

REPORTS OF THE COUNCIL ON SCIENCE AND PUBLIC HEALTH

The following reports, 1–4, were presented by Stuart Gitlow, MD, Chair:

1. GENOMICS IN HYPERTENSION: RISK PREDICTION AND TREATMENT

Reference committee hearing: see report of [Reference Committee K](#).

HOUSE ACTION: RECOMMENDATIONS ADOPTED AS FOLLOWS AND REMAINDER OF REPORT FILED

See Policy [H-460.901](#).

BACKGROUND

One in three adults in the United States (about 77 million) has hypertension, a major risk factor for cardiovascular disease, stroke and kidney failure.¹ Hypertension is responsible for half of all cardiovascular-related mortalities¹ and is present in approximately 50 percent of patients with coronary artery disease and 70 percent of those with stroke.^{2,3} Its financial burden in the United States is nearly \$50 billion annually, including health services, medications, and missed days of work.¹ This burden of disease has led to intensive efforts to identify undiagnosed hypertension and control it. The American Medical Association has partnered with the Department of Health and Human Service's Million Hearts® initiative, Johns Hopkins Medicine's Armstrong Institute for Patient Safety and Quality and the Johns Hopkins Center to Eliminate Cardiovascular Health Disparities to make a measureable impact on the number of patients with uncontrolled hypertension.

The biological pathways underlying blood pressure control are complex, and incompletely understood. Additionally, variation in risk factors and response to antihypertensive medications among individuals is common. A great deal of research aiming to understand the underlying causes and optimal treatments is ongoing. This research includes efforts to uncover the genetic factors contributing to hypertension, along with the possibility of translating genetic information into tools that better identify who is at risk before it develops and predict what therapies will be most effective for each individual. The Council on Science and Public Health initiated this report to examine current knowledge about the genetic factors relevant to the control of hypertension and emerging genomic-based diagnostic and therapeutic tools.

METHODS

Literature searches were conducted in the PubMed database for English-language articles published between 2004 and 2014 using the search terms “hypertension” and “blood pressure” with the terms “genomic,” “genetic,” “personalized medicine,” “pharmacogenomic,” and “family history.” These searches were intended to identify the involvement of genetics in the control of blood pressure, contribution to hypertension, risk assessment, and therapeutic management. To capture reports not indexed on PubMed, a Google search was conducted using the same search terms. Additional articles were identified by manual review of the references cited in these publications.

RISK FACTORS

A number of risk factors for the development of hypertension have been identified including age, ethnicity, family history and genetic factors, lower education and socioeconomic status, greater weight, lower physical activity, tobacco use, psychosocial stressors, sleep apnea and dietary factors, e.g., dietary fats, higher sodium intake, lower potassium intake and excessive alcohol intake.¹ These risk factors increase the relative risk of developing hypertension by about 1.5-6-fold.^{4,5} Individual risk for hypertension and its eventual development is dependent on the risk factors present and their combined effects. Many risk factors, such as weight, physical activity, tobacco use and dietary intake are modifiable and can attenuate or amplify the risk conferred non-modifiable risk factors.⁶

Family History as a Risk Factor

Data supporting a role for the genetic control of blood pressure comes from family and twin studies. The heritability of blood pressure is approximately 30-60 percent,⁷ meaning that 30-60 percent of hypertension risk can be explained

by additive genetic factors.^{8,9} Family history can therefore be a valuable indicator of an individual's chance of developing hypertension.¹⁰ Individuals that have one or both parents with hypertension have an approximately 1.5-2.5-fold greater risk of developing hypertension themselves.¹¹⁻¹³ This risk rises to as much as 6.2-fold in individuals whose parents both experienced hypertension before the age of 55 years.^{11,12} These risk increases are independent of other behavioral risk factors that tend to be shared among families, like physical activity levels, dietary intake patterns and alcohol consumption.

GENE DISCOVERY EFFORTS

Studies demonstrating the heritability of blood pressure and family history as a risk factor have prompted intensive efforts to discover gene variants that contribute to hypertension. Early efforts to identify hypertension-causing gene variants were dominated by linkage and association mapping studies, i.e., studies designed to map genetic regions and gene variants that are shared among individuals and families with hypertension.^{14,15} These were successful in identifying variants that alone are sufficient to cause rare monogenic hypertension syndromes such as familial hyperaldosteronism and congenital adrenal hyperplasia, but the studies were underpowered to detect common gene variants with smaller contributions to hypertension that, in combination, are likely to cause hypertension in a much larger proportion of the population.¹⁴⁻¹⁸

Newer genomic technologies have enabled the rapid scanning of the genome for single-nucleotide variations associated with common, complex conditions. Termed "genome-wide association studies," or GWAS, the studies use statistical algorithms to detect association between a certain phenotype and genetic variants.¹⁹ Several GWAS have been undertaken to identify variants contributing to hypertension. To date, more than 40 variants affecting blood pressure have been identified, but none, individually or in combination, are thought to explain more than 1-2% of systolic and diastolic blood pressure variance.¹⁴ This translates into approximately 1 mmHg for systolic blood pressure and 0.5 mmHg for diastolic blood pressure.²⁰ Although these increases are small, modest increments in population systolic and diastolic blood pressure are associated with substantial increases in cardiovascular disease risk and mortality.²¹⁻²⁴ Nonetheless, a great deal of work remains to identify other variants involved in blood pressure control.

The issue of GWAS detecting only a small proportion of the heritability of common, complex diseases has led to the term "missing heritability" and speculation about how to detect and explain the remaining heritability.²⁵ Predictions about what constitutes missing heritability include undiscovered rare variants that have large effect sizes, undetected structural variants such as insertions and deletions, epigenetic effects like imprinting, and unknown gene-environment interactions.^{14,25-27}

RISK PREDICTION USING GENOMICS

The identification of genetic variants affecting blood pressure has led to the development of genetic tests aimed at enhancing the prediction of hypertension and associated cardiovascular events in individual patients. These tests assess genotype at several variant locations associated with blood pressure control, and then return a genetic risk score (GRS) based on the variants that are present. GRSs evaluated to date are significantly associated with changes in blood pressure, hypertension incidence, stroke, and coronary heart disease, even after the effects of traditional risk factors are accounted for.^{20,28,29} The relative weight of the GRS's ability to predict hypertension is similar to that of type 2 diabetes or positive family history of hypertension, but less than that of obesity or prehypertension.²⁸ Although studies so far have been unable to show that use of a GRS improves risk classification beyond the presence of other risk factors, a closer look at gene variant combinations has yielded promising results. For example, in those carrying a combination of variants that results in the highest GRS range, risk for coronary heart disease is increased by 60-70 percent.³⁰

Some potential for GRS utility exists in younger age groups that may not yet exhibit other risk factors. In a study of children, adolescents and teens of European ancestry, a GRS predicted increased risk of adult hypertension and coronary heart disease independently of a family history of hypertension.^{31,32} Similar results were observed among the more ethnically diverse population of the Bogalusa Heart Study.³¹

Modulating Genetic Risk and Risk Perception

Like many complex diseases, the development of hypertension is the result of a combination of inherited genetic factors and environmental/behavioral risks. Although the genetic variants identified thus far contribute only a small proportion to hypertension risk, emerging evidence suggests that their effects can be magnified or attenuated by interaction with non-genetic risk factors. For example, the heritability of blood pressure appears to be modulated by body-mass index (BMI). Generally speaking, heritability increases as BMI increases.³³ The physiological mechanisms underlying this relationship are not fully understood, but are thought to be a function of the increased inflammation, insulin resistance, and hormonal changes associated with obesity that can cause changes in gene expression.³³ Similarly, dietary intake patterns associated with obesity are thought to result in epigenetic modifications that can alter gene expression.^{34,35} Socioeconomic factors like literacy, income and educational attainment also have been shown to modulate the effect of hypertension gene variants. The mechanisms by which these interactions are mediated are unclear but are hypothesized to depend on the genes' pleiotropic involvement in pathways controlling learning, memory and addiction behaviors.³⁶⁻³⁹

Apart from risk modulation due to changes in gene expression, studies are exploring how risk perception among individuals may change and potentially affect behavior. One trial currently underway is testing changes in risk perception and understanding of a series of genetic test results for participants with hypertension who receive in-person genetic counseling versus those that do not.⁴⁰ The goal is to determine whether, in patients with a chronic disease like hypertension, genetic counseling affects how risk and personal control are perceived and how health behavior may be impacted.

GENOMIC APPLICATIONS IN TREATMENT

Although comorbidities and other patient characteristics must be considered when choosing an anti-hypertensive therapy, the treatment of hypertension usually begins with a thiazide diuretic, calcium channel blocker (CCB), angiotensin-converting enzyme (ACE) inhibitor or an angiotensin receptor blocker (ARB).^{41,42} In African-Americans, the recommended first-line therapy is a thiazide or CCB.⁴² A second drug from a different class is commonly recommended if blood pressure control is not achieved with one drug.^{41,42} β -blockers are often prescribed to treat hypertension, but they are no longer recommended as a first-line therapy due to mixed findings about their ability to reduce cardiovascular death, myocardial infarction and stroke.⁴¹ As many as 16 million patients report taking antihypertensive medication,⁴³ and several antihypertensives were among the top 100 prescribed drugs in the United States last year.⁴⁴

Despite a recommended standard approach to pharmacologic treatment of hypertension, patient response is often variable and suboptimal. The response rate to any given antihypertensive is about 50 percent,⁴⁵⁻⁴⁶ and aside from age and race, there are few reliable predictors of the most effective antihypertensive therapy for each patient.^{45,47} Genetic variations are thought to partially explain the variability in response, and pharmacogenomic evaluation has been suggested as a potential method by which the most effective antihypertensive could be selected for each patient.⁴⁵ Below, selected pharmacogenomic study results are briefly summarized for several antihypertensive drug classes.

Thiazides

Thiazide diuretics target the sodium-chloride transporter in the distal renal tubule, increasing excretion of sodium, chloride and potassium. Substantial variation in response to thiazides has been observed among patients, with a growing body of evidence suggesting that certain genetic polymorphisms influence response. Several genetic variants affecting response to hydrochlorothiazide have been identified in clinical trial populations.⁴⁸ For example, carriers of a variant in the *α -adducin* gene appear to have a greater decrease in systolic and diastolic blood pressure in response to hydrochlorothiazide than do non-carriers.⁴⁸ Further, in *α -adducin* variant carriers, thiazide therapy is associated with a more substantial reduced risk of combined myocardial infarction and stroke than are ACE inhibitors, CCBs, β -blockers or other vasodilators.⁴⁹ The *α -adducin* variant is estimated to be present in 30-60 percent of the population, depending on ethnicity,⁵⁰ potentially explaining a portion of the observed patient variability in thiazide response, and pointing to a possible opportunity to better target thiazide therapy.

Angiotensin-Converting Enzyme Inhibitors

ACE inhibitors, which suppress the renin-angiotensin-aldosterone system by inhibiting formation of angiotensin II, have been used for many years in the treatment of hypertension, heart failure, myocardial infarction, renal failure and diabetic nephropathy, and have been shown to significantly reduce mortality related to cardiovascular disease.⁵¹ However, nearly 20% of patients discontinue ACE inhibitor therapy due to adverse drug reactions,⁵² two of which are a dry, persistent cough and the more serious angioedema, a quickly developing inflammation in the dermis, subcutaneous tissue, mucosa and submucosal tissues.⁵³ A number of studies have identified a gene variant that is associated with a 2-4-fold increase in ACE inhibitor-induced angioedema in carriers.⁵³⁻⁵⁵ Additionally, a GWAS identified 16 and 41 variants in African-Americans and Europeans, respectively, that are moderately associated with ACE inhibitor-induced angioedema.⁵⁶ Similarly, a study examining ACE inhibitor-induced cough revealed a significant association with a variant in the gene encoding the angiotensin-converting enzyme itself, occurring with greater frequency in Asian populations than in Caucasian populations.⁵⁷ Subgroup analyses revealed that in those recessive for the variant and over age 60 years, ACE inhibitor-induced cough was more than twice as likely to occur.⁵⁷ The angioedema and cough results may contribute to efforts to identify which patients will experience adverse reactions when taking ACE inhibitors, but since they were primarily derived from small studies, further research is required to determine whether testing patients for variants before prescribing ACE inhibitors is clinically warranted.

Calcium Channel Blockers

CCBs have been a recommended first-line therapy for hypertension and reduction of cardiovascular risks for a number of years, although their efficacy varies from one patient to another.⁴⁶ To explore the basis of this variability, a pharmacogenomic risk score was developed using three gene variants that were identified as being associated with poor cardiovascular outcomes in patients being treated with CCBs or β -blockers, with one point assigned for each homozygous variant they carried.⁵⁸ In patients with a pharmacogenomic risk score of zero or 1, meaning they were not homozygous for any variant or were homozygous for only one variant, respectively, CCB treatment was associated with an approximately 40% reduced risk for adverse cardiovascular outcomes.⁵⁸ In those with a score of 2 or 3, meaning that they were homozygous for two or three variants, respectively, CCB treatment was associated with an approximately 30% increased risk.⁵⁸ The same relationship was not seen in patients treated with β -blockers, suggesting that in those with a higher pharmacogenomic risk score, CCB therapy should be avoided.

Angiotensin Receptor Blockers

ARBs modulate the renin-angiotensin-aldosterone system by reducing the vasoconstrictor and aldosterone-secreting effects of angiotensin II by selectively blocking its binding to the angiotensin-1 receptor. They also are used often in patients who cannot tolerate ACE inhibitor-induced cough.⁵⁹ Although research into the pharmacogenomic effects of ARBs is sparse, results suggest that patients carrying certain genetic variants may respond better to ARBs than those who do not carry the variants. In a small study comparing systolic and diastolic levels in Japanese patients taking ARBs, those carrying certain sets of variants had lower systolic and diastolic values than those who did not carry the variants.⁶⁰ Further studies are needed to determine whether this result will be consistently observed among other ethnicities and in larger clinical trial populations.

β -Blockers

Although β -blockers are no longer recommended as a first-line therapy to treat uncomplicated hypertension, they are still used by millions of patients and often prescribed when comorbidities such as arrhythmia, coronary artery disease, angina, migraines, and some types of congestive heart failure are present. Several β -blockers are metabolized by the cytochrome P450 2D6 (CYP2D6) enzyme, which is subject to altered activity when mutations in the gene encoding it are present. For example, studies have demonstrated that in patients carrying mutations that reduce the activity of CYP2D6 (poor metabolizers), the metabolism of metoprolol is reduced.^{61,62} In poor metabolizers, β -blocker therapy results in a greater heart rate reduction than in normal (extensive) metabolizers. However, metoprolol's effect on blood pressure response does not appear to be different in poor metabolizers, and a difference in adverse event rates has not been observed.⁶³⁻⁶⁶ Since other β -blockers are not metabolized by CYP2D6 as extensively as metoprolol, it is unlikely that mutations in the gene encoding CYP2D6 would affect their efficacy or toxicity.⁶⁷

Several drugs act as potent inhibitors of CYP2D6 activity, altering the pharmacokinetics of drugs metabolized by CYP2D6. The drug labeling for metoprolol, nebivolol, carvedilol and propranolol notes that co-administration of drugs inhibiting CYP2D6 activity may increase toxicity and adverse events due to increased plasma levels of the β -blocker.⁶⁸⁻⁷¹ Drugs such as bupropion, fluoxetine, paroxetine, and quinidine are strong inhibitors of CYP2D6.⁷²

DISCUSSION AND FUTURE PERSPECTIVES

The physiological control of blood pressure is complex, but continued identification of associated gene variants has contributed to increased understanding of the biological pathways involved and the factors that lead to hypertension. Although the genetic variants discovered so far appear to contribute only a small proportion to the overall risk for hypertension, much thought and effort is being directed toward identifying variants that may contribute to the “missing heritability.” Recent discoveries in genomic architecture, such as the effects of imprinting, along with a better understanding of the interaction between inherited and behavioral risk factors, hold promise for filling the heritability gap.

A key problem complicating the interpretation of hypertension clinical trial results is the variability of the phenotype. Blood pressure levels measured in clinical trial participants can be affected by a number of factors. These include the type of measurement method (home or ambulatory devices, physician office measurement, other retail or pharmacy devices) and the time of the day during which the measurements are taken. Inaccuracies in self-reported information are often present. Additionally, the use of antihypertensive medications prior to the trial and their long-term effects on blood pressure levels may skew blood measurements during the trial.⁴⁸ Since even small changes in blood pressure levels can impact cardiovascular outcomes, heterogeneity in the trial population can lead to results that are difficult to interpret and apply to clinical care. For genomic research, the detection of variants that contribute to a small proportion of total blood pressure control is difficult if the clinical trial population is not simultaneously large and free of heterogeneity.¹⁴ To improve the quality of information from clinical trials, many calls for the incorporation of methods to reduce heterogeneity have been made.^{14,29,48}

The state of genomic-based diagnosis and treatment of hypertension is still in its infancy, but important discoveries are being made that may partially explain some of the variation in individual risk and response to antihypertensive medications. In particular, GRSs developed to date are about as good as other risk factors at predicting hypertension. With continued discovery of genetic variants, it is not unreasonable to think that the GRSs will improve and could become a valuable tool in predicting hypertension before it manifests. In the meantime, physicians should be aware that a large proportion of blood pressure variability is genetic, and that a family history is a valuable tool for predicting those who may be at risk. Likewise, although no clinical practice guidelines recommend genotyping before initiating antihypertensive therapy, an awareness of the pharmacogenomic factors affecting response to antihypertensive agents is important for anticipating varying responses to prescribed medications and altering treatment when blood pressure levels are not satisfactorily lowered. Tools to aid in prescribing decisions are especially needed since many patients must take multiple antihypertensive medications to achieve blood pressure control, increasing the risk for adverse events and drug interactions.

With continued improvements in clinical trial design, discovery of genetic variants not yet known to control blood pressure, and application of new findings to targeted antihypertensive therapy, the potential to improve prevention and treatment of hypertension and reduce adverse cardiovascular events is promising.

RECOMMENDATIONS

The Council on Science and Public Health recommends that the following recommendations be adopted and the remainder of the report be filed.

1. Our American Medical Association encourages continued research on the genetic control of blood pressure, including in pediatric populations, and the development of genomic-based tools that may assist health professionals in better predicting risk and targeting therapy for hypertension.
2. Our AMA supports the view that hypertension clinical trial designs should attempt to reduce phenotypic heterogeneity in order to improve the quality and interpretation of results.

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2. ELECTRONIC CIGARETTES, VAPING, AND HEALTH: 2014 UPDATE

Reference committee hearing: see report of [Reference Committee K](#).

**HOUSE ACTION: RECOMMENDATIONS ADOPTED
IN LIEU OF RESOLUTIONS 919, 927 AND 930 AND
REMAINDER OF REPORT FILED**

See Policy [H-495.972](#) and [H-495.973](#).

INTRODUCTION

CSAPH Report 6-A-10, “Use of Electronic Cigarettes in Smoking Cessation Programs,” reviewed the manufacture and characteristics of electronic cigarettes (e-cigarettes), applicable regulations, potential health impacts of these products, and the potential role of e-cigarettes in smoking cessation. E-cigarettes were a relatively new product when the Council developed this report. Since that time, the marketplace has experienced rapid penetration of these products despite ongoing concern about their potential impact on public health. This is an important issue for physicians and other health care professionals who are being asked to counsel patients and communities about the safety and efficacy of e-cigarettes in the midst of conflicting or inconsistent research findings, a changing regulatory landscape, and the expanding influence of major tobacco companies. The CSAPH deems that another report is needed to educate and inform the House of Delegates (HOD) on this evolving topic. In addition to this report, the HOD will continue to be apprised of issues and developments related to e-cigarettes via the “Annual Tobacco Report,” which is submitted to the HOD each June.

METHODS

This report updates and expands information presented in CSAPH Report 6-A-10. English-language articles were selected from searches of the PubMed and Google Scholar databases from 2010 to July 31, 2014 using the search terms “electronic cigarettes,” “e-cigarette,” and “electronic nicotine delivery systems” in the article title and/or abstract. Internet sites managed by federal agencies and applicable health professional organizations and tobacco control advocacy organizations also were reviewed for relevant information. Additional articles were culled from reference lists contained in pertinent articles and other publications.

The literature search revealed an extensive list of peer-reviewed publications on e-cigarettes published since 2010. Recognizing the dynamic nature of research being published on this topic, the Council deemed it appropriate to summarize the findings and conclusions of a recent authoritative review and to evaluate any recent pertinent literature. In December 2013, the Center for Tobacco Control Research and Education at the University of California, San Francisco, released an extensive background paper on e-cigarettes for the World Health Organization (WHO) Tobacco Free Initiative.¹ The WHO Background Paper reviewed the literature on e-cigarettes that was available as of September 2013, and includes an update of tobacco industry involvement in the e-cigarette market, research recommendations, global regulations pertaining to e-cigarettes, and potential options for regulation. A highly condensed version of the WHO Background Paper, which includes five additional studies, was published in May 2014.² Relevant articles that were not included in the WHO Background Paper are cited, as appropriate, in

this report; readers should refer to the WHO Background Paper for more detailed information and for primary source citations.

In July and August of 2014, the Forum of International Respiratory Societies,³ the American Heart Association,⁴ and the WHO⁵ released reports and policy recommendations that accord with findings and recommendations in the WHO Background Paper.

BACKGROUND

Cigarette smoking remains the leading preventable cause of sickness and mortality in the United States, responsible for more than 400,000 deaths each year. The most dire health consequences associated with smoking (e.g., cancer and heart disease) are linked to inhalation of tar and other chemicals produced by tobacco combustion and the heat of inhaled smoke; the pleasurable, reinforcing, and addictive properties of smoking are produced primarily by the nicotine contained in tobacco. The prevalence of current cigarette smoking among adults has declined from 42% in 1965 to 18% in 2012. However, more than 42 million Americans still smoke. Tobacco has been linked to the premature deaths of more than 20 million people since the first US Surgeon General's report on this topic was published in 1964.

E-cigarettes and other electronic nicotine delivery systems (ENDS)^{*} are designed to simulate the act of tobacco smoking by producing a flavored aerosol that looks and feels like tobacco smoke but without the toxic chemicals produced by burning tobacco leaves. While e-cigarettes do not contain tobacco, most contain nicotine, which can be harmful and is associated with toxicity and addiction. In most e-cigarettes, puffing activates a heating device to vaporize nicotine and other ingredients, which simulate the visual, sensory, and behavioral aspects of smoking without the combustion of tobacco. The resulting aerosol or vapor is then inhaled (called "vaping"). Because they deliver nicotine without burning tobacco, e-cigarettes are marketed as a safer, less toxic alternative to conventional cigarettes. Theoretically, the extent to which these products are less harmful to health than conventional cigarettes and help some smokers quit could help reduce the overall death and disease burden from tobacco product use in the United States.

Many health professionals are concerned that e-cigarettes may have an adverse impact on users' health, encourage smoking initiation, perpetuate the use of nicotine and tobacco products among smokers who might otherwise quit, and counter the effectiveness of smoke-free policies. There is concern about potential health effects of acute and chronic inhalation of the vaporized base components of these products. Whereas some experts welcome e-cigarettes as a potential pathway to the reduction or cessation of tobacco use, opponents characterize them as dangerous products that could undermine efforts to denormalize smoking. Opponents of e-cigarettes argue that these products can serve as initiators for new tobacco users before they migrate to cigarettes or other tobacco products, or for existing users to become dual users (i.e., users of e-cigarettes and conventional tobacco cigarettes). The increasing popularity of e-cigarettes has raised concern that these products might undercut significant gains associated with tobacco cessation efforts and limits on public use and advertising. Experts have also raised concerns that the marketing of products such as e-cigarettes can increase nicotine addiction among young people or serve as a gateway to try other tobacco products, including conventional cigarettes, which are known to cause disease and lead to premature death. The temporal and causal relationships between e-cigarette use and smoking among youth have not been determined.

The US Food and Drug Administration (FDA) has the legal authority to regulate e-cigarettes as a tobacco product; a proposed rule, which is discussed in this report, would extend the agency's tobacco authority to cover additional tobacco products. In the meantime, e-cigarettes have grown to become a multibillion dollar industry with no federal oversight. Rapid e-cigarette product penetration in the marketplace is occurring despite many unanswered questions about their safety, efficacy for harm reduction and for facilitation of cessation of use of tobacco products, and their total impact on public health.

PRODUCT CHARACTERISTICS

Wide variability exists in e-cigarette product engineering, including varying concentrations of nicotine in the solution (also called "e-liquid") used to generate the aerosol, varying volumes of solution in the product, different

* For this report, these products are collectively referred to as "e-cigarettes" for the purpose of brevity and simplicity.

carrier compounds (most commonly propylene glycol with or without glycerol [glycerin]), a wide range of additives and flavors, and battery voltage. Battery voltage differences and device circuitry can result in variability in the ability of these products to heat and convert the e-liquid to an aerosol and, consequently, may affect actual delivery of nicotine and other chemicals to users emitted in the exhaled aerosol or “vapor” (which looks like smoke). Some e-cigarettes have refillable cartridges, which may provide a means for users (or others, including children) to expose themselves to potentially toxic levels of nicotine when refilling the cartridges. These cartridges also could be filled with substances other than nicotine, thus possibly serving as an alternate delivery route for other drugs.

Manufactured e-liquids contain variable concentrations of nicotine. Analysis of simulated e-cigarette use found that individual puffs contained from 0 micrograms (μg) to 35 μg of nicotine. Assuming a high nicotine delivery of 30 $\mu\text{g}/\text{puff}$, an individual would need to take about 30 puffs to deliver the 1 mg (milligram) of absorbed nicotine typically delivered by smoking a conventional cigarette. The amount of nicotine delivered to the user is likely to be dependent on the temperature achieved by the heat source in the e-cigarette and how the product is used. The variability in nicotine delivery from these products is evident from an FDA analysis, which involved the simulated use of three different cartridges for the same e-cigarette product (labeled as menthol high strength; 18 mg nicotine). Testing yielded nicotine delivery concentrations of 26.8, 34.9, and 43.2 $\mu\text{g}/100\text{ mL}$ puff from the respective cartridges.⁶

An analysis of 20 models of 10 popular brands of e-cigarette refill liquids found that the nicotine content measured in the refill bottles corresponded closely to the labels on the bottles, with concentrations ranging from 6.0 mg/mL to 29.0 mg/mL.⁷ Some brands had levels of impurities above acceptable limits for pharmaceutical products. To ensure that e-liquids meet the quality standards required of nicotine replacement medications, the study authors suggest that e-liquid manufacturing processes should be controlled and that standard testing and quality control procedures be implemented. For some brands of e-liquids, the manufacturing process or control systems are probably below required standards for nicotine-based medications.

SALES AND MARKETING

The popularity of e-cigarettes has grown steadily since their introduction into the US market in 2007. The estimated market for these products approached \$2 billion in 2013, and is estimated to rise to \$10 billion by 2017. It is further estimated that e-cigarette sales will surpass sales of conventional cigarettes by 2023.⁸ As of January 2014, there were more than 400 different e-cigarette brands being sold on the Internet.⁹

Most e-cigarettes are marketed and sold independently; however this changed in 2012 when Lorillard, the manufacturer of Newport cigarettes, acquired the blue-cigarette brand. The two other major US tobacco companies followed suit, with Reynolds American (maker of Camel) launching its VUSE brand and the Altria Group (maker of Marlboro) debuting its MarkTen e-cigarette in select test markets in 2013; national launches were announced for some time in the second half of 2014. With the entry of these established tobacco companies into the marketplace, e-cigarette advertising is becoming more aggressive. Brands now use celebrity endorsements, event sponsorships, and advertisements on cable television, print, and web media to promote their products.¹⁰ “Vaping bars” are being located in many communities to promote the use of e-cigarettes and the glamorization of such use.

In addition to traditional media outlets, e-cigarettes have established a strong advertising presence on the Internet, and e-cigarette companies heavily advertise their products through electronic communication. Another innovation employed effectively by e-cigarette marketers and retailers is the use of social media and viral video sharing. Given the substantial research demonstrating the effect of viewing smoking in the movies on smoking initiation, the addictive nature of nicotine, and the lack of regulatory assurance of their quality or safety, tobacco control experts cite the important need to keep e-cigarettes from being sensationalized through the use of celebrity promotion or product placement in movies or other entertainment media.

In September, 2013, federal legislators launched an investigation into the practices of nine commonly sold e-cigarette brands.¹¹ E-cigarette manufacturers have significantly increased marketing spending, more than doubling expenditures between 2012 and 2013. In total, six e-cigarette companies spent \$59.3 million in 2013 to market e-cigarettes. E-cigarette companies are marketing their products using some of the same claims, tactics, and media channels -- including television and radio -- that were effective at marketing conventional cigarettes to attract young people and deter smokers from quitting before use of these channels to market cigarettes was banned. Among the most popular claims are that e-cigarettes are healthier, cheaper, and cleaner than cigarettes, can be smoked

anywhere, can be used to circumvent smoke-free policies, and do not produce secondhand smoke. Cessation-related claims (ranging from overt statements that one can use the product to quit smoking to indirect claims such as “you’ll never want to smoke tobacco cigarettes again”) were found on many of the sites. Claims about effects on bystanders frequently included statements that e-cigarettes emit “only water vapor” that is harmless to others. All nine companies surveyed were using marketing practices that appeared to appeal to youth. Seven e-cigarette companies were airing television and radio advertisements during events and programs, including those with youth viewership. Six e-cigarette companies were marketing e-cigarettes in flavors that could appeal to children and teens. For example, e-cigarette manufacturers are marketing flavors like Cherry Crush, Chocolate Treat, Peachy Keen, and Grape Mint.

A recent article, based on results from the Centers for Disease Control and Prevention (CDC) National Youth Tobacco Survey, showed that flavored smoking products are used by 42% of middle-school and high-school students who smoke.¹² The study authors conclude that advertising for flavored tobacco products is a tactic to target youth. Because flavors can mask the natural harshness and taste of tobacco, flavored tobacco products are easier for young people to use and flavoring increases their appeal.

AWARENESS AND USE OF E-CIGARETTES BY ADULTS

E-cigarettes are increasing rapidly in popularity: prevalence of ever use among adult smokers in the United States appears to have increased from approximately 2.5% in 2010 to more than 7% in 2012. In 2010, approximately 40% of adults reported awareness of e-cigarettes, rising to nearly 70% in 2011. Population-based studies of adults show the highest rate of e-cigarette use among current smokers (dual use), followed by former smokers, with little use among nonsmokers; e-cigarette use rose in each of these categories over the past few years. Awareness is more prevalent among men, but trying e-cigarettes is more prevalent among women. The most common reasons given by adults for trying e-cigarettes are for use in places where smoking is restricted, to reduce smoking, because they believe e-cigarettes are less harmful than combustible cigarettes, and for help with quitting smoking.

AWARENESS AND USE OF E-CIGARETTES BY YOUTH

Data on e-cigarettes for adolescents are limited but, like adults, show rapid increases in awareness and use. Awareness among teens and young adults appears to be higher than awareness among adults. According to a recent survey published by the Legacy Foundation, awareness of e-cigarettes among young people is nearly ubiquitous, ranging from 89% for those between 13 and 17 years of age to 94% for young adults between 18 to 21 years of age.¹⁰ Awareness was even higher in both age groups for individuals who had either ever or currently used traditional cigarettes. Analyses by race/ethnicity found that e-cigarette awareness was similar across racial/ethnic groups.

The first national estimates of e-cigarette use among US youth from the CDC National Youth Tobacco Survey indicate rapid growth of e-cigarette use among middle school and high school students in the United States from 2011 to 2012. Among middle school youth (grades 6 through 8), prevalence of “ever trying” an e-cigarette doubled from 1.4% in 2011 to 2.7% in 2012. Similarly, current use (past 30-day use) rose from 0.6% to 1.1%. Among high school youth, ever use doubled from 4.7% in 2011 to 10.0% in 2012, with current use rising from 1.5% in 2011 to 2.8% in 2012. Notably, dual use with cigarette smoking accounts for most of the past 30-day e-cigarette use among middle school youth (61.1%) and high school youth (80.5%). Initiation of nicotine exposure with e-cigarettes is apparent in that 20% of middle school youth who had tried an e-cigarette and 7.2% of high school youth who had tried an e-cigarette had not yet tried a conventional tobacco cigarette. These results indicate rapid market penetration of e-cigarettes among youth. Moreover, although youth who had tried to quit were more likely to use e-cigarettes, most adolescent e-cigarette users are dual users with conventional smoking, suggesting that use of e-cigarettes is not leading to abstinence from smoking among adolescents.

Analysis of data from the 2011, 2012, and 2013 National Youth Tobacco surveys of middle and high school students in the United States found that the number of students who say they have tried e-cigarettes but not traditional cigarettes increased by about 60% from 2012 to 2013.¹³ The study found that non-smoking youth who used e-cigarettes were nearly twice as likely to say they plan to start smoking tobacco cigarettes compared to those who never used e-cigarettes (about 43.9% versus 21.5%, respectively). Survey results indicate that more than 263,000 middle and high school students who had never smoked before used e-cigarettes in 2013, up threefold from 79,000 in 2011. The study also showed that 21.9% of youth who had never smoked conventional cigarettes intended to try them in the next year.

PRODUCT SAFETY

Electronic cigarettes vaporize and deliver to the lungs a chemical mixture typically composed of nicotine, propylene glycol (a known irritant when inhaled), and other chemicals often of unknown dose and identity. While e-cigarettes are often promoted as safer alternatives to traditional cigarettes, little is actually known about the short- and long-term health effects of using these devices. Though the FDA states that propylene glycol and glycerin food additives are “generally regarded as safe,” the long-term effects of inhaling rather than ingesting these substances are unknown, especially in the heated vaporized form delivered by an operational e-cigarette.

Acute Toxicity

Between 2008 and early 2012, 47 adverse event reports were filed with the FDA Center for Tobacco Products regarding e-cigarettes; these include reports of eye irritation, nausea, headaches, sore throat, vomiting, and coughing. Eight reports claimed more serious health problems such as hospitalization due to congestive heart failure, hypotension, pneumonia, chest pain and “possible infant death secondary to choking on e-cigarette cartridge.” While such reports do not indicate causation, they raise questions of biological plausibility that need to be addressed. Injuries also have been reported from explosion or overheating of the lithium batteries in e-cigarettes when the device is charged for long periods or if charged with an improper charger or a powerful electrical source. Reports include an 18-month-old girl who became seriously ill after drinking e-liquid in a refill container that was left in the child’s reach and was not sealed with a child-proof cap.

From September 2010 to February 2014, 2,405 calls were made to poison control centers related to e-cigarettes.¹⁴ E-cigarettes accounted for an increasing proportion of combined monthly e-cigarette and cigarette exposure calls, increasing from 0.3% in September 2010 to 41.7% in February 2014. E-cigarette exposures were reported mostly among children between 0 and 5 years of age (51.1%) and adults over 20 years of age (42.0%). Exposure types included ingestions (68.9%), inhalations (16.8%), eye exposures (8.5%), and skin exposures (5.9%). In 2014, a case report was published involving a 10-month-old boy who was poisoned by ingesting e-liquid from a cartridge reported to contain nicotine (18 mg/mL) and unknown concentrations of oil of wintergreen (methyl salicylate), glycerin, and propylene glycol.¹⁵

Nicotine

Nicotine, whether inhaled, ingested, or in direct contact with the skin, can be particularly hazardous to certain populations, such as children, young people, pregnant women, nursing mothers, people with cardiovascular disease, and the elderly. Nicotine directly activates neuronal cholinergic receptors in autonomic ganglia, the adrenal gland, and central nervous system. Centrally, this action also enhances the release of other neurotransmitters, such as dopamine and serotonin, making it a very effective reinforcing and mood-altering substance, key elements in fostering nicotine’s addictive properties. Because nicotine is eliminated rapidly, it needs to be replaced frequently to maintain effects or to prevent withdrawal symptoms in users who are physically dependent. Peripheral effects include epinephrine release, vasoconstriction, increased heart rate and blood pressure, and combination of increased free radical production, vascular wall adhesiveness, and a reduction of fibrinolytic activity in the plasma that may contribute to premature atherosclerosis. Like other broadly neuroactive substances, chronic nicotine exposure during youth and adolescence may have lasting consequences on brain development.

The efficiency of nicotine delivery by e-cigarettes is variable and incompletely understood. Studies measuring levels of plasma nicotine and/or craving have shown disparate results ranging from no nicotine delivery to levels similar to traditional smoking. The authors of a recent published analysis of the nicotine content of e-liquid bottles indicated that some products pose a potential danger as they can contain up to 720 mg of nicotine. This amount is several times the fatal dose of nicotine (and larger bottles are available online).⁷ The authors state further that the minimum lethal oral dose of nicotine when acutely ingested is 40 to 60 mg in children (e.g., as occurs with oral intake of tobacco from a tobacco cigarette ingested by a child) or 0.8 to 1.0 mg/kg of body weight in adult non-smokers.

Currently, no standards exist to specify how much nicotine e-cigarettes deliver, how consistently they deliver it, or if they are packaged safely. Without safety protections, standards for product consistency, or truth-in-labeling requirements, two e-cigarettes produced on the same production line can be dramatically different. Researchers have identified instances of poor quality control and significant variability in nicotine content when testing certain e-

cigarette cartridges. This potential variability in nicotine content could be misleading to consumers who believe that they are consuming one level of nicotine but instead may be consuming higher levels in certain instances.

Other Chemicals and Particulates

The aerosol emitted from e-cigarettes results only from what is exhaled by users. E-cigarettes do not generate sidestream aerosol analogous to sidestream smoke from conventional cigarettes. Researchers have detected the presence of volatile organic compounds (VOCs), tobacco-related carcinogens, metals, and other chemicals in e-cigarette aerosol. Some of the chemicals, particularly some flavoring agents, were found to be cytotoxic to human and rat cells, particularly human embryonic cells.

The particle size distribution and number of particles delivered by e-cigarettes is similar to that of conventional cigarettes, with most of the particles in the ultrafine range (modes around 100 to 200 nanometers). The particle delivery appears to depend on nicotine level in the e-liquid, with more particles delivered in e-cigarettes with higher nicotine content; the presence of flavors does not seem to be a factor. Users exhale some of these particles, which exposes bystanders to “passive vaping.” Based on available data, it is plausible that e-cigarette aerosol could be inhaled deep into the lungs similar to tobacco smoke.

Chronic Toxicity

Data are limited on chronic use of these products; thus it is too soon to know if e-cigarettes will cause long-term harm. At a minimum, current research shows that e-cigarette aerosol is certainly not merely “water vapor” as is often claimed in product marketing. Overall, e-cigarettes that have been tested show much lower levels of most toxicants (but not particles) than conventional cigarettes. The thresholds for long-term human toxicity of potential toxicants in e-cigarette aerosol are not known, and the possibility of health risks to primary users of the products and those exposed passively to the product emissions must be considered.

The FDA website states that the safety and efficacy of e-cigarette products have not been fully studied, and that consumers of e-cigarettes have no way of knowing whether e-cigarettes are safe for their intended use, how much nicotine or other potentially harmful chemicals are being inhaled during use, or if there are any benefits associated with using these products.¹⁶

EFFECT ON SMOKING CESSATION

Many e-cigarette consumers have strong, but to date unsubstantiated, beliefs that e-cigarettes are a safe and effective way for quitting cigarette use; many start using e-cigarettes because of those unsubstantiated beliefs. It is reasonable to assume that, if existing smokers switched completely from conventional cigarettes (with no other changes in use patterns) to e-cigarettes, there would be a lower disease burden associated with product use. However, available evidence (although limited) points to high levels of dual use of e-cigarettes with conventional cigarettes, no proven cessation benefits, and rapidly increasing youth initiation with e-cigarettes. Furthermore, high rates of dual use may result in greater total public health burden and possibly increased individual risk if a smoker maintains an even low-level tobacco cigarette addiction for many years instead of quitting.

Data are accumulating but conflicting regarding the potential benefits of e-cigarettes as a useful tobacco cessation tool, compared with other established nicotine replacement products (e.g., “gums,” lozenges, patches). Variation among e-cigarette products and vaping techniques may affect nicotine delivery, which in turn may affect their utility as a nicotine replacement intervention. Studies of adult smokers contradict claims that e-cigarettes are effective cessation aids. Pooled results of five population-based studies of smokers showed that smokers who used e-cigarettes were about one-third less likely to quit smoking than those who did not use e-cigarettes. Whether e-cigarette use prevents attempts to quit or whether people who choose to use e-cigarettes are more highly dependent and therefore have a harder time quitting remains to be determined. A randomized trial comparing e-cigarettes to the nicotine patch showed that in the context of low level behavioral support, the quit rate for those using e-cigarettes was low and similar to those using a nicotine patch. The number of cigarette smokers who actually quit tobacco product use with e-cigarettes is low. To date, no e-cigarette manufacturer has submitted the requisite applications for FDA approval of these products for smoking cessation.

Some vocal supporters of e-cigarettes have embraced the strategy of harm reduction as an approach to risky behavior that prioritizes the minimization of damage rather than elimination of the behavior. The debate over e-cigarettes has centered on whether e-cigarettes could be useful as a harm-reduction strategy in established adult cigarette smokers. E-cigarettes have been argued to be the most promising product for tobacco harm reduction to date, because, besides delivering nicotine vapor without the combustion products that are responsible for nearly all of the damaging effects from smoking, they also replace some of the rituals associated with smoking behavior. However, the behavior of vaping can become associated with its own behavioral rituals. Although the use of e-cigarettes could potentially reduce harm associated with smoking if their use were to replace the use of conventional cigarettes, some studies suggest that current smokers who use these products do not reduce use of conventional cigarettes and may delay cessation. Studies suggest further that e-cigarettes may contribute to nicotine addiction and are unlikely to discourage conventional cigarette smoking.

Available evidence indicates that a substantial portion of e-cigarette users of all ages use cigarettes at the same time. This “dual use” pattern raises the concern that e-cigarettes are being used as a “bridge product”, bridging smokers from one cigarette to the next by satisfying their nicotine addiction in places where smoking is not allowed rather than as a means to quit smoking entirely, raising concerns that the beneficial public health impact of e-cigarettes could be minimal. This pattern suggests that e-cigarettes are being used to perpetuate nicotine addiction rather than break it. Also, individuals who chose to continue smoking conventional cigarettes (in any quantity) retain cardiovascular disease and cancer risks, as these risks are affected more by smoking duration than intensity. Dual use of both e-cigarettes and conventional cigarettes also carries the risk of secondhand smoke exposure, which can worsen respiratory problems in others, particularly those with asthma.

According to the WHO, the efficacy of e-cigarettes in aiding smoking cessation has not been demonstrated scientifically and those concerned are advised strongly not to use e-cigarettes until a reputable national regulatory body has found them to be safe and effective.¹⁷

REGULATION OF E-CIGARETTES

In June 2009, President Obama signed the Family Smoking Prevention and Tobacco Control Act into law, which granted the FDA authority to regulate all tobacco products. This Act specifically directed the FDA to regulate cigarettes, cigarette tobacco, roll-your-own tobacco, and smokeless tobacco; it also authorized the agency to extend its authority to other categories of tobacco products, including cigars and e-cigarettes.

In April 2011, the FDA stated that it would regulate e-cigarettes as “tobacco products” and not as “drug-delivery devices.”¹⁹ This decision resulted from a federal court ruling that blocked the FDA from regulating e-cigarettes as drug-delivery devices due to a specific interpretation of the Family Smoking Prevention and Tobacco Control Act. Under that law, any product that contains nicotine from tobacco and makes no claims to be therapeutic must be regulated as a tobacco product. Concerns have been raised that this ruling allows for the sale of unregulated refined nicotine directly to consumers, unless and until the FDA takes further action.

With the authority vested in the Family Smoking Prevention and Tobacco Control Act, the FDA proposed a new rule in April 2014, which would extend the agency’s tobacco authority to cover “additional tobacco products.”¹⁸ Products that would be “deemed” to be subject to FDA regulation are those that meet the statutory definition of a tobacco product, including currently unregulated marketed products, such as e-cigarettes, cigars, pipe tobacco, nicotine gels, waterpipe (or hookah) tobacco, and dissolvable tobacco products.

Consistent with currently regulated tobacco products, under the proposed rule, makers of e-cigarettes would, among other requirements, register with the FDA and report product and ingredient listings; only market new tobacco products after FDA review; only make direct and implied claims of reduced risk if the FDA were to confirm that scientific evidence supports the claim and that marketing the product will benefit public health as a whole; and not distribute free samples. Additional provisions that would apply to newly “deemed” tobacco products include minimum age and identification restrictions to prevent sales to underage youth; requirements to include health warnings; and prohibition of vending machine sales, unless in a facility that never admits youth.

Critics of the proposed rule contend that the FDA did not go far enough, particularly with respect to the use of flavorings. While some states and localities have enacted regulations affecting the sale, marketing, and use of e-cigarettes to minors, these regulations can be circumvented by purchasing these products on the Internet. Easy

access to these products (e.g., online or via kiosks in shopping malls), in addition to their wide array of cartridge flavors (such as coffee, mint, candy, and fruit flavors), may make them particularly appealing to adolescents. Critics further contend that prospects for manufacturers and marketers of e-cigarettes would likely be enhanced if clean indoor air laws designed to curb the risks of secondary cigarette smoke exposure do not include prohibitions on vaping in indoor environments. Regulation of e-liquids, including requirements for labeling and child-proof caps, also must be taken into consideration.

Absent federal law, the sale, use, and taxation of these products is being addressed by states and localities. Thirty-four state laws address e-cigarettes either explicitly or as part of language applying to tobacco-derived or nicotine-containing products.²⁰ Twenty-eight of these state laws (all of which have been adopted since 2009) explicitly apply to e-cigarettes; 22 states regulate youth access to e-cigarettes; 12 states explicitly apply smoke-free air provisions to e-cigarettes; and 1 state, Minnesota, has imposed an excise tax on e-cigarettes.

Six of nine e-cigarette companies that were surveyed in a 2014 Congressional report indicated support for some form of regulation, such as restrictions on the sale and marketing of e-cigarettes to children and teenagers; a ban of the usage of television to market e-cigarettes; a prohibition on characterizing flavors; restricting online sales; and regulation of e-cigarettes at the point of sale.¹¹ Specific actions and recommendations from the WHO and other health organizations have been published recently to inform policymaking on such issues.³⁻⁵

Relevant AMA Policy

AMA policy supports FDA regulatory authority of all tobacco products and nicotine delivery systems. At the June 2014 Annual Meeting, the HOD amended Policy H-495.973 to oppose the exemption of any non-pharmaceutical nicotine and tobacco products from FDA regulation. Specifically, the policy calls for tighter restrictions on the sale and marketing of e-cigarettes including:

- legislation and/or regulation addressing the minimum purchase age, locations of permissible use, the use of secure, child- and tamper-proof packaging and design, advertising and promotion activities, and sponsorship of e-cigarettes;
- transparency and disclosure concerning the design, content of, and emission from e-cigarettes
- restrictions on the use of characterizing flavors that may enhance the appeal of such products to minors, and the development of strategies to prevent marketing to, and use of, e-cigarettes by minors; and
- the prohibition of claims of reduced risk and/or the marketing of e-cigarettes as tobacco cessation tools until such time that credible evidence is developed that supports such claims.

AMA Policy H-490.909 “Use of Electronic Cigarettes (e-cigarettes) in Smoking Cessation Programs” urges that: (1) e-cigarettes be classified as (nicotine) drug delivery devices and should be subject to FDA regulation with appropriate standards for identity, strength, purity, packaging, and labeling with instructions and contraindications for use, including age of the user; (2) state legislatures prohibit the sales of e-cigarettes and all other nicotine devices that are not FDA-approved; and (3) as currently marketed, e-cigarettes be included in smoke free laws but separately defined from tobacco products.

AMA Policy H-495.988(1), “FDA Regulation of Tobacco Products,” calls upon the AMA to reaffirm its position that all tobacco products (including but not limited to, cigarettes, smokeless tobacco, chewing tobacco, and hookah/water pipe tobacco) are harmful to health and that there is no such thing as a safe cigarette.

THE PHYSICIAN’S ROLE

Considering the expanding awareness and use of e-cigarettes among adolescents and adults, it is likely physicians will need to consider how best to counsel patients about these products. Although it is not possible to endorse a product that is not yet regulated for quality, consistency, efficacy, and safety, it is possible that e-cigarettes could be a potential aid in the battle against smoking and tobacco addiction. However, genuine uncertainty exists about the therapeutic merits of e-cigarettes or their role as a harm reduction strategy. Physicians should be sensitive that when patients ask about e-cigarettes they are likely asking for help to quit smoking, which provides an opportunity for discussing this important topic. If patients ask about e-cigarettes, they should be informed of the need for more research to determine the safety and efficacy of these products.

Physicians may consider expanding their social history questions to ask, “Do you vape (or do you use electronic cigarettes)?” rather than asking only, “Do you smoke?” Subsequent advice would then be tailored to the individual being counseled. For nonsmokers, the physician message should clearly be, “Don’t start. E-cigarettes are not a safe alternative to smoking conventional tobacco.” For an individual who has never smoked cigarettes but has tried e-cigarettes (and is thus at risk for trying traditional cigarettes), physicians should emphasize the potential for nicotine addiction introduced by these devices and caution them on the unknown risks of these unregulated products. For current smokers interested in quitting smoking, e-cigarettes are unproven aids for smoking cessation. It is important to emphasize the potential hazard associated with dual use, as some patients may choose to use e-cigarettes in venues where they can’t smoke (e.g., in a workplace or some other environment).

For those who are using e-cigarettes, it is important to state clearly that data are inconclusive regarding the safety and efficacy of these products. While some physicians may choose to acknowledge that e-cigarettes are probably less hazardous than conventional cigarettes in smokers who are unable or unwilling to quit, physicians should emphasize that e-cigarette vapor is not harmless water vapor. For some smokers, the use of e-cigarettes might be considered as an option to help them quit smoking if they can commit to short-term use with an established quit date. It is important to emphasize that there is not enough evidence for clinicians to counsel their patients who use conventional cigarettes to use e-cigarettes as a primary smoking cessation aid. Due to the novelty of these products, there also are no data to determine possible chronic health effects from long term use of e-cigarettes.

A number of FDA-approved smoking cessation medications are available that have been appropriately tested in clinical trials and are known to be safe and effective for smokers to reduce their dependence on nicotine, including nicotine gum, nicotine skin patches, nicotine lozenges, nicotine oral inhaled products, and nicotine nasal spray.²¹ Although controversial, some smoking cessation experts see potential in e-cigarettes as a cessation tool, addressing behavioral and sensory needs that other nicotine replacement products, such as transdermal patches and gum, do not. Data are not available to compare e-cigarettes with counseling, nicotine replacement, or use of bupropion or varenicline. Free help is available to all smokers who want to quit at 1-800-QUIT-NOW or by visiting www.smokefree.gov.

With the growing use of e-cigarettes, physicians need to be alert for nicotine poisoning. They need to educate patients and especially parents and other caregivers about this danger, and advocate for measures that will help prevent potentially fatal liquid nicotine poisoning of infants and young children. In the United States, the lack of regulatory oversight has resulted in inconsistent labeling, insufficient or nonexistent child protective packaging for bottles of replacement liquid, and product design and flavoring that may encourage children to explore and ingest these products.

DISCUSSION

Given the rapid increase in electronic cigarette use among both adults and adolescents, rigorous surveillance of these products is particularly important, including their impact on the initiation and cessation of conventional tobacco use and concurrent use with other conventional tobacco products. Due to the lack of rigorous chemical analyses and toxicological studies, as well as clinical trials on commercially available e-cigarettes, neither their value as therapeutic aids for smoking cessation nor their “safety” as cigarette replacements is established. At this time, the public health impact of wide distribution of these devices is unknown. Limited data exist on the safety or effectiveness of e-cigarettes; consumers have no way of knowing whether the purported therapeutic benefits or advantages of e-cigarettes over conventional cigarettes are real. There are no requirements for manufacturers of e-cigarettes to adhere to established consumer safety practices that list ingredients and produce consistent products with uniform concentrations and defined maximum doses of nicotine. Studies have demonstrated a lack of standards for e-cigarettes, mislabeled nicotine content, and wide variability in e-cigarette constituents and toxicants. The e-liquid aerosolized in e-cigarette devices is not uniform in ingredient content and concentration. Until e-cigarette regulations are introduced to standardize device content and characteristics, product variability will continue to limit claims of safety and reliability.

The potential benefits of e-cigarettes, including harm reduction and enhancing smoking cessation, have not been proven by long-term studies of significant numbers of e-cigarette users. E-cigarettes have not been proven to help people quit smoking; it is unclear whether e-cigarettes may be effective as smoking-cessation aids or whether they perpetuate nicotine addiction and thus interfere with smoking cessation. The value of e-cigarettes as a substitute for conventional cigarettes has been questioned because of high levels of dual use with conventional cigarettes; the hope

that e-cigarettes will reduce harm by delivering “clean” nicotine will not be realized in continuing dual users. Used appropriately, e-cigarettes may have a valuable part to play in smoking cessation, but because the long-term safety of e-cigarettes is unclear, and the effects of secondhand exposure to vapors unknown, it is important to proceed cautiously to ensure that users and the general public are protected from harm. Given that smokers already have access to licensed nicotine-replacement therapy products, it is important to establish whether e-cigarettes are effective in aiding quitting. It is crucial to distinguish whether the use of e-cigarettes in a quit attempt improves the likelihood of success of that attempt, or whether the use of e-cigarettes for any purpose, such as aiding smoking reduction or recreation, promotes or suppresses attempts to stop smoking.

Because e-cigarettes deliver fewer total chemicals and fewer carcinogens than conventional tobacco-burning cigarettes, they are sometimes considered less hazardous products. However, e-cigarette cartridge fluids and their emissions are not yet well characterized and may vary among products. E-cigarettes have the potential to cause acute adverse health effects. Injuries and illness have resulted from e-cigarette use, which may be related to lack of basic safeguards in the product design and manufacturing process, as well as the contents of the solution. There is a real danger to infants and young children from e-liquid. Adverse health effects for people exposed to e-cigarette emissions cannot be excluded; research is needed to determine whether the vapor produced by e-cigarettes is harmful to bystanders.

Without more research, consumers currently don't know the potential risks of e-cigarettes when used as intended, how much nicotine or other potentially harmful chemicals are being inhaled during use, or whether there are any relative benefits associated with using these products. It is important to assess e-cigarette toxicant exposure and individual risk as well as health effects of e-cigarettes as they are actually used to ensure safety of all ages and populations. The first priority is to characterize the safety profile of these products, including in long-term users. If these products are demonstrated to be safe, their efficacy as smoking cessation aids should then be tested in appropriately designed clinical trials. Ideally, these studies would have been conducted prior to marketing of these products.

Data on the impact of e-cigarettes on adolescents are particularly limited. Young adulthood marks a critical developmental period, one that often coincides with both the initiation and establishment of regular tobacco use. Available data suggest that youth awareness of e-cigarettes is high and use is increasing rapidly. The extent to which e-cigarette use in youth will result in nicotine dependence and subsequent use of other tobacco products is unknown. Avoiding preventable contact with a highly concentrated nicotine solution remains important; this can be achieved by specific labeling of all products, child-proof packaging, and proper consumer education.

Increases in the use and acceptance of e-cigarettes by consumers depend not only on explicit marketing such as via advertising, but on cultural attitudes and beliefs about potential harms. If the risk of using these products is perceived to be low, the likelihood of use increases. Just as cultural glamorization of cigarette smoking led to increased use in the mid-twentieth century United States (and in the Third World thereafter), and just as glamorous views of smoking as incorporated in movies, television shows, and other mass media have served to inhibit prevention efforts to reverse statistics on incidence and prevalence of cigarette smoking, glamorization of vaping as a behavior portrayed as enjoyable and safe, compared to smoking, contributes to societal shifts in attitudes and behaviors associated with these products. Smoking is now perceived by a majority of Americans as an unseemly activity, with negative attitudes attached to exposing others to the smells and health risks of a smoker's cigarette smoke. Vaping can be portrayed as more “respectful of others” and healthy if second-hand exposure is perceived to be irrelevant as a harm.

A number of states and localities have taken action to address the sale and use of these products, but only federal regulation can ensure that all ages and populations are protected. The FDA is encouraged to act swiftly to assert jurisdiction over e-cigarettes and to issue regulations regarding their manufacture and prohibiting their marketing and sale, particularly to youth and current nonsmokers. While most adolescents using e-cigarettes are dual users, up to a third of them have never smoked a conventional cigarette, indicating that some youth are starting use of the addictive drug nicotine with e-cigarettes.

The use of e-cigarettes could re-normalize smoking, promote experimentation among young people who otherwise may not have tried smoking, or lead to dual-use together with conventional cigarettes and thereby deter some smokers from quitting. To minimize the potential negative impacts on prevention and cessation, and the undermining of existing tobacco control measures, e-cigarette use should be prohibited where tobacco cigarette use

is prohibited and the products should be subject to the same sales and marketing restrictions as tobacco cigarettes. The sale of characterizing flavors should be eliminated in e-cigarettes and all other tobacco products with no exemptions. Evidence-based policies and regulations are needed that protect the entire population (children and adults, smokers and nonsmokers) in the context of how the e-cigarette industry is marketing and promoting these products. Therapeutic claims should be prohibited until such time that e-cigarette companies provide evidence that, as actually used, e-cigarettes improve cessation success. Until such evidence is provided and evaluated thoroughly, the continued marketing and use of these products constitutes an uncontrolled experiment on the US population.

RECOMMENDATIONS

The Council on Science and Public Health recommends that the following recommendations be adopted, and the remainder of the report be filed.

1. That Policy H-495.973, FDA to Extend Regulatory Jurisdiction Over All Non-Pharmaceutical Nicotine and Tobacco Products, be amended by addition and deletion to read as follows:

Our AMA ~~supports~~:

(1) ~~supports~~ the U.S. Food and Drug Administration's (FDA) proposed rule that would implement its deeming authority allowing the agency to extend FDA regulation of tobacco products to pipes, cigars, hookahs, e-cigarettes and all other non-pharmaceutical tobacco/nicotine products not currently covered by the Federal Food, Drug, and Cosmetic Act tobacco law, as amended by the Family Smoking Prevention and Tobacco Control Act.

(2) ~~supports~~ legislation and/or regulation ~~addressing the~~ of electronic cigarettes and all other non-pharmaceutical tobacco/nicotine products that:

(a) establishes a minimum legal purchase age of 18; locations of permissible use;

(b) prohibits use in all places that tobacco cigarette use is prohibited, including in hospitals and other places in which health care is delivered;

(c) applies the same marketing and sales restrictions that are applied to tobacco cigarettes, including prohibitions on television advertising, product placement in television and films and the use of celebrity spokespeople;

(d) prohibits product claims of reduced risk or effectiveness as tobacco cessation tools, until such time that credible evidence is available, evaluated, and supported by the FDA;

(e) requires the use of secure, child- and tamper-proof packaging and design, and safety labeling on containers of replacement fluids (e-liquids) used in e-cigarettes ~~advertising and promotion activities, and sponsorship of e-cigarettes and all other non-pharmaceutical tobacco/nicotine products;~~(3)

(f) establishes manufacturing and product (including e-liquids) standards for identity, strength, purity, packaging, and labeling with instructions and contraindications for use;

(g) requires transparency and disclosure concerning ~~the product~~ design, contents of, and emissions; ~~and from e-cigarettes and all other non-pharmaceutical tobacco/nicotine products;~~(4)

(h) restrictions prohibits on the use of characterizing flavors that may enhance the appeal of such products to youth minors, and the development of strategies to prevent marketing to, and use of, e-cigarettes and all other non-pharmaceutical tobacco/nicotine products by minors; and (5) the prohibition of claims of reduced risk and/or the marketing of e-cigarettes as tobacco cessation tools until such time that credible evidence is developed that supports such claims.

2. Our AMA urges physicians to:

(a) educate themselves about e-cigarettes, be prepared to counsel patients about the use of these products and the potential for nicotine addiction and the potential hazards of dual use with conventional cigarettes, and be sensitive to the possibility that when patients ask about e-cigarettes, they may be asking for help to quit smoking;

(b) consider expanding clinical interviews to inquire about "vaping" or the use of e-cigarettes;

(c) promote the use FDA-approved smoking cessation tools and resources for their patients and caregivers; and

(d) advise patients who use e-cigarettes to take measures to assure the safety of children in the home who could be exposed to risks of nicotine overdose via ingestion of replacement e-cigarette liquid that is capped or stored improperly.

3. That our AMA encourage further clinical and epidemiological research on e-cigarettes.
4. That Policy H-490.909, Use of Electronic Cigarettes (e-cigarettes) in Smoking Cessation Programs, be rescinded.

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3. TORNADO SAFETY AND MANUFACTURED HOMES (RESOLUTION 401-A-13)

Reference committee hearing: see report of [Reference Committee K](#).

**HOUSE ACTION: RECOMMENDATIONS ADOPTED
IN LIEU OF RESOLUTION 401-A-13 AND
REMAINDER OF REPORT FILED**
See Policy [H-130.936](#).

INTRODUCTION

Resolution 401-A-13, “Tornado and Storm Safety,” introduced by the Indiana Delegation and referred by the House of Delegates (HOD), asked:

That our American Medical Association (AMA) adopt policy that: 1) manufacturing standards be improved to require every new manufactured home produced in the United States to contain a “safe room” with clear labeling indicating its location; 2) local ordinances across the United States require that manufactured homes be properly anchored; 3) incentives be offered to owners of existing homes to promote the installation of a “safe room” or other storm shelter for those homes; and 4) programs providing discounted weather alert radios be developed and promoted.

The reference committee recommended that the resolution be referred for more in-depth study and analysis to inform a comprehensive approach to personal and community preparedness for tornadoes affecting occupants of manufactured homes. The HOD agreed.

BACKGROUND

In the United States, federal agencies such as the National Oceanic and Atmospheric Administration (NOAA) constantly monitor for tornadoes and other extreme weather events. Despite their best efforts, the circumstances, severity, and exact strike point of some of these events are hard to predict reliably. For tornadoes, it is possible to forecast potential storm formation, but it is not possible to forecast the actual occurrence of the storm, where it will strike, or how it will move. Modern technology allows for live tracking of a storm’s path. Coupled with emergency communication systems and local media, such technology can provide people with useful and very timely information about the estimated time of arrival of a storm at a given location so that appropriate actions can be taken to avoid or mitigate harm. Typically, building structures of light construction, such as residential homes (and particularly manufactured homes), suffer the greatest damage from tornado impact. In buildings hit by tornadoes, the threat to human life results from a combination of effects resulting from very strong winds and the impact of wind-borne debris, which occur almost simultaneously. Pre-event planning and mitigation are particularly relevant to communities located in regions prone to tornadoes and other extreme wind events.

The United States experiences the highest number of tornadoes in the world. In the continental United States, tornadoes typically occur between the months of April and June; nearly a third of these occur in the midsection of the country, an area known as “Tornado Alley.” Even states that are at lower risk for tornadoes and hurricanes can experience dangerous wind conditions that threaten human health and safety. During an average year, more than 1,000 tornadoes occur across the continental United States, resulting in 60 deaths, more than 1,500 injuries, and millions of dollars in personal and property losses.¹ Tornado-related fatality rates have decreased substantially over the last century with better storm prediction and warning systems, improvements in building construction technologies and codes, and better disaster mitigation planning, among other factors.²

During a tornado, strong winds and fast moving wind-borne debris present a risk to people who are unable to find safe shelter, as well as to those in homes that are not able to withstand these violent forces. In the United States, residential housing options include manufactured, modular, panelized, and site-built housing. Most residential homes are not designed to withstand the extreme forces caused by the high wind speeds of severe tornadoes (up to 200 mph). The majority of tornadoes recorded in the United States are considered weak (Enhanced Fujita scale [EF]-1 or below[†]), with maximum wind speeds of 110 mph or less (intensities that properly designed and constructed homes can withstand).

Manufactured homes (sometimes called “mobile homes”[‡]) provide affordable housing options for many families. They are not the same as modular or prefabricated homes, which are factory-built and then towed in sections to be installed at a permanent location. Manufactured homes have a permanent chassis to assure the initial and continued transportability of the home to a residential site. The requirement to have a wheeled chassis permanently attached differentiates manufactured homes from prefabricated/modular homes. Some manufactured homes also may have second stories, dormers, and other amenities more typically found in conventional “site-built” homes.

An estimated 20 million people (mostly between the ages of 18 to 59) live in manufactured housing nationwide, accounting for approximately 9% of new single family home sales.³ In 2013, more than half of these homes were shipped to eight mostly southeastern coastal states, Kentucky, and California. About 70% of manufactured homes are located on private properties and 30% are located in communities (on public or leased land). Residents of manufactured homes are particularly vulnerable in tornadoes since most of these homes lack permanent foundations, are tied down with metal straps, and lack interior rooms or basements for shelter.

According to the NOAA, the fraction of tornado-related deaths that occurred in manufactured homes has increased since 1975. From 1976 to 1980, 24% of tornado-related deaths were in manufactured homes. That fraction increased to 34% from 1986 to 1990 and 50% from 1996 to 2000.² The mean annual tornado fatality rate from 1975 to 2000 in manufactured homes was 1.23 per million population per year; the mean annual fatality rate from 1985 to 2000 in site-built housing was 0.06 per million population per year.^{2,4}

METHODS

English-language articles were selected from searches of the PubMed and Google Scholar databases from 2010 to July 31, 2014 using the search terms “manufactured homes,” “mobile homes,” and “tornadoes” in the article title and/or abstract. Internet sites managed by federal agencies also were reviewed for relevant information. Additional articles were culled from reference lists contained in pertinent articles and other publications.

REGULATIONS AND STANDARDS APPLICABLE TO MANUFACTURED HOMES

The US Department of Housing and Urban Development (HUD) Office of Manufactured Housing Programs regulates the construction of all manufactured homes built in the United States.⁵ This office is responsive to the Manufactured Housing Consensus Committee, a federal advisory group charged with providing HUD with recommendations on the revision and interpretation of HUD’s manufactured home construction and safety standards and related procedural and enforcement regulations. The HUD federal building code for manufactured homes was originally established in 1976; prior to this, manufactured homes were built to voluntary industry standards. Following Hurricane Andrew (in which 97% of all manufactured homes in Dade County, Florida, were destroyed, compared with 11% of conventional homes), HUD revised its construction standards in 1994 to improve the wind resistance of manufactured homes. The federal standards are preemptive of state or political subdivision standards to ensure that disparate state and local requirements do not affect the uniformity and comprehensiveness of the federal standards.

The HUD regulations, commonly referred to as the HUD code, are codified mostly under 24 CFR 3280 and 24 CFR 3285.^{6,7} The HUD code regulates manufactured housing design, construction, and installation, and is the only federally-regulated national building code. On-site additions, such as garages, decks and porches must be built to local, state, or regional building codes. The HUD code does not address local standards governing the placement of

[†] EF tornado intensities are classified on the Enhanced Fujita Scale with ratings between EF-0 (weakest: 65 to 85 mph) to EF-5 (strongest: greater than 200 mph).

[‡] This is the term used for manufactured homes produced prior to 1976 when federal standards went into effect. Despite the more preferred terminology of *manufactured home*, *mobile home* and *trailer* are still commonly used in the United States to describe this type of housing.

individual units on site. Local zoning, subdivision ordinances, architectural design standards, and other requirements often limit both the number of locations in which manufactured housing can be placed, impose additional onsite installation standards and other design requirements (which do not pertain to site-built units), and in some cases, prohibit the use of manufactured housing units altogether. No manufactured home can be shipped from the factory unless it complies with the HUD code and receives a certification label from an independent, third-party inspection agency.

All manufactured homes are required, at a minimum, to be tethered with metal straps attached to steel anchors screwed into the ground. The home manufacturer must provide installation instructions and certification by a professional engineer or registered architect confirming that the foundation support and anchoring meets HUD's installation standards.⁷ Third-party monitoring and inspection of the installation are typically provided by a representative from a state or local government. The Federal Emergency Management Agency (FEMA) has guidance for manufactured home foundation system design and installation.⁸ Disconnects can develop between design standards or agency policies and installation practices in the field. Jurisdictions vary in their ability to provide competent inspectors who can discern all deviations from established standards (E. Kiesling, PE, PhD, written communication, August 6, 2014).

SAFE ROOMS AND STORM SHELTERS

Historically, building codes for storm shelters were aimed at reducing the level of damage to structures during extreme wind events but did not address life-safety protection for building occupants during such events. In 2008, the International Code Council (ICC), with support of the National Storm Shelter Association, released a consensus *Standard for the Design and Construction of Storm Shelters*, also known as the ICC-500, which introduced specific criteria into US building standards for providing protection from extreme wind events and wind-borne debris associated with these events.^{9,10}

Storm Shelters vs Safe Rooms

“Storm shelters” are structures, buildings, or portions of buildings that have been designed and constructed to meet ICC 500 criteria and provide life safety protection from extreme wind events. By contrast, a “safe room” is a hardened structure or area of a building that has been designed and constructed to provide near-absolute protection[§] against both wind forces and the impacts from wind-borne debris. To be considered a FEMA safe room, the structure must be designed and constructed to the criteria specified in FEMA P-320, *Taking Shelter from the Storm: Building a Safe Room for Your Home or Small Business*¹¹ or FEMA P-361, *Design and Construction Guidance for Community Safe Rooms*.¹² Additionally, all applicable federal, state and local codes must be followed. Structures built to the FEMA safe room criteria meet and exceed all of the design criteria in the ICC 500 standard, and also consider additional emergency management-related performance criteria.

The level of occupant protection provided by a space specifically designed as a safe room is intended to be much greater than the protection provided by buildings that comply with the minimum requirements of building codes. The construction of a safe room typically requires a permit from the local building department. Further, to verify compliance with the FEMA 320/361 or ICC-500 criteria, additional quality control inspections for community safe rooms, and often for residential safe rooms, may be needed. FEMA recommends that a professional engineer or architect be consulted for site specific guidance on the appropriate location and type of safe room to be constructed. In an investigation of two tornado outbreaks in 2011, all observed residential safe rooms and storm shelters were used successfully to prevent injuries and fatalities.¹³

Location and Labeling of Safe Rooms

Safe rooms should be constructed in a basement, on top of a concrete slab-on-grade foundation or garage floor, or an interior room on the first floor. Both above-ground (which may be more accessible to young, old, and disabled individuals) and below-ground safe rooms can be stand-alone structures away from the home or building, or they can be rooms or areas in the home, such as a bedroom, a bathroom, or a closet. As long as a safe room is designed to meet or exceed specific FEMA criteria, it will offer the same near-absolute protection whether it is above or below ground. A design often used in the past is a residential safe room installed below the ground surface outside a house

[§] *Near-absolute protection* means that, based on FEMA's current knowledge of tornadoes and hurricanes, the occupants of a safe room built according to FEMA 320 and 361 will have a very high probability of being protected from injury or death.

or building to accommodate the occupants of one house, a few houses, or a small apartment building. Today many manufactured products are available utilizing a variety of materials that can be installed above or below ground level, indoors or outdoors. Many are anchored to garage slabs or installed underneath the slab with sliding door access. Underground shelters present special challenges in compliance for access by individuals with disabilities.

Below-ground safe rooms must be designed to avoid accumulating water during heavy rains that often accompany severe windstorms. Optimal attributes of above ground, hardened structures are having minimal access times and locations away from flood prone areas, collapsible structures, and electrical power lines.

Safe rooms should be labeled accurately and also identified on posted floor plans. This is especially important for visitors who may not know where the safe room is located or the extent of the protected space within a larger building. Safe rooms should be registered with local emergency management agencies (sometimes it might be police or fire departments), with the exact Global Positioning System (GPS) coordinates of the main entrance of the room, so that occupants of the safe room can be located readily by first responders in the wake of a severe weather event. This is a concern because safe rooms can be hidden beneath debris and difficult to locate after a storm, and occupants may have no means of communication with first responders.

Construction Costs

Local jurisdictions generally do not require safe rooms or shelters. Costs for construction vary from \$6,600 to \$8,700 for a safe room (~64 ft²) built inside a new house as a master closet, bathroom, or utility room; larger designs for greater comfort have higher costs, with 14 foot by 14-foot safe rooms ranging in cost from approximately \$12,000 to \$14,300. States have developed incentives and initiatives for the construction of residential, public, and private safe rooms, including safe rooms in hospitals, emergency operations centers, first-responder facilities, schools, day care centers, manufactured home parks, private residences, community centers, senior centers, and campgrounds. Some state and local governments have engaged in grant programs with the federal government to partially subsidize the construction of safe rooms, both residential and community.

SAFE ROOMS AND MANUFACTURED HOMES

Construction of a safe room similar to what is described in FEMA P-320 in manufactured homes poses significant challenges because most of these homes are installed on piers or posts, and not permanent foundations. If a safe room cannot be easily constructed within a structure, several possible approaches can be considered: (1) a stand-alone safe room placed on a permanent foundation as a completely separate structure; (2) concrete steps with shelter space underneath, which can be partially underground or be sufficiently anchored outside the home to provide protection; (3) below ground shelters not within the home; (4) storm shelters (manufactured or site-built) anchored to a concrete slab adjacent to the manufactured home and that can serve other purposes in addition to storm protection; or (5) a single larger community shelter built to withstand both the uplift and debris impact that accompany a tornado event shared by a group of homeowners.

Most manufactured home parks do not have community storm shelters or safe room locations for tornado protection. Owners of manufactured home parks may be reluctant to provide such shelters largely because of cost and liability issues, as well as challenging operational policies. In some cities, ordinances require that community storm shelters be provided in new manufactured home parks. Currently, Minnesota is the only state that has requirements for certain owners of manufactured home parks to provide community storm shelters. An additional deterrent to more widespread use of safe rooms in manufactured home parks is that, in most cases, the occupant is not the landowner.

TORNADO SAFETY FOR MANUFACTURED HOME RESIDENTS

Absent a properly constructed and installed safe room, there is no place in a manufactured home that can provide adequate life safety protection during a tornado; the best advice is to plan in advance for an alternate location to take cover (such as the lowest floor of a sturdy, nearby building or a storm shelter). Manufactured homes, even if tied down, offer little protection from tornadoes. A recent FEMA report stated that, although the design and construction of manufactured housing has improved after HUD requirements were changed in 1994, manufactured housing is not constructed to survive a tornado event.¹⁴ The long, narrow dimension of these units and the different means and methods of securing them have contributed to overturning and other failures. Anchoring systems provide some protection from uplift during both wind and flooding events but do not eliminate the risk of debris impact damage to

the structure or perforation of the building envelope. Like the decision to construct a safe room, it is best to seek a design professional to make specific recommendations on the appropriate anchoring system for a specific manufactured home. FEMA provides general guidance on tie down/anchoring components and systems and has evaluated these following various storms.^{7,15}

During severe weather, federal agencies recommend that manufactured home occupants move to a safer location that is best protected from potential wind-borne debris and least susceptible to collapse. While these areas may not provide near-absolute protection (unless designed as safe rooms), they may reduce the number of occupants injured or killed. Appropriate tornado refuge areas should be identified by architects, engineers, or design professionals familiar with FEMA 361 and FEMA P-431, *Tornado Protection: Selecting Refuge Areas in Buildings* and should be clearly marked with a permanent sign (e.g., tornado refuge, shelter, safe room) depending on its ability to meet existing criteria for those designations.¹⁶ In the absence of access to a safe room or storm shelter constructed to FEMA 320/361 or ICC 500 specifications, tornado refuge areas are typically a “last choice” or “only option” for those seeking protection. These areas are usually interior locations with short-span roof systems, reinforced masonry or concrete walls, and no glazed (glass) openings (e.g., corridors, small interior rooms, and restrooms). It is important to note that tornado refuge areas do not guarantee safety and offer only limited protection from wind and windborne debris; however, if they are identified correctly, they offer the most protection for occupants seeking refuge during tornadoes and are better than no protection at all.

All safe rooms, storm shelters, and best available refuge areas should be equipped with the tools necessary for occupants to open or dismantle the door from the inside in the event that egress is blocked or the door is damaged. Safe room and storm shelter owners and operators should plan for potential disruptions to both wired and wireless communications systems. Community safe rooms and storm shelters in particular may require backup power to operate alternate communication systems.

PREPARATION AND PLANNING FOR TORNADOES AND OTHER DISASTERS

To protect health and safety, it is important that residents learn about tornadoes and other disasters that may affect the community, actions that can be taken to minimize the impact of these events, and about community plans for warning residents, sheltering displaced persons, and evacuating affected populations. The best way to make homes and communities safer for such events is to be prepared before disaster strikes.

Personal Preparedness

The key to surviving a tornado and reducing the risk of injury lies in planning, preparing, and practicing “what to do” in such an emergency. Knowing what to do can make a difference when seconds count. Advance planning is especially important if an individual requires assistance to reach shelter from an approaching storm or has other special medical needs. In a disaster, individuals and communities may have to deal with an increased demand for medical resources, especially in rural areas and when local emergency medical services and hospitals are overwhelmed. Personal preparedness involves being able to recognize and protect against potential dangers and hazards, knowing how and when to call for help, and knowing how to provide basic first aid and critical life support.¹⁷ Most personal preparedness efforts are germane to any disaster, such as putting together an emergency kit, developing a family communications plan, ensuring access to medications and medical equipment, monitoring local community and broadcast warning systems, identifying evacuation routes and places to take shelter, and establishing procedures to account for family and friends.

The American Red Cross, Centers for Disease Control and Prevention, Department of Homeland Security, NOAA, and FEMA, as well as state and local emergency management agencies, provide detailed information on their respective websites to help individuals and families prepare for, respond to, and recover from tornadoes and other disasters. The American Academy of Pediatrics “Children & Disasters” Web site (<http://www.aap.org/disasters>) provides information and resources for physicians, families, child care centers, schools, and policymakers on disaster preparedness and response issues affecting children.

Community Preparedness

Community disaster preparedness addresses the short- and long-term objectives of planning, response, and recovery activities to include mobilization of resources to protect public health and safety; restoration of essential government

services; and provision of emergency relief to government, businesses, and affected residents. Well-coordinated plans are essential for the mobilization of assets from local, regional, and national sources in a predetermined manner. In a catastrophic emergency, communities will face the challenge of allocating scarce resources to minimize illness, injury, and death. Addressing the great diversity of special health concerns, language and cultural barriers, and other life circumstances present multiple challenges for disaster response and recovery systems. It is essential that children and individuals with special health needs have valid emergency care plans in place before disaster strikes. To enhance community preparedness, health officials and other emergency management personnel must collaborate with other community partners to:¹⁸

- identify the types of events that might occur in their communities and regions;
- plan interagency emergency activities in advance to ensure a coordinated response to the consequences of credible threats;
- build the capabilities necessary to respond effectively to the consequence of those events;
- identify the type and nature of an event when it occurs;
- implement the planned response quickly and efficiently; and
- mobilize resources to recover from the incident.

Resilience is the sustained ability of individuals and communities to withstand, recover from, and more successfully adapt – in both the short and long terms – to adverse events.¹⁹ Resilient people and communities are prepared to (1) prevent, cope with, and mitigate the initial stress of a disaster with limited expectation of external support; (2) undertake recovery activities that try to restore their lives and communities to pre-disaster levels of functioning; and (3) apply knowledge gained from analyses of disaster response efforts to strengthen individual and community capacities and capabilities to withstand future events.

Public Communications during Severe Weather Events

In the United States, disaster warnings are issued primarily through the Emergency Alert System (EAS) and the NOAA Weather Radio All-Hazards Network, both of which rely primarily on broadcasting media.^{20,21} If the EAS is activated, national, state, and local television and radio broadcast stations will deliver important emergency information to the public. FEMA is responsible for national-level activation of the EAS as well as testing of the system. The NOAA Weather Radio Network is a network of radio stations broadcasting continuous weather information directly from a nearby National Weather Service (NWS) office. NOAA Weather Radio broadcasts severe weather warnings, watches, forecasts, and other hazard information 24 hours a day, 7 days a week. More recently, the NOAA Weather Radio has been adapted to become an all-hazards emergency communication tool. Although used most often for weather threats, emergency management agencies can request the NWS to automatically sound an alarm on individual radio receivers and trigger cable television and broadcast media to display emergency messages.

All community residents should listen to commercial radio or television newscasts for the latest weather information, and consider purchasing an NOAA Weather Radio All Hazards public alert radio. These radios, which cost about \$30, operate on frequencies dedicated exclusively to the National Weather Service. NOAA Weather Radio immediately broadcasts severe weather warnings and civil emergency messages; this includes sheltering and evacuation instructions and the status of the emergency event. Unlike a regular AM/FM radio or weather band radio, weather alert radios sound an alarm even if the unit is in stand-by mode.**

Given the advanced state of communication technologies, especially the Internet and wireless devices, the capability to deliver emergency warnings is being expanded beyond radio and television broadcasts. A number of states and communities are implementing alert systems that use e-mail, wireless text messages, or the Internet for alerts; some issue mass alerts to telephones by using autodialing technologies, or to wireless devices by using cellular broadcasting technology. In addition to emergency alert broadcasts, many communities utilize outdoor warning systems. Residents should be familiar with these systems, as communities have different ways of warning residents about tornadoes. Typically, these consist of a network of sirens and highway message boards that are activated by local authorities in an emergency.

** In 2007, Indiana enacted legislation requiring that all new and relocated manufactured homes install NOAA Weather Radio All Hazards public alert radios. The legislation was passed to honor a two-year-old boy who was killed when an EF-3 tornado struck his parent's Evansville, Indiana, manufactured home park in the middle of the night on November 6, 2005 (Indiana Code Section 16-41-27-16.6: Mobile Home Park Weather Radios and Smoke Detectors. <http://www.in.gov/legislative/bills/2007/EH/EH1033.1.html>. Accessed August 25, 2014).

The Physician's Role

AMA Policy H-130.946, AMA Leadership in the Medical Response to Terrorism and Other Disasters, underscores the need for physicians and medical societies to participate directly with public health, law enforcement, and emergency management authorities in developing and implementing disaster preparedness and response protocols in their communities, hospitals, and practices in preparation for disasters. Physicians should be knowledgeable of state and federal resources that contribute to emergency management and response at the local level, and understand their integrated roles and responsibilities in disaster management and response efforts. Physicians also should be knowledgeable of ethical and legal issues in disaster response, including their professional responsibility to treat casualties; their rights and responsibilities to protect themselves from harm; and issues surrounding their responsibilities and rights as volunteers and associated liability issues.

DISCUSSION

The increase in manufactured homes as housing options has experienced particular growth in the southeastern United States, which is prone to tornadoes, hurricanes, and other extreme weather events. Improvements in the accuracy and lead time of weather forecasts and warnings may have little effect on decreasing deaths if the problem of deaths in manufactured homes is not addressed. Although these homes may meet federal and local government safety and zoning standards, federal authorities recommend against taking shelter in a manufactured home during a tornado. The key objective is to provide safer places for residents. As part of disaster preparedness planning efforts, local jurisdictions should review their local zoning and code requirements to ensure manufactured housing and storm refuge options can be accommodated safely and effectively. Citizens also should develop emergency plans for where they will go and what they will do when a severe weather alert is issued. Without a plan or clear instructions, severe weather alerts create anxiety without significantly promoting safety.

Manufactured homes may not withstand even a weak tornado, and residents should make plans before the storm arrives to get to a safe location. This underscores the critical importance of tornado safety plans for residents of these homes. Due to the potentially short amount of time between a warning and the arrival of a tornado, people should consider executing their safety plans when a tornado watch is issued rather than wait for a tornado warning. Occupants will likely not be safe in a manufactured home and should seek shelter elsewhere. To better ensure safety, manufactured home residents should: (1) have the home inspected periodically to be sure it is anchored properly; (2) become familiar with the emergency procedures that should be followed in the event of severe weather since injuries can occur during high wind events even when proper anchoring procedures have been used; and (3) be prepared to immediately evacuate the home and seek a safe room or storm shelter in the event of a tornado, severe thunderstorm, or high wind warning. Taking cover under sturdy furniture, in a bathtub or closet, or under a mattress will be meaningless in a manufactured home if the home itself is destroyed, blown over, or rolled over by a tornado. Occupants need to evacuate manufactured homes and find a more substantial shelter or safe room as quickly as possible. Such facilities must be available at any time of the day or night. While the manufactured housing industry has devised reliable anchors for manufactured homes, anchors are not sufficient to withstand extreme winds such as tornadoes. And while the structures of modern manufactured homes are well-designed and connected, they are not sufficient to withstand tornado-force winds, even if the frame is anchored appropriately. In a tornado, the lack of approved safe rooms or community storm shelters puts these residents at greater risk.

The most preferred life-safety protection from tornadoes is a safe room or storm shelter, specifically one designed and tested to existing criteria (FEMA 320/FEMA 361 or the ICC 500 standard). However, practical ways to provide safe rooms inside manufactured homes have not been identified. At this time, it is more prudent to promote other storm protection measures for occupants of manufactured homes. Safe rooms, whether manufactured or site built, must have a permanent foundation or slab to anchor them so they are not moved by extreme winds. By their nature, most manufactured homes do not have permanent foundations, which preclude appropriate installation of safe rooms within these homes. Options do exist for owners of manufactured homes and owners of manufactured home parks that can provide a high degree of occupant protection from extreme winds in structures constructed outside the home, anchored to a secure foundation, and constructed to provide high resistance to wind-induced pressures and windborne debris.

RECOMMENDATIONS

The Council Science and Public Health recommends that the following recommendations be adopted in lieu of Resolution 401-A-13 and the remainder of the report be filed.

Our AMA believes that:

1. Owners of manufactured home parks should provide a plan, developed with and approved by local authorities, for the evacuation and sheltering of residents of the park in severe weather events such as tornadoes, high winds, or floods. The plan should advise residents of the vulnerability of manufactured homes in tornadoes and other extreme wind events and that evacuation to a safer location is necessary. The shelter or evacuation plan should be posted conspicuously in the park and the park owner should provide each resident with a copy of the approved shelter or evacuation plan.
2. State and local government authorities in regions at increased risk for tornadoes and other extreme wind events should enact measures to either provide, or require owners of manufactured home parks in their jurisdiction to provide, as appropriate, an approved common storm shelter or safe room for all residents of manufactured homes in the park as protection against tornadoes and other extreme wind events.
3. Research is needed to enhance the design and construction of manufactured homes and manufactured home tie down/anchoring systems to withstand extreme wind forces and wind-blown debris.
4. Federal, state, regional, and local authorities should coordinate policies, processes, and procedures to ensure that manufactured homes are installed and inspected in accordance with established guidelines and standards, including requirements for the installation and inspection of tie down/anchoring systems.
5. Incentives should be developed for all homeowners (including those who live in manufactured homes), businesses, and local governments in regions at increased risk for tornadoes and other extreme wind events for the installation of home or community safe rooms and storm shelters, in accordance with federal and professional guidelines and standards.
6. All citizens should consider purchasing a NOAA Weather Radio All Hazards public alert radio for use in disasters and other emergency situations. Citizens also should develop a plan for where they will go and what they will do when a severe weather alert is issued.

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4. ROLE OF PHARMACISTS IN IMPROVING IMMUNIZATION RATES (RESOLUTION 212-I-12)

Reference committee hearing: see report of [Reference Committee K](#).

**HOUSE ACTION: RECOMMENDATIONS ADOPTED
IN LIEU OF RESOLUTION 212-I-12 AND
REMAINDER OF REPORT FILED**

See Policies [H-160.921](#), [H-440.836](#), [H-440.877](#) and [H-440.899](#).

INTRODUCTION

At the 2013 Interim Meeting, the House of Delegates (HOD) referred Board of Trustees (BOT) Report 1-I-13, Pharmacist Administration of Immunizations, for further study and report back. The BOT report was written in response to Resolution 212-I-12 “Pharmacist Administration of Vaccines,” submitted by the Louisiana Delegation and referred by the HOD. Resolution 212-I-12 recognizes the potential role that pharmacists can play in increasing immunization rates and specifies criteria, including the need for model legislation to ensure appropriate physician oversight and involvement in state-level efforts authorizing pharmacists to administer vaccines.

In referring BOT Report 1-I-13, the HOD identified several issues in need of clarification, including safety issues associated with immunization of pediatric populations, the safety of live vaccines, the appropriateness of pharmacist immunization of at-risk populations, the need to ensure communication with the treating physician, parity in requirements for reporting to immunization registries, and handling of adverse events.

Given the broad public health and clinical implications of these issues, the BOT determined that the issue of pharmacist administration of vaccines could benefit from a contemporary, collaborative review by relevant councils of our AMA. The Council on Science and Public Health agreed to take the lead in this endeavor and engaged the Council on Medical Service, Council on Legislation, and the Council on Long Range Planning and Development to develop a comprehensive report that is responsive to the public health imperative to immunize and protect all ages and populations from vaccine-preventable diseases, and reflects best practices for patient selection, management, and follow-up.

METHODS

This Council report includes and expands upon information presented in BOT Report 1-I-13. English-language articles were selected from searches of the PubMed and Google Scholar databases from 2004 to July 31, 2014 using the search terms “vaccine administration,” “vaccine delivery,” “vaccine provider,” “vaccine safety,” “immunization delivery,” “immunization program,” “pharmacist and vaccine,” “pharmacy and vaccine,” or “nontraditional vaccine provider” in the article title and/or abstract. Internet sites managed by federal agencies and applicable health professional organizations and vaccine advocacy organizations also were reviewed for relevant information. Additional articles were culled from reference lists contained in pertinent articles and other publications.

BACKGROUND

Vaccines are among the safest and most cost-effective measures to prevent infectious diseases.¹ Immunization recommendations in the United States currently target 17 vaccine-preventable diseases across the lifespan.^{2,3} National vaccination rates for most recommended childhood vaccines are between 80% and 90%; and more than 99% of US children have received at least one vaccination.⁴ Vaccination coverage *among adolescents (between 13 and 17 years of age) ranges from 78% for at least one dose of meningococcal vaccine to 95% for at least one dose of varicella vaccine; however, only 57% of girls and 35% of boys have received at least one dose of human papillomavirus (HPV) vaccine.*⁵ Population coverage for adult vaccines ranges from 2% to 70%, depending on the vaccine and the target population.^{6,7} The CDC reports that less than half of eligible adults 18 years of age or older received an influenza vaccine last year.^{6,7} Only 60% and 62% of adults 65 years of age or older received a pneumococcal or influenza vaccine, respectively; and only 20% of adults 60 years of age or older received a herpes zoster vaccine.⁷ Each year, about 42,000 adults and 300 children in the United States die of vaccine-preventable diseases, mostly due to influenza.⁸

Primary care is the most appropriate setting for vaccine administration since it serves as the medical home. In the medical home, physicians have timely access to patient information to perform clinical assessments as well as timely access to other members of the health care team.⁹ Each clinical encounter is an opportunity to enhance the physician/patient relationship and provide immunizations and other health services. Current success in improving pediatric immunization rates has been achieved largely as a result of the federal Vaccines for Children (VFC) Program, which has made it easier for eligible children and adolescents to receive vaccines in their medical homes by reducing financial barriers.¹⁰

Although the medical home is the ideal place to deliver vaccines, current low rates for administration of adult vaccines and some adolescent vaccines indicate that a strategy of delivering vaccinations to a high proportion of these populations solely through the medical home is suboptimal. Since 2000, the CDC Advisory Committee on Immunization Practices (ACIP) has expanded recommendations for adolescents to include vaccines protecting against HPV, meningococcal disease, and pertussis, as well as annual influenza vaccination for individuals older than six months of age. Implementing expanded vaccination recommendations, particularly for adolescent and adult patients, is a challenge for primary care physicians who administer the majority of vaccines in their practices. To improve immunization rates, community settings beyond the traditional medical home are increasingly being utilized (e.g., schools, student health services, employer sites, retail clinics, pharmacies), particularly for individuals who are unlikely to receive primary care medical services through conventional venues.

Physicians have a clear interest in ensuring that state laws on the qualifications of health care professionals who administer vaccines outside the medical home are sufficient to protect patient health and safety. Vaccine administration calls for verification and safety considerations, adherence to complex vaccination schedules, accurate medical history and record keeping, protocols for responding to allergic reaction or other adverse side effects, and overall monitoring of the individual's health and medical conditions. This includes having systems in place for

assessing vaccination status of high-risk patients, including pregnant women and patients with renal failure, diabetes, cardiac disease, chronic lung disease, cancer, and immunocompromised individuals.

CHALLENGES TO INCREASING IMMUNIZATION RATES

Patient and Provider Attitudes and Beliefs

Vaccination decisions are influenced by an individual's perception of health, beliefs about vaccine-preventable diseases, perceptions about the risks of these diseases, perceptions about vaccine effectiveness and vaccine components, and trust in institutions. A recommendation from a physician or other health care provider is recognized as one of the most important predictors of receipt of vaccination, coupled with the ability to provide the recommended vaccine during the same clinical encounter.¹¹ Common reasons precluding adult vaccination include patient concerns about vaccine-associated side effects or vaccine-acquired illness, provider and patient belief that the vaccine is not effective, provider and patient lack of awareness that the vaccine is needed, and lack of a health care provider recommendation for the vaccine.¹¹⁻¹⁵

The pediatric immunization schedule is particularly complex and benefits greatly from coordination within a medical home.¹⁶ Parental attitudes, beliefs, and behaviors about the safety of vaccines have a considerable impact on decisions regarding vaccination. A consistent reason for vaccine refusal or delay among parents on behalf of their children is concern about vaccine safety.¹⁷ While most parents adhere to the ACIP-recommended immunization schedule for their children, some are concerned, even in the absence of supporting evidence, that the schedule may present unnecessary risk because of the timing and number of vaccinations. With the currently recommended immunization schedule, children can receive up to 24 immunizations by two years of age, and up to five injections in a single office visit.

While many adolescents obtain some medical care (including vaccinations) from a primary care physician,¹⁸ as adolescents age into their late teens, visits to primary care physicians decline substantially, reducing opportunities for immunization.^{19,20} Adolescents should preferably be vaccinated during early or middle adolescence, when they are most likely to visit pediatricians and family practice physicians and more likely to have preventive visits than older teens.

Cost

Financial pressure from vaccine costs and inadequate reimbursement for vaccine purchase and administration challenge physicians' ability to provide vaccines to their patients, with some physicians opting out of providing vaccines or choosing not to vaccinate uninsured or underinsured patients.²¹⁻²⁴ A recent physician survey on adult vaccine delivery conducted by the Vaccine Policy Collaborative Initiative^{††} revealed that only 20% to 30% of internists and family physicians stocked all 11 CDC-recommended vaccines for adults; 80% of survey respondents stocked seasonal influenza, pneumococcal, Td (tetanus, diphtheria), and Tdap (tetanus, diphtheria, pertussis) vaccines.²⁵ Survey respondents indicated they were less likely to stock more expensive vaccines like herpes zoster and hepatitis B, as well as "catch up" vaccines such as HPV, MMR (measles, mumps, rubella), and varicella. The survey revealed that most internists and family physicians refer patients elsewhere for vaccines they did not stock. The most commonly reported reasons for referring patients elsewhere for vaccines included insurance not covering the vaccine or inadequate insurance reimbursement. When they did not stock the vaccine, survey respondents most often reported referring patients to pharmacy/retail stores and public health clinics.

Access and Availability of Services

Presently, the United States faces a growing shortage or maldistribution of physicians, especially primary care physicians, which has significant implications for basic health care access.^{26,27} These shortages are expected to persist or worsen, in light of current health system reform efforts that enable many more Americans to obtain health care insurance and seek health care services. The projected surge in patient volume is accompanied by an aging US population and an increasing number of patients with chronic disease, who can benefit from immunizations and other medical services. To address this reality, supplementary venues (e.g., schools, student health services, worksites, retail clinics, pharmacies) are being utilized to provide immunization services. Increased immunization

^{††} The Vaccine Policy Collaborative Initiative at the University of Colorado Denver works with the CDC to perform rapid-turnaround surveys to assess physician attitudes about vaccine issues.

rates can be achieved by complementing the efforts of primary care physicians with efforts to deliver vaccines in other health settings, particularly settings that adolescents and adults tend to frequent.²⁸⁻³⁰

Convenience and proximity are important factors associated with the choice of vaccination setting, particularly for individuals who do not frequently visit physicians or do not have a regular source of care.^{20,31} Reducing the distance from the vaccine setting to the target population, eliminating the need for making an appointment in advance and avoiding the waiting time often associated with a clinic or office visit, offering more convenient clinic hours, and reducing administrative barriers to vaccination are factors that increase vaccine-seeking behavior.²⁸ The potential benefit of expanded access to immunizations through nonphysician settings was demonstrated in a study showing that almost 31% of 6,250,402 immunizations administered over a one-year period at a large national pharmacy chain occurred during evenings, weekends, or federal holidays, when physician settings for vaccine delivery were less accessible.³²

INTEGRATION OF IMMUNIZATION PROGRAMS IN PHYSICIAN AND NONPHYSICIAN SETTINGS

Integration of complementary (nonphysician-based) immunization programs with the traditional medical home provides the potential to increase vaccine coverage rates and decrease vaccine-preventable diseases. This includes expansion of services offered by pharmacists and other community providers.¹¹ According to the Infectious Diseases Society of America (IDSA), the proper use of complementary sites for immunization services can: (1) improve access to immunizations for many adolescents and adults who are otherwise unable to reach a primary care provider; (2) have the potential to eliminate barriers associated with seeking care in a primary care setting, such as making an appointment or long waiting times; (3) provide immunizations at lower costs, which may increase access for the uninsured or for people who have insurance that either does not cover immunizations or is associated with large deductibles or co-payments; and (4) increase opportunities to raise awareness and educate the public about the value of immunizations. In addition, new partnerships and alliances can be formed that can improve immunization outreach.²⁹

AMA Policy H-160.921, *Store-Based Health Clinics*, is germane to the provision of immunizations and other health services in complementary settings with respect to the scope of clinical services provided, use of standardized protocols, access to and supervision by a physician as consistent with state law, continuity of care, and referral systems.

Surveys demonstrate that primary care physicians are generally accepting of the increased access that adults and school-age children now have to vaccination services outside of the medical home, particularly for influenza vaccination.^{25,33-37} Some physicians may be reluctant to refer patients to complementary settings for vaccination services, citing concerns about the safety of vaccination in immunization programs outside of the medical home or the ability of providers in other settings to properly screen patients for a wide range of vaccinations without access to a full patient history. Additional concern has been expressed that the provision of vaccinations outside the traditional medical home may interfere with the receipt of other preventive health care services that are typically received in traditional primary care settings.^{20,38,39} No studies were identified suggesting that adults or adolescents forego preventive health care services provided in primary care settings if they receive vaccinations elsewhere or that administration of vaccines in complementary settings places patients at increased risk for adverse events.

Guidelines for Vaccine Administration in Nonphysician Settings

In 2009, the IDSA released clinical practice guidelines to address immunization services delivered in complementary settings.²⁹ The guidelines stipulate that health care professionals who administer vaccines in these settings adhere to quality standards, including the ability to appropriately manage vaccine-related adverse events, proper storage and handling of vaccines, appropriate record keeping, regulatory issues, and provision of education regarding both risks and benefits of immunizations. Furthermore, records of immunizations administered in these settings should be sent to primary care providers and to immunization information systems (registries). Vaccine recipients in such settings should be encouraged to see their primary care providers for other preventive and therapeutic services. These guidelines supplement quality standards and guidance issued in 2000 by the National Vaccine Advisory Committee (NVAC).³⁰ The most recent NVAC recommendations specify that all health care providers should assess the patient's immunization status and either administer needed vaccines or refer the patient to a provider who can provide vaccination services (see Appendix).¹¹

PHARMACISTS' ROLE IN VACCINE Administration

Over the past two decades, pharmacies in the United States have increased their participation nationally in vaccination activities.^{40,41} Although state laws vary regarding educational requirements, any pharmacist who wishes to administer vaccines must undergo additional training in immunization delivery. The most common educational requirements include completion of a state-specific course in vaccine administration, certificate programs in vaccine administration, and completion of a specified number of contact hours of continuing education related to immunizations. Most states also require basic life support or cardiopulmonary resuscitation certification.

More than 20 years ago, the American Pharmacists Association (APhA) developed and began delivering *Pharmacy-Based Immunization Delivery: A National Certificate Program for Pharmacists*, which was based on CDC, ACIP, NVAC and other published standards and guidelines.⁴² The course involves 12 hours of self-study and 8 hours of seminar and demonstration with hands-on experience in intramuscular and subcutaneous vaccination techniques. Content includes education on vaccine-preventable disease epidemiology, vaccine characteristics, reporting and documentation, and emergency response to adverse events. In addition, participants must pass an exam, including demonstration of administration technique, and obtain certification in cardiopulmonary resuscitation. According to the APhA, more than 250,000 pharmacists in the United States have been trained to provide immunizations, primarily through the 20-hour APhA certificate training program.

In 2013, the APhA conducted a national Internet survey regarding pharmacy-based immunizations on behalf of the US Department of Health and Human Services National Vaccine Program Office.⁴³ Responses from 2,351 pharmacy practice sites revealed that nearly all sites (97%) planned to administer influenza vaccine to adults, 56% planned on administering the vaccine to adolescents (aged 10 to 18 years), and 22% planned to provide the vaccine to pediatric patients (between 2 and 9 years of age); only 4% of pharmacy practice sites planned to administer influenza vaccine to infants younger than 2 years of age. In addition to influenza vaccine, the majority of pharmacies surveyed administered pneumococcal (77%), herpes zoster (75%), and tetanus (57%) vaccines. Fewer than half of pharmacies administered hepatitis B vaccine (47%), hepatitis A vaccine (43%), meningococcal vaccine (43%), and HPV vaccine (37%). Only 10% of pharmacies surveyed reported that they administered pediatric vaccines. Only 3% of pharmacy practice sites reported that they did not offer immunization services.

Medical Society Recognition of Pharmacists' Role in Vaccine Administration

National medical specialty societies support the use of settings outside of the medical home to immunize target populations who have difficulty accessing a medical home; some of these societies specifically recognize the role of pharmacists in providing such services:

- The American Academy of Family Physicians (AAFP) strongly recommends that patients receive all immunizations recommended by the AAFP in their medical home.⁴⁴ When vaccines are administered elsewhere, all pertinent vaccine-related information should be transmitted back to the patient's primary care physician and their state registry when one exists so that there is a complete vaccination record. The AAFP supports arrangements in which pharmacists are part of an integrated, team-based approach to care but believes the interests of patients are best served when such care is provided by a physician or through an integrated practice supervised directly by a physician.
- The American Academy of Pediatrics (AAP) advocates that all children receive immunizations in a medical home,^{45,46} but recommends that pediatricians assist in the identification of other venues in which vaccinations can be delivered if a significant number of children in a community do not have convenient access to a medical home or if existing medical homes are not able to meet the demand.⁴⁶ If sufficient pediatric medical homes are not available, additional venues for vaccine administration could include public health department clinics, Women, Infants, and Children Program offices, child care centers, school-based health clinics, and, in those states that allow it, pharmacies.
- The American College Physicians (ACP) supports pharmacists as immunization information sources, hosts of immunization sites, and immunizers, as appropriate and allowed by state law.⁴⁷
- To improve adolescent and adult immunization rates, the IDSA urges states to develop standing order policies that allow nonphysicians to administer vaccines in certain circumstances, such as at schools, pharmacies, and walk-in clinics.⁴⁸ IDSA policy further urges states to require and promote the use of state-based immunization registries. Promotional efforts must reach immunization providers in nontraditional locations (retail and

community settings) to increase participation in registries; information about immunizations administered in nontraditional settings should be conveyed to the patient's primary care provider.

Physician and Patient Perspectives on Pharmacists' Role in Vaccine Administration

Pediatricians and family physicians have expressed concern about pharmacists administering vaccines because they view this as inconsistent with medical home principles.^{18,44,46} A particular concern is that pharmacist administration of vaccines would eliminate an opportunity for children and adolescents to receive much needed well-care visits in the critical pre-teen and teenage years. Medical homes are integral to both the delivery of immunizations and comprehensive care. Most medical homes for children and adolescents involve primary care pediatric and family physician practices, although the role of these settings is diminished among older adolescents who are more likely to visit gynecologists or specialists or may not visit a health care provider at all.¹⁸

In a recent national survey, about 60% of general internal medicine and family physicians indicated that they "always," "often," or "sometimes" referred patients to a pharmacy/retail store for vaccinations.²⁵ About 70% of family physicians and 75% of general internal medicine physicians agreed that it was helpful to have pharmacists share a role in vaccinating adult patients.²⁵ While additional surveys indicate physician support for pharmacists in vaccinating adult patients,^{34,36,38} physicians feel more strongly that vaccines should be administered in the medical home rather than a pharmacy for pediatric patients, particularly children with chronic medical conditions.^{35,36,38}

Data are limited on patient and parental preferences for receipt of vaccination services in pharmacies and other settings outside the medical home. For the 2011-2012 influenza season, CDC data indicate that 65% of children between 6 months and 17 years of age received the influenza vaccine in a medical setting (i.e., physician office, health department, other health clinic/health center, or hospital); among nonmedical settings, pharmacies and other retail settings accounted for about 3% of influenza vaccinations delivered to this age group.⁴⁹ The percentage of vaccinated children who received the vaccine in a pharmacy or other retail setting was higher among children between 5 and 17 years of age than younger children. Among adults (18 years of age and older), about 57% reported that they received the influenza vaccine in a medical setting; with the majority reporting vaccination in a physician office.^{49,50} Pharmacies and other retail settings accounted for 20% of influenza vaccinations administered to adults. Older adults (50 years of age and older), individuals with certain high-risk medical conditions (i.e., asthma, diabetes, cardiovascular disease, chronic obstructive pulmonary disease, emphysema, chronic bronchitis, and cancer), those having a checkup in the past year, and those having a primary care physician were more likely to have been vaccinated in a medical setting. Characteristics associated with an increased likelihood of receipt of vaccination in nonmedical settings were higher education; not having certain identified high-risk conditions; not having had a routine checkup in the previous 12 months; and not having a primary physician for health care.⁵⁰

One published survey involving 420 adult patients in Iowa who presented to a family physician or pharmacy for receipt of the pneumococcal and influenza vaccines revealed greatest support for adult immunizations provided by physicians (85%), followed by pharmacists (64%), community health departments (38%), and school nurses (15%); little support was shown for vaccinations provided by chiropractors or dentists.⁵¹ For childhood immunizations, adult respondents preferred to have their children vaccinated by physicians (99%) and community health departments (87%). About 10% of adults supported receipt of vaccines for children in a pharmacy setting.

A survey of 370 households in Colorado found that 78% of parents preferred that adolescents receive vaccines in the medical home.⁵² For adolescents who need to seek care in settings outside of the medical home, a majority of parents were "definitely" or "probably" accepting of vaccination in public health clinics (74%), school health clinics (70%), and obstetrics and gynecology clinics (69%). Only 36% of parents indicated retail-based clinics as an alternative setting for adolescents who could not receive vaccinations in the medical home.

USE OF VACCINE ORDERS AND VACCINE PROTOCOL AGREEMENTS BY PHARMACISTS

Use of Protocol Agreements

In many states, pharmacists who are authorized to administer immunizations must do so under a written protocol agreement signed and dated by a licensed physician. Some states require jointly adopted rules by state medical and pharmacy boards to permit "authorized" pharmacists to administer selected vaccines to specified age groups via protocol under supervision of a physician. These joint rules specify what physicians must do to adequately supervise

an authorized pharmacist, what the pharmacist must do to be authorized, and what the protocol must address. State regulations stipulate whether a physician is required to issue a written or verbal patient-specific prescription order for a particular vaccine administration, and whether a physician can prescribe vaccines for a group of patients via a non-patient-specific vaccine order contained in the protocol agreement. The vaccine protocol agreement includes a definitive set of treatment guidelines established by the physician and contains directives and provisions for immediate consultation between the pharmacist and the physician.

Use of Standing Orders

Standing orders authorize nurses, pharmacists, and other nonphysician healthcare personnel, where allowed by state law, to assess an individual's immunization status and administer vaccines according to the process approved by an institution, physician, or other authorized practitioner. Standing orders are typically institution-based, while vaccine orders in protocol agreements are used outside of institutions. Such procedures enable assessment and vaccination without the need for examination or direct order from the attending physician at the time of the interaction.

While standing orders have been shown to be an effective tool for increasing access to immunization services,^{53,54} less than half of primary care physicians reported using standing orders for adult influenza vaccinations.⁵⁵ This was attributed to lack of awareness of recommendations and regulations for the use of these procedures and of evidence for the effectiveness of standing orders in improving vaccination rates. A recent national survey of pharmacists indicated that the main sources of vaccine protocols or standing orders were corporate physicians who are employed by an entity via contract or as consultants (33%), family physicians (29%), internal medicine physicians (21%), and public health departments (9%).⁴³

STATE REGULATIONS FOR TYPES OF VACCINES ALLOWED FOR PHARMACIST ADMINISTRATION AND AGE RESTRICTIONS

All 50 states and the District of Columbia (DC) authorize pharmacies to administer vaccines at some level; variations exist regarding the type of vaccines that can be administered by pharmacists and the age of eligible individuals to whom pharmacists can administer vaccines.⁵⁶ All states and DC require that pharmacists who administer vaccines have and maintain specific education and training in the provision of immunization services. The AMA Advocacy Resource Center (ARC) maintains 50 state surveys that provide detailed information on the state laws and regulations that govern pharmacist immunization practice. These surveys are on file with the ARC and are available upon request by contacting arc@ama-assn.org.

Most states and DC allow pharmacists to administer any vaccine or a broad subset of vaccines recommended by the ACIP for adults and/or children through various processes. All states and DC allow pharmacists to administer the influenza vaccine. Most states and DC also allow pharmacists to administer the zoster, pneumococcal, Td/Tdap, and HPV vaccines. The allowable age of individuals that pharmacists are authorized to vaccinate are outlined within the state statute or regulations:

- 19 states and DC allow pharmacists to vaccinate individuals of any age.
- 9 states allow pharmacists to administer vaccines only to individual 18 years of age or older.
- 22 states allow pharmacists to administer certain vaccines to individuals under the age of 18 (allowable age levels range from 3 years of age and older to 14 years of age and older).

Depending on the antigen or age of the patient, most states and DC require a prescription, protocol, standing order, consent of parent or guardian, or a combination of these factors prior to a pharmacist being authorized to administer vaccines. As of July 2014, 13 states allow pharmacists to administer some or all ACIP-recommended vaccines without a physician protocol or prescription for specified ages (see Table).

In the event of a declared public health emergency, which necessitates the rapid immunization of the population to respond to an infectious disease threat, states can authorize pharmacists to administer specified vaccines for the duration of the emergency declaration. Five states (Arizona, Kentucky, New Jersey, New York, Oregon) either reduce the age restriction or expand the types of vaccines that pharmacists can administer during public health emergencies.

VACCINE SAFETY

Vaccines, like other medications, are not without risk. Despite a credible body of scientific evidence supporting the safety and effectiveness of vaccines,⁵⁷⁻⁶⁰ unsubstantiated concerns continue to be raised about possible associations between various vaccines and health conditions (e.g., MMR vaccine and autism).⁶¹⁻⁶³ While most people who are vaccinated suffer no effects or minor side effects, severe allergic reactions or other medical problems sometimes occur. A patient history of severe systemic hypersensitivity reactions (including anaphylaxis) to egg protein, gelatin, neomycin, or streptomycin are contraindications for vaccines that contain these products.⁶⁴

To prevent serious adverse reactions to vaccines, vaccine providers should adhere to all quality standards for safe immunization.⁶⁴ This includes following standard precautions to prevent transmission of infection during immunization, such as proper hand hygiene prior to vaccination. Safety devices for vaccine administration should be used for safe disposal of needles and syringes. All vaccine providers should screen individuals for contraindications and precautions before administering a vaccine dose, and should be trained to manage adverse reactions that might occur. All vaccine providers should have procedures in place and be prepared for emergency care of an individual who experiences an anaphylactic reaction. Epinephrine and equipment for maintaining an airway should be available for immediate use. All vaccine providers should be familiar with the facility emergency plan and should be certified in basic life support and cardiopulmonary resuscitation.

Live Vaccines

Live attenuated vaccines may cause severe reactions or even death as a result of uncontrolled replication of the vaccine virus in patients with immunodeficiencies (e.g., from leukemia, treatment with immunosuppressive drugs, or infection with human immunodeficiency virus). Commonly administered live attenuated viral vaccines include measles, mumps, rubella, varicella, zoster, rotavirus, and influenza (intranasal). Oral polio vaccine is a live viral vaccine but is no longer available in the United States. Live attenuated bacterial vaccines are bacille Calmette-Guérin (which is not currently available in the United States) and oral typhoid and cholera vaccines. However, since the theoretical possibility of fetal injury exists, live vaccines should not be administered routinely to women known to be pregnant. Live attenuated vaccines need to be refrigerated or frozen to maintain potency.⁶⁵ Appropriate vaccine storage, handling, and monitoring systems need to be in place for all vaccines. Manufacturer protocols, found in the manufacturer's product information and package inserts, should be referred to for specific and detailed information about storage and handling of specific vaccines.

Vaccine Adverse Event Reporting System

The National Childhood Vaccine Injury Act of 1986 requires health care providers and manufacturers to report any adverse event listed by the vaccine manufacturer as a contraindication to further doses of the vaccine, or any adverse event listed in the Vaccine Adverse Event Reporting System (VAERS) "Table of Reportable Events Following Vaccination," which occurs within the specified time period after vaccination.⁶⁶ In addition to mandated reporting, health care providers are encouraged to report any clinically significant adverse event following vaccination. VAERS, which is administered jointly by the CDC and the Food and Drug Administration, is the spontaneous reporting system used to monitor vaccine safety. VAERS accepts reports of adverse events after vaccination from vaccine manufacturers, health care providers, vaccine recipients, and others.

During an 11-year surveillance period (1991-2001), VAERS received 128,717 reports, whereas more than 1.9 billion net doses of human vaccines were distributed.⁶⁷ Overall, the most commonly reported adverse event was fever, which appeared in 25.8% of all reports, followed by injection-site hypersensitivity (15.8%), rash (unspecified) (11.0%), injection-site edema (10.8%), and vasodilatation (10.8%). Serious adverse events were described in approximately 14% of all reports, which by regulatory definition include death, life-threatening illness, hospitalization or prolongation of hospitalization, or permanent disability. Considering that 1.9 billion doses of vaccines were distributed during this 10-year reporting period, the likelihood of any adverse event could be extrapolated at well below one percent. No evidence exists that the occurrence of adverse events differs based on whether the vaccine was administered in a physician or nonphysician setting.

VAERS generally cannot assess whether a vaccination caused an adverse event, but can identify possible vaccine safety problems for further investigation. Findings in VAERS need to be interpreted with caution. VAERS is prone to both over- and under-reporting (stimulated reporting has been observed following publicity around a potential

adverse event).⁶⁸ Additionally, the information in VAERS reports can be incomplete or inconsistent in quality. VAERS does not collect data on the number of vaccinated individuals; therefore, rates and relative risks cannot be calculated. Although VAERS data must be interpreted with these limitations in mind, VAERS is a valuable system for detecting potential vaccine safety concerns or “signals” which can then be investigated in other epidemiological studies.⁶⁸

INFORMATION EXCHANGE AND RECORDKEEPING

While surveys demonstrate that primary care physicians are generally accepting of the increased access that adults and adolescents now have to vaccination outside of the medical home, communication between alternate vaccine providers and primary care physicians is suboptimal. This problem extends to physicians in other medical specialties, who also do not always communicate vaccination information back to the primary care physician.²⁵ Communication and coordination of care between primary care physicians and other vaccine providers (including physicians in other medical specialties) is an ongoing challenge.^{25, 33-36, 38}

Current reporting practice for pharmacist administration of vaccines typically involves the pharmacy sending a fax or letter to the physician’s office.⁶⁹ However, such practice may not always occur or be effective; in many cases, additional administrative work is required to transcribe the information into the patient record. Pharmacists may have to call or fax the physician or office staff with patient-related questions or prescription clarifications, which is impractical in a busy pharmacy or within the primary care office work flow. These interruptive, indirect, and relayed methods of exchanging patient health information are subject to misinterpretation, miscommunication, and inefficiencies that can affect vaccination delivery and patient safety.

Role of Vaccine Registries

Many recordkeeping tasks, as well as patient reminder/recall activities, can be simplified by participation in a population-based immunization information system, also known as an immunization registry.⁷⁰ Immunization registries are confidential, computerized databases that record all immunization doses administered by participating providers to persons residing within a given geographic area (e.g., state). The Task Force on Community Preventive Services recommends immunization registries on the basis of strong evidence of effectiveness in increasing vaccination rates.⁷¹ Specifically, the Task Force concluded that registries are directly related to increasing vaccination rates through their capabilities to create or support effective interventions such as client reminder/recall systems, provider assessment and feedback, and provider reminders. Registries also can be used to generate and evaluate public health responses to outbreaks of vaccine-preventable disease; facilitate vaccine management and accountability; determine patient vaccination status for decisions made by clinicians, health departments, and schools; and aid surveillance and investigations on vaccination rates, missed vaccination opportunities, invalid dose administration, and disparities in vaccination status. AMA Policy H-440.899 “Immunization Registries” encourages physicians to participate in the development of immunization registries in their communities and to use immunization registries in their practices.

Vaccine providers should understand how to access immunization registries as a source to check for vaccines that a patient has received or should receive.⁷⁰ The NVAC recommends that a record of receipt of vaccination be placed in the patient’s electronic health record and that information be placed in immunization registries when available.¹¹ In addition, primary care providers should be informed of any vaccines given to their patients by alternative providers, and all patients should receive a written or electronic record of administered vaccines.

In 2012, 54 of 56 CDC immunization program grantees (representing 50 states, five cities, and the District of Columbia) reported that 86% of US children under the age of six and 54% of adolescents between 11 and 17 years of age participated in an immunization registry.^{72,73} While 53 of the registries are capable of recording vaccination data across the lifespan, adult participation remains low at 25%.⁷² According to the CDC, challenges to increase adult participation in immunization registries include: (1) identifying and enrolling the diverse providers that serve adults; (2) a lack of adult immunization reporting mandates in many grantees’ jurisdictions; and (3) competing priorities for state and local immunization programs. A national survey of general internal medicine and family physicians suggests that physician awareness and use of registries for adult vaccinations is limited.²⁵ Internists and family physicians reported that they rely on immunization registries 25% and 44% of the time, respectively, to assess whether their patients were vaccinated by alternate providers. However, only 8% of internists and 36% of

family physicians reported that they recorded adult vaccination information in a state or regional immunization registry.

A recent survey of pharmacy practice sites indicated that 55% of sites screen patients for needed vaccines; 91% reported that their practice sites maintained documentation of individuals receiving vaccinations in the pharmacy; 69% provided individuals with a copy of their consent form; and 53% entered the vaccination into the individual's medical record.⁴³ In addition, 63% of survey respondents reported that they provide documentation of an individual's vaccinations directly to a primary care physician. Overall, 35% of respondents entered an individual's vaccination data into an immunization registry; 11% indicated that they were not permitted to access state and local immunization registries.

CONCLUSION

Health care settings beyond the traditional medical home currently have an important role in the provision of vaccines, especially for adolescents and adults who do not receive primary care medical services through conventional venues. Improving immunization rates and reducing vaccine preventable illness across the lifespan requires a collaborative approach that engages physicians, public health agencies, and other community health care professionals, such as pharmacists, in identifying approaches that are most readily applicable to their communities. In the United States, the use of nonphysician (or complementary) vaccine delivery settings is most critical for vaccinating adult patients; however, even for the administration of pediatric vaccines, complementary settings may be needed to reach populations that have poor access to primary care. Collaboration should be pursued with pharmacists and other community health care professionals to educate patients about the importance of the medical home, as well as to coordinate efforts to improve vaccination rates and meet quality metrics and desired processes for communication. An essential step toward creating a more effective immunization infrastructure and improving national vaccination rates is to improve integration and data sharing of immunization efforts in physician and nonphysician settings.

Under the Affordable Care Act, millions of newly insured Americans will gain access to medical care services, which places increased demand on the current primary care workforce. The existing shortage or maldistribution of primary care physicians, exacerbated by this influx of newly insured Americans, underscores a real need to engage other health professionals who can administer vaccines safely and effectively, as well as expand where those vaccines are administered. For some individuals, the use of alternative settings, such as pharmacies, work sites, and school-based clinics, are an effective means for immunization delivery. More research is needed on immunization services provided in physician and nonphysician settings to assess patient preferences and reasons for receiving vaccines in these settings. Data characterizing individuals who do not receive vaccines and their reasons for not getting vaccinated also are needed. More research is needed to address the effectiveness of immunization programs in pharmacies and other nonphysician settings toward improving immunization rates. Results of such research can help clarify specific health system-based activities that may contribute most to improving patient and population immunization rates and the challenges that must be overcome to achieve success. Ongoing surveillance also is warranted to monitor the safety and quality of immunization services delivered in physician and nonphysician settings.

Pharmacists in all states are authorized to provide immunization services in accordance with state regulations. Differences exist among the states with respect to the age of people who can be immunized by a pharmacist, which vaccines can be provided, and the requirement for physician protocol agreements, prescriptions, or standing orders. All states require that pharmacists who administer vaccines have and maintain specific education and training in the provision of immunization services. Such requirements should be based on ACIP recommendations and recognized standards and guidelines derived with input from physicians and pharmacists who have demonstrated expertise in this field. While pharmacists should support the importance of immunizations across the lifespan and share consistent messages about vaccine safety for all ages and populations, the primary mode of vaccine delivery for pediatric patients, and for adult patients with chronic disease and co-morbidities, should be the medical home to ensure coordination of care. Important components of quality care that impact vaccine administration in pharmacies include ability to screen individuals for needed vaccines, ability to handle adverse reactions, notification of the primary care physician or health department when vaccines are administered, provision of physician referral services, and providing education regarding other key preventive health measures. When vaccines are administered in pharmacies, the information should be transmitted back to the individual's medical home and documented in the

electronic health record and immunization registry (when one exists) so that a complete vaccination record is maintained.

It is important to monitor current trends in vaccine administration to ensure that services do not become fragmented and place patients at risk. Mechanisms should be developed and implemented to ensure that communication and record sharing are optimized between pharmacists and primary care physicians. Important factors regarding recordkeeping include how to determine which individuals are in need of vaccines and how to prevent inappropriate revaccination. Federal, state, and local public health agencies are continuing efforts to improve immunization registries and to increase participation by physicians and other vaccine providers. Until electronic health records and immunization registries routinely include this information, the primary care physician and/or public health agency should be notified when a vaccine is administered in a pharmacy setting so that immunization records are updated appropriately.

RECOMMENDATIONS

The Council on Science and Public Health recommends that the following recommendations be adopted in lieu of Resolution 212-I-12 and that the remainder of the report be filed.

Our American Medical Association believes that:

1. Physicians and medical professional organizations should support state and federal efforts to engage pharmacists in vaccinating target populations that have difficulty accessing immunizations in a medical home. Before administration of a vaccine, pharmacists should assess the immunization status of the patient, which includes checking an immunization registry when one exists. Pharmacists should ensure that a record of vaccine administration is transmitted to the patient's primary care physician and documented in the immunization registry, and that written or electronic documentation is provided to the patient.
2. Vaccination programs in pharmacies should promote the importance of having a medical home to ensure appropriate and comprehensive preventive care, early diagnosis, and optimal therapy. Physicians and pharmacists should work together in the community to: (a) establish referral systems to facilitate appropriate medical care if the patient's conditions or symptoms are beyond the scope of services provided by the pharmacies; and (b) encourage patients to contact a primary care physician to ensure continuity of care.
3. State educational requirements for pharmacists who administer vaccines should be based on ACIP recommendations and recognized standards and guidelines derived with input from physicians and pharmacists with demonstrated expertise in immunization practices.
4. Policy H-440.877, "Distribution and Administration of Vaccines," should be amended by addition and deletion to read as follows:

AMA policy is that:

(1) it is optimal for patients to receive vaccinations in their medical home to ensure coordination of care. This is particularly true for pediatric patients and for adult patients with chronic disease and co-morbidities. If a vaccine is administered outside the medical home, all pertinent vaccine-related information should be transmitted back to the patient's primary care physician and entered into an immunization registry when one exists to provide a complete vaccination record.

(2) all physicians and other qualified health care providers who administer vaccines should have fair and equitable access to all ACIP recommended vaccines. However, when there is a vaccine shortage, those physicians and other health care providers immunizing patients who are prioritized to receive the vaccine based upon medical risks/needs according to the ACIP recommendations of the ACIP must be ensured timely access to adequate vaccine supply.

(3) physicians and other qualified health care providers should: (a) incorporate immunization needs into clinical encounters, as appropriate; (b) strongly recommend needed vaccines to their patients in accordance with ACIP recommendations and consistent with professional guidelines; (c) either administer vaccines directly or refer

patients to another qualified health care provider who can administer vaccines safely and effectively, in accordance with ACIP recommendations and professional guidelines and consistent with state laws; (d) ensure that vaccination administration is documented in the patient medical record and an immunization registry when one exists; and (e) maintain professional competencies in immunization practices, as appropriate.

~~(2)(4) all vaccines should be administered by a licensed physician, or by a qualified health care provider under the supervision of a physician pursuant to a prescription, order, or protocol agreement from a physician licensed to practice medicine in the state where the vaccine is to be administered or in a manner otherwise consistent with state law.~~

~~(3) patients should be provided with documentation of all vaccinations for inclusion in their medical record, particularly when the vaccination is ~~was~~ provided by someone other than the patient's primary care physician provider.~~

~~(6) physicians and other qualified health care providers who administer vaccines should seek to use integrated and interoperable systems, including electronic health records and immunization registries, to facilitate access to accurate and complete immunization data and to improve information-sharing among all vaccine providers.~~

~~(4)(7) our AMA will work with vaccine manufacturers, medical specialty societies, electronic medical record vendors, and immunization information systems should ~~to~~ apply uniform bar-coding on vaccines based on standards promulgated by the medical community.~~

5. That Policy H-440.899, "Immunization Registries," should be amended by addition to read as follows:

Our AMA encourages:

(1) physicians to participate in the development of immunization registries in their communities and use them in their practices for patients of all ages;-

(2) electronic health record (EHR) vendors to add features to automate the exchange of vaccination information in the patient EHR to state immunization registries to improve and help ensure completeness and accuracy of vaccination records. EHR vendors and registry administrators need to work with physicians and other health professionals to facilitate the exchange of needed vaccination information by establishing seamless, bidirectional communication capabilities for physicians, other vaccine providers, and immunization registries; and

(3) all states to move rapidly to provide comprehensive lifespan immunization registries that are interfaced with other state registries.

6. That Policy H-160.921, "Store-Based Health Clinics," should be reaffirmed.

Table. States Allowing Pharmacists to Administer Vaccines without a Physician Protocol or Prescription (but in alignment with ACIP Recommendations)^{††}

State	Provision
Arizona	Allows pharmacists to administer all ACIP-recommended vaccines to adults without a prescription order in compliance with rules and protocols adopted by the state pharmacy board; influenza vaccine can be administered to individuals 6 years of age and older.
California	Allows pharmacists to administer all vaccines for individuals 3 years of age and older according to ACIP recommendations and practice guidances without a physician-specific protocol or prescription.
Idaho	Allows pharmacists to administer all vaccines to a healthy individual 12 years of age and older without immunization contraindications pursuant to the latest recommendations by the CDC or other qualified government authority or to any individual 12 years of age and older pursuant to a prescription drug order issued by another prescriber.

^{††} Source: Personnel communication. Mitchel C. Rothholz, RPh, MBA, American Pharmacists Association, June 10, 2014 and Rebecca Snead, RPh, National Alliance of State Pharmacy Associations, June 11, 2014. The AMA Advocacy Resource Center (ARC) maintains 50-state surveys that provide detailed information on the state laws and regulations that govern pharmacist immunization practice. These surveys are on file with the ARC and are available upon request by contacting arc@ama-assn.org.

Louisiana	Allows pharmacists to administer vaccine to individuals 17 years of age and older without a patient-specific prescription or medical order if “the vaccine is administered in conformance with the most current immunization administration protocol as set forth by the ACIP.” Pharmacists must inform the vaccine recipient that the administration of the vaccine is not to be construed as being in lieu of an annual checkup with the individual’s primary care physician.
Maine	Allows pharmacists to administer the influenza vaccine to individuals 9 years of age and older without a physician prescription or protocol.
Maryland	Allows pharmacists to provide influenza vaccine without a prescription to individuals 9 years of age and older without a physician prescription or protocol.
Montana	Allows pharmacists to administer the influenza, pneumococcal, Tdap, and zoster vaccines to specified ages without a physician specific protocol or prescription, and other vaccines pursuant to a physician protocol or prescription.
New Hampshire	Allows pharmacists to administer influenza, pneumococcal, and zoster vaccines without a physician prescription or protocol.
New Mexico	Allows pharmacists to administer all ACIP-recommended vaccines in accordance to a protocol filed with the state.
Oregon	Allows pharmacists to administer all vaccines in accordance to protocols issued by the state health authority.
Virginia	Allows a pharmacist to administer influenza vaccine to minors (6 months and older) who do not present a prescription, when acting in accordance with guidelines developed by the Virginia Department of Health.
West Virginia	Allows pharmacists to administer all ACIP-recommended vaccines to individuals 18 years of age and older in accordance with ACIP guidelines.
Wyoming	Allows pharmacists to administer all vaccines for healthy adults and influenza vaccine for individuals 7 years of age and older without a physician-specific protocol or prescription.

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APPENDIX

Summary of 2013 National Vaccine Advisory Committee's Standards for Adult Immunization Practices¹¹

The National Vaccine Advisory Committee (NVAC) was established in 1987 to advise and make recommendations to the Assistant Secretary for Health, who is the designated director of the National Vaccine Program. The NVAC recommends strategies to achieve optimal prevention of human infectious diseases through vaccine development, and provides direction to prevent adverse reactions to vaccines.

All providers should:

- Incorporate immunization needs assessment into every clinical encounter.
- Strongly recommend needed vaccine(s) and either administer vaccine(s) or refer patient to a provider who can immunize.
- Stay up-to-date on, and educate patients about, vaccine recommendations.
- Implement systems to incorporate vaccine assessment into routine clinical care.
- Understand how to access immunization information systems (i.e., immunization registries).

Immunizing providers should:

- Ensure professional competencies in immunizations.
- Assess immunization status in every patient care and counseling encounter and strongly recommend needed vaccine(s).
- Ensure that receipt of vaccination is documented in patient medical record and immunization registry.

Non-immunizing providers should:

- Routinely assess the immunization status of patients, recommend needed vaccine(s), and refer patient to an immunizing provider.
- Establish referral relationships with immunizing providers
- Follow up to confirm patient receipt of recommended vaccine(s).