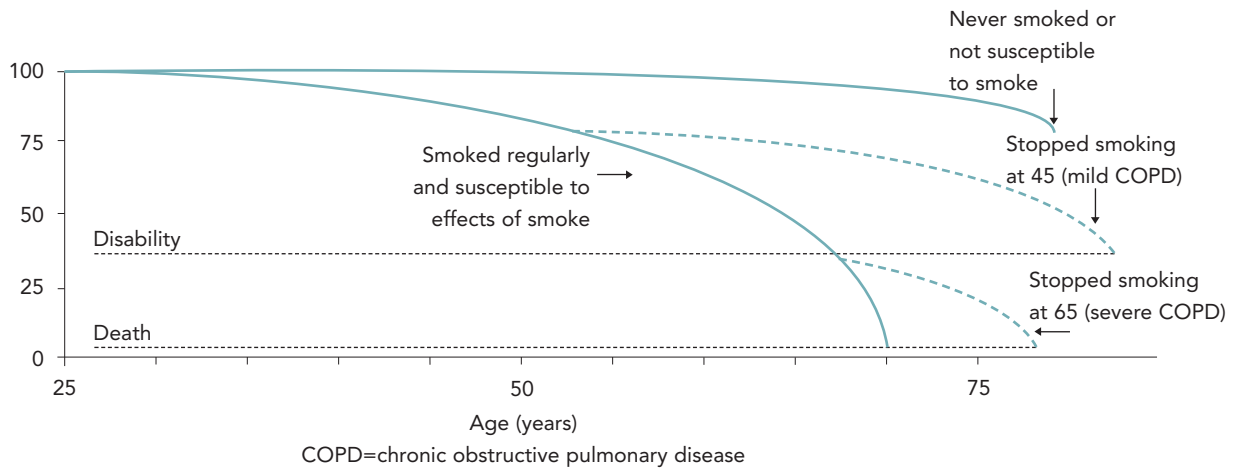
Exhibit 4: Annual Smoking Attributable Economic Costs—U.S., 1995-1999



Reference: 11

Exhibit 5: Beneficial Effects of Quitting: Pulmonary Effects

At any age, there are benefits of quitting.



stroke declines to that of someone who has never smoked. Similarly, deaths due to cancer, especially lung cancer, will drastically reduce. These statistics should send the message to smokers that it is never too late to quit. Obviously, it is better if the patient can quit at an earlier age rather than later.

Exhibit 5 illustrates the beneficial, measurable effects of smoking cessation on lung function in various patients.¹² Normally, there is a slight decline in lung function as a person ages. Usually, this is not clinically significant enough to cause any quality of life impact. People who smoke regularly get significant disability at an early age and are likely to die at an earlier age. On average, cigarette smokers die approximately 10 years younger than nonsmokers.¹³ In the example in Exhibit 5, the person who quits smoking at age 45 will regain a substantial portion of lung function compared to the person who quits later. Quitting smoking allows a person to regain years of healthy life. The number of years regained is a function of the age at which the person stopped smoking (Exhibit 6).¹³

People who never smoke have a cumulative risk of death from lung cancer of less than 1 percent versus close to 16 percent for a patient who is a lifelong smoker.¹⁴ Among those who continue smoking, at least half will die due to a tobacco-related disease.¹³

In 2000, the U.S. Public Health Service published a clinical practice guideline for treating tobacco use and dependence.¹⁵ This is an evidence-based practice guideline designed to provide the tools for healthcare professionals to assist their patients in smoking cessation. Clinician intervention can be by non-physician clinicians (nurse or pharmacists) or physicians.

Compared to smokers who receive no assistance from a clinician, smokers who receive counseling are 1.7 to 2.2 times as likely to quit successfully for five or more months.¹⁴ Self-help material or recommending self-help material is only minimally better than no intervention at all.

Surprisingly, tobacco users expect health care professionals to encourage them to quit.¹⁶ Survey data have shown that tobacco users are more satisfied when their healthcare providers address their smoking use. Failure to address tobacco use tacitly implies to the patient that quitting is not important. Clinicians have a professional obligation to address tobacco use and can have an important role in helping patients plan for their quit attempts. But, the decision to quit lies in the hands of each patient.

Exhibit 6: Smoking Cessation: Reduced Risk of Death

Prospective study of 34,439 male British doctors
Mortality was monitored for 50 years (1951-2001)

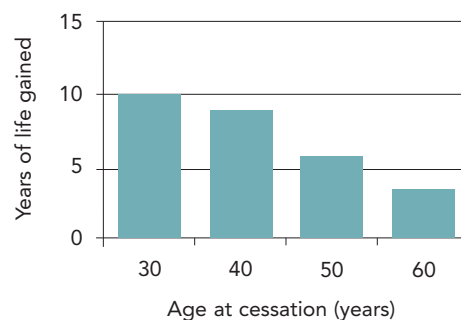
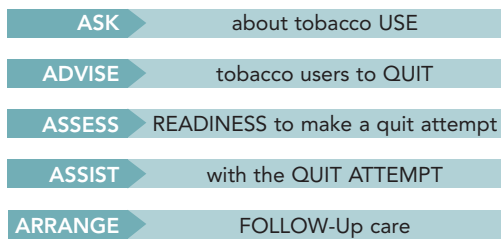


Exhibit 7: The 5 A's



Reference: 15

For many tobacco users who have tried to quit in the past, the main reason that they have failed is because they didn't have a systematic plan in place to have a successful outcome. Most tobacco users do not plan to fail—they fail to plan. This is where health care professionals can be vital in a successful outcome.

A systematic approach to smoking cessation is needed. The approach that the guideline puts forth is called the 5As (Exhibit 7).¹⁵ All patients who smoke should be questioned about their use and advised to quit. Readiness to quit is then assessed. If the patient is ready, the health care provider can assist them with quitting. Arranging for follow-up care is especially important in having a successful outcome.

Patients differ in their readiness to quit. There are four stages of readiness for smoking cessation.¹⁷ Stage one is the patient who is not ready to quit any time in the next month. Some patients are aware of the need to quit but struggle with ambivalence about change. At this point, the pros of continued tobacco use outweigh the cons in the patient's mind. Pushing these patients to quit will not be successful most of the time. Stage two is the patient who is ready to quit. He or she is aware of the need to, and the benefits of, making the behavioral change, and is getting ready to take action. Stage three is a recent quitter who may have quit within the past six months. This patient needs continued follow-up care to maintain abstinence. Stage four is the former tobacco user who quit more than six months ago. This patient may need strategies to prevent relapse. Assessing a patient's readiness to quit enables clinicians to deliver relevant, appropriate counseling messages.

It is important to realize that quitting smoking is a process of behavioral change. It is not a single event; usually, the process is characterized by multiple quit attempts and subsequent relapses. Patients will move between those four stages. This is normal and should be expected.

When patients are at stage 1, the health care professional should provide motivation and information on smoking risks. The goal here is to get the patient to start thinking about quitting. At stage two, the

patient is ready to quit and the goal is to achieve cessation. Once the patient's ready to quit, there has to be a multifactorial approach to the quitting process.

Formal cessation programs can be self-help programs, individual counseling, group programs, telephone counseling, or web-based counseling. Two web-based programs are www.smokefree.gov and www.quitnet.com. The toll-free hotline, 800-QUIT-NOW, is a great resource for patients because it is available around the clock.

Pharmacotherapy, cognitive strategies, behavioral strategies, withdrawal management, and social support are all used in successful smoking cessation programs. Success is usually maximized if many of those are done. Successful smoking cessation is not just pharmacotherapy or counseling. Social support is critical because patients who receive social support are more successful in quitting.

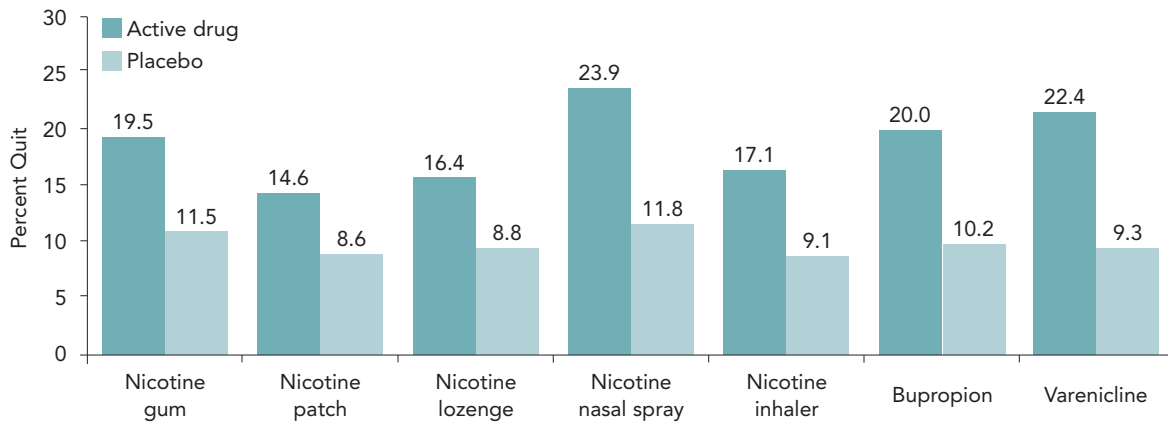
Pharmacotherapy for smoking cessation consists of nicotine replacement therapy (nicotine gum, patch, lozenge, nasal spray, inhaler), sustained-release bupropion (Zyban[®]), and varenicline (Chantix[®]). Varenicline, the newest agent, is a partial nicotinic receptor antagonist. The primary role of pharmacotherapy is to help with the withdrawal symptoms. The physiologic symptoms of depression, insomnia, irritability, and difficulty concentrating, will begin within the first day or two of quitting smoking. These usually pass within two to four weeks after quitting. Getting the patient through that period with pharmacotherapy will maximize success. Some of the agents have to be started before the patient stops smoking to let the drug levels build up in the blood stream.

The pharmacotherapy component of a smoking cessation plan should not be viewed as a crutch. It is a treatment to alleviate withdrawal symptoms so the patient can focus on behavioral and cognitive changes.

The long-term abstinence rate, which is defined as more than six months, for the pharmacotherapy medications range from about 15 to 24 percent (Exhibit 8).¹⁸⁻²² Few head-to-head trials have been performed comparing these agents.²² In general, pharmacotherapy will double a person's chance of quitting successfully.

If patients are not successful with a plan combining monotherapy, cognitive and behavioral support, and follow-up care, combination pharmacotherapy can be tried. One possible combination is a long acting nicotine replacement product (patch) and a short-acting formulation (gum, lozenge, inhaler, nasal spray). The long acting product provides a sustained level of nicotine and the short acting product allows for acute dose titration as needed for withdrawal symptoms. This combination may be especially

Figure 8: Long-term (≥ 6 month) Quit Rates for Available Cessation Medications



Reference: 18-21

beneficial for heavy smokers who may not have withdrawal symptom alleviation even with the highest dose patch. The other combination that may be valuable is sustained release bupropion with the nicotine replacement therapy. At this time, there is no evidence that varenicline with nicotine replacement or bupropion is effective. Based on the mechanism of the varenicline, it is highly unlikely to be effective in combination with nicotine replacement therapy. There have been some small studies that have shown a significant increase in nausea, dizziness, and headaches when both these agents are used together.

Medication counseling is key to success with pharmacotherapy. Following directions is especially important with the shorter acting nicotine replacement therapies because they should not be used on an as-needed basis. The patient needs to use at least the minimum number of pieces of gum or lozenge, for example, each day in the early phases of their quit attempt. If they wait until they have the urge, it is too late for them to benefit from these products. Nicotine replacement therapy doesn't provide the same levels of nicotine concentrations as a cigarette.

If patients cannot take pharmacotherapy or they refuse pharmacotherapy for some reason, there are nonpharmacological methods for smoking cessation. Cold turkey is the least effective. Ninety-five percent of patients who quit cold turkey will relapse. Unassisted tapering also is not very effective. Unassisted tapering involves reduced frequency of cigarettes to slowly cut down, lower nicotine cigarettes, and special filters or holders. These are not effective because the smoker can compensate for these types of methods. For example, they may inhale the cigarette more deeply.

Assisted tapering using an electronic device (QuitKey™) can be quite successful for patients who

cannot take pharmacotherapy (www.quitkey.com). It may be useful in pregnant women, teens, and chewing tobacco users. This device helps the patient gradually reduce the total number of cigarettes smoked per day. Purchase of the device includes a telephone support service. The 24-percent abstinence rate at one year with this product is very comparable to pharmacotherapy abstinence rates.

Follow-up care is important to ensuring success. It is not enough to have an initial intervention with the patient, prescribe a drug therapy, and give them the 1-800-QUIT-NOW phone number. Patients need reinforcement to continue their quit attempts, to be reminded of the adverse health consequences of smoking and the benefits of quitting, and some supportive counseling for any of the stresses that come

Figure 9: Useful Web sites

- www.surgeongeneral.gov/tobacco
- www.cdc.gov
- www.smokefree.gov
- www.ahrq.gov
- www.ashp.org
- http://trytostop.org
- www.treattobacco.net
- www.quitnet.com
- www.quitkey.com
- www.who.int
- www.tobaccofreeforkids.org

along with the quit attempt. The more time spent with the patient, the higher their quit rate will be. Zero to one follow-up sessions results in an estimated 12.7 percent quit rate at five months.¹⁵ Eight or more sessions produce a 24.7 percent quit rate.¹⁵

In terms of the follow-up, patients should be seen within the first week of quitting. The second follow-up should occur within the first month of quitting. Additional follow-up can be scheduled on an as needed basis. Patients are at significant risk for a relapse during the first six months after quitting. All former tobacco users can be vulnerable to relapse.

Although smoking cessation counseling can be a time consuming process, it has been shown that even brief interventions can increase the chances of quitting by up to 1.7 times more than no intervention at all.¹⁵ All health care professionals who have patient contact have an obligation to at least conduct brief smoking cessation interventions. The brief intervention can take 30 seconds or less and should include ask, advise, and refer. The patient is asked if they smoke. If the answer is yes, they are advised to quit smoking and referred to a smoking cessation program. The most commonly recommended referral is 1-800-QUIT-NOW telephone counseling.

Exhibit 9 lists some useful websites for obtaining additional information on smoking cessation.

Conclusion

Smoking has significant costly effects on people of all ages. All health care providers have an obligation to at least briefly intervene with their patients who smoke. Smoking cessation is a process that requires significant support to complete successfully and maintain. Pharmacotherapy combined with other interventions will most likely result in success. **JMCM**

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