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Preventive Medicine

Improving Healthcare Costs and Patient Outcomes Across Healthcare Professions

Hannah Lamb, Jourdan Ujlaki, Paige Torbet, Isabel Cwikla, Rebecca Worden, Michael Rush, PharmD, BCACP, COE, TTS

Abstract
Healthcare professionals must be aware of the importance of preventive medicine and the responsibility they have in contributing to it. There are three levels of preventive medicine that a healthcare professional can provide based on the patient population that is receiving care and the goals of the particular service. Preventive medicine has the ability to improve both overall healthcare costs and have a positive impact on a patient's quality of life. All healthcare professionals have the potential to fulfill a role in each level of preventive medicine, and should understand the role of each member of the healthcare team, to ensure that preventive medicine can be effectively provided.

Key Terms
Healthcare Costs; Individualized; Patient Care Team; Population-based; Preventive Measures; Preventive Medicine; Quality of Life; Screening

Introduction
The importance of preventive medicine in patient health is often overlooked. In some cases, medical concerns can be prevented by changing lifestyle habits, limiting exposure to risk or catching disease states at early stages via routine screenings. Medical professionals must work together to provide education and guidance for patients in order to prevent major events from occurring.

Preventive medicine leads to an improved quality of life, early detection of disease and increased direct and indirect healthcare cost savings. Emphasizing the importance of all levels of preventive medicine affects patients, society and overall healthcare costs. Pharmacists, exercise physiologists and other healthcare professionals can perform vital roles in patient interventions. The routine patient interactions in all stages of health provide unique opportunities to ensure appropriate screenings and lifestyle choices are taking place. Therefore, there are numerous benefits of preventive medicine which include opportunities for patient and healthcare savings.

Levels of Preventive Medicine
Preventive medicine is a broad topic that can be subdivided into three different levels: primary prevention, secondary prevention and tertiary prevention. These levels are categorized by the target population and associated with specific goals.

Primary prevention includes the total population with a focus on healthy individuals. The goals of primary prevention are to limit the rate of a disease by reducing its risk in the total population and to promote overall good health. Primary prevention can be achieved by lifestyle modifications, such as consuming a healthier diet, administering vaccinations or making positive environmental changes.

Secondary prevention targets asymptomatic individuals who either have high risk factors or are in the early stages of a particular disease state. The main goal of this level is to reduce the progression of the disease. This is accomplished through methods of early detection (e.g., hypertension screenings).

Tertiary prevention focuses on patients with an established disease state and the goals are to limit the impact of the disease and improve the patient's quality of life after diagnosis. Examples include rehabilitation after a stroke or injury and prescribing proper medications for chronic disease states.

Healthcare Cost Improvements
In addition to improving patients' quality of life, one of the best measures to explain the impact of preventive medicine is to examine the costs associated with and saved from each prevention measure. Preventive care that decreases costs is referred to as cost savings. If an intervention has benefits that extensively outweigh the associated costs, the measure is referred to as cost-effective, regardless of whether it saves money. Often, cost-savings interventions slow the growth of healthcare costs.

To simplify, an intervention's cost and the health impact it delivers is summarized in the cost-effectiveness ratio which is equal to the intervention's incremental cost divided by its incremental health benefits. A small cost-effectiveness ratio favors intervention, while a large ratio is unfavorable due to high incremental costs compared to the incremental health benefits.

Health benefits are often expressed in the number of quality adjusted life years (QALYs) saved. One year of perfect health is represented by one QALY, whereas a year with an adverse condition is worth between zero and one QALY. Economists disagree on the value contained in a QALY; it is usually estimated between $50,000 and $100,000, though it has been argued that one QALY could be worth up to $430,000.

Targeting high risk populations for preventive measures typically improves cost-effectiveness by increasing the proportion of individuals in good health. High risk populations usually encounter more health problems, which costs more money. Therefore, targeting them for preventive measures saves more money compared to non-high risk populations in the long run. How cost-effective a measure is also depends...
on what it is compared with and the assumptions made about how people who develop the targeted disease will be treated. For example, comparing a preventive measure to no intervention will show a greater cost-effectiveness ratio than comparing one preventive measure to another. Also, the availability of preventive treatments can the cost-effectiveness of a measure. However, preventive measures can cause people to live longer, which can in turn increase lifetime healthcare costs because people have more time to develop additional illnesses.

There are a variety of preventive measures, all of which have varying cost-effectiveness ratios. An example of a secondary prevention measure is screening for diabetes in patients with hypertension, which has been shown to be a cost-effective preventive health measure. When screening 75- and 35-year-olds with hypertension, the cost-effectiveness ratio is $38,000/QALY and $87,000/QALY, respectively. This compares to all 35-year-olds who have a cost-effectiveness ratio when screened for diabetes of $130,000/QALY. This shows a substantial savings for diabetes screenings for hypertension patients because a lower cost-effectiveness ratio is preferred. Another example of a cost-effective secondary prevention is screening for hypertension in any adult which has an estimated cost-effectiveness range of $29,000/QALY to $38,000/QALY. An example of a primary preventive measure is counseling adult and adolescent women to use calcium supplements to prevent bone fracture. This shows a cost-effectiveness ratio of between $17,000/QALY and $42,000/QALY. Additionally, the frequency of the intervention can have an impact on cost-effectiveness. For example, a colonoscopy every three years is estimated at a cost-effectiveness ratio of $22,000/QALY while every 10 years is approximately $11,000 to $27,000.

Health Benefits
While preventive medicine is associated with significant healthcare cost improvements, it has significant impact on improving overall health. Chronic diseases, such as cardiovascular disease (CVD), cancer, chronic respiratory disease and diabetes, are the primary cause of death in almost all countries worldwide, resulting in about 36 million deaths annually. With the exception of the African region, chronic noncommunicable diseases have been found to cause significantly more deaths than communicable diseases. Furthermore, chronic, noncommunicable diseases occur more commonly in low- and middle-income countries as opposed to high-income countries; 80 percent of deaths due to chronic diseases occur in low- and middle-income countries while 20 percent occur in high-income countries.

Table 1. Trends in primary and secondary intervention and their potential to save lives.

<table>
<thead>
<tr>
<th>Population analyzed</th>
<th>Current % engaged in given activity</th>
<th>Lives saved annually if current % increased to 90%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Daily aspirin use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males 40+</td>
<td>40%</td>
<td>45,000</td>
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<tr>
<td>Females 50+</td>
<td></td>
<td></td>
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<tr>
<td>(Reported in 2005)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Smoking cessation advice and help quitting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult smokers</td>
<td>28%</td>
<td>42,000</td>
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<tr>
<td>(Reported in 2005)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Colorectal cancer screening</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults 50+</td>
<td>48%</td>
<td>14,000</td>
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<tr>
<td>(Reported in 2005)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Influenza vaccination</strong></td>
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<tr>
<td>Adults 50+</td>
<td>37%</td>
<td>12,000</td>
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<tr>
<td>(Reported in 2005)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Pneumococcal vaccination</strong></td>
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<td></td>
</tr>
<tr>
<td>Adults 65+</td>
<td>54%</td>
<td>800</td>
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<tr>
<td>(Reported in 2005)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Cervical cancer screening</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females 18-64</td>
<td>83%</td>
<td>620</td>
</tr>
<tr>
<td>(Screened between 2002-2005)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Cholesterol screening</strong></td>
<td></td>
<td></td>
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<tr>
<td>Males 35+</td>
<td>79%</td>
<td>2,450</td>
</tr>
<tr>
<td>Females 45+</td>
<td></td>
<td></td>
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<tr>
<td>(Screened between 1998-2003)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Breast cancer screening</strong></td>
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<td></td>
</tr>
<tr>
<td>Females 40+</td>
<td>67%</td>
<td>3,700</td>
</tr>
<tr>
<td>(Screened between 2003-2005)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Chlamydia screening</strong></td>
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<td></td>
</tr>
<tr>
<td>Females 16-25</td>
<td>40%</td>
<td>30,000</td>
</tr>
<tr>
<td>(Screened in 2005)</td>
<td></td>
<td></td>
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</tbody>
</table>

*All statistics above extrapolated according to National Health Interview Survey done by the National Center for Health Statistics within the CDC (Partnership for Prevention. Preventive care: a national profile on use, disparities and health benefits. Washington, DC: Partnership for Prevention; 2007.)
strategies focus on high-risk or susceptible individuals by providing direct intervention. In contrast, population-based prevention strives to control determinants of health in the population as a whole by promoting healthy behavior to lower the overall risk within a population.

Preventive measures that are individual-based are most effective for people with the greatest risk of developing a specific disease. The main disadvantage of a personalized approach is that it usually requires screening programs to identify high-risk groups, which are often difficult and expensive. Screening programs do not serve to establish diagnoses, but are used to identify the presence or absence of an identified risk factor. However, such information is very valuable in that identified risk factors make individuals aware of their likelihood of developing a given disease. This encourages monitoring for early diagnosis and increases the chance of a full recovery. As a result, this correlates with improved quality of life and increased life expectancy because of decreased morbidity and mortality.

Health screenings provide an opportunity to identify disease states at a stage that can be addressed by lifestyle modifications alone. Healthcare professionals can influence the course of a patient’s disease development through monitoring values such as blood pressure. Heart disease is the number one cause of death, regardless of gender, resulting in over 610,000 deaths in the United States each year. An indicator of heart health is blood pressure, a value that is easily measured. Hypertension is indicated by a reading greater than 140/90 mmHg, and often requires two or more types of antihypertensive medications to keep blood pressure within the normal range. Preventive screenings can identify patients who are at risk for developing hypertension, which allows healthcare professionals to advise diet and exercise changes to positively affect these values. Small lifestyle changes can have a large impact overall, for instance, losing 10 pounds will show reductions in a patient’s blood pressure. A dose-response relationship has also been identified between physical activity and health. As levels of activity increase, the rates of premature mortality, cardiovascular disease, hypertension, type 2 diabetes, obesity and many other disease states decrease. Identifying patients at risk for high blood pressure and implementing diet and exercise changes may prevent the need for future medications and decrease healthcare costs. Lifestyle changes can lower a patient’s chance of developing heart disease, stroke and kidney failure; helping to increase their quality and length of life. Some other benefits of lifestyle changes include improved cognitive function, prevention of limitations and a higher sense of well-being. Primary intervention has the greatest impact on prevention of disease development, but lifestyle changes after risk of a disease state is identified are also important. Secondary interventions can help prevent the progression of a disease, and tertiary interventions reduce the chances of recurrence. As a result, patients will be able to have more independence and live more satisfied lives when they are in good health. As medical professionals, our help in identifying risks and support through lifestyle changes can save lives.

Combining individual-based preventive actions with a population-based strategy has been shown to be a more effective approach than solely focusing on high-risk individuals. This principle is based on improving the health of individuals as a means of improving the health of general populations. This is especially applicable to communicable diseases, which are responsible for 14.2 million deaths annually, and are most prevalent in low-income countries. The most widespread communicable diseases include human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), tuberculosis and malaria. One of the most effective preventive measures in a population-based strategy includes immunizations which serve as a powerful tool in the management and control of infectious diseases. Systematic immunization programs have been proven to be very effective in controlling transmission. An example of this is the eradication of smallpox. In 1967, 10 to 15 million new cases of smallpox were reported annually in 31 countries while 2 million deaths occurred annually. As a result, the World Health Organization (WHO) established a 10 year eradication program for smallpox. After effective vaccination, this disease was declared eradicated on May 8, 1980. On the other hand, HIV/AIDS has no definitive treatment even though it is one of the most destructive infectious disease epidemics in recorded history. In this instance, preventive action stresses identifying risk factors and social determinants, as well as promoting safe practices to control the spread of the disease.

Role of Healthcare Professionals
There are many roles that healthcare providers can fulfill in preventive medicine. It is important that each professional is aware of their own role and the role of other healthcare professionals due to the nature of the work across disciplines and in interprofessional teams. Each healthcare professional has a different skill set that allows them to perform a unique role in the three levels of preventive medicine. Every member of the healthcare team must work together to provide the best care available for all patients, especially for the prevention of chronic healthcare concerns and costs.

Roles in Primary Prevention
Primary prevention can be accomplished through a variety of services and healthcare providers. Pharmacists are very accessible healthcare professionals in the community which allows them to have a large opportunity to provide preventive services. One primary preventive medicine service is education on various over-the-counter products that patients seek when going to a pharmacy. A study showed that some of the top ranked preventive services include educating men over the age of 40 and women over the age of 50 on the use of aspirin to prevent heart disease, and counseling patients on the importance of smoking cessation and helping them through the process of quitting. Rankings are based on clinically preventable burden (CPB), or how likely providing the service is to prevent a disease state or premature death and promote cost-effectiveness. Educating women of childbearing age on the use of folic acid and elderly women about calcium supplementation are also in the rankings of preventive services that pharmacists can focus on to help improve the quality of life for patients. Pharmacists can also provide a
cost-effective, primary preventive service through administering immunizations to prevent the spread of diseases. The importance of pharmacists in this role has been noticed. In Ohio, House Bill 394 was passed in the spring of 2015, which lowered the age that a pharmacist or pharmacy intern can administer a Centers for Disease Control and Prevention (CDC) recommended vaccine to patients seven years old and older.12 While pharmacists are one of the most accessible healthcare providers to administer vaccines, they can also be provided by other healthcare professionals including doctors and nurses.

Another primary preventive service that can benefit patients is supporting lifestyle modifications such as a healthier diet and participation in an exercise program. Physical activity has been found to reduce the rates of premature mortality, cardiovascular disease, hypertension, obesity, functional health and many other disease states.9 Exercise physiologists are in a unique position to develop and guide a patient through the implementation of an exercise program. After the identification of a need for an exercise prescription, a doctor will clear the patient for participation depending on their risk stratification. While some risks are associated with exercise, the benefits of exercise for patients at all levels of preventive medicine are extensive. Benefits include lower incidence rates of cardiovascular disease, stroke, type 2 diabetes mellitus, osteoporotic fractures and cancers of the colon and breast. Patient education is the most important role an exercise physiologist has throughout program development and progression. Individual-based prevention embodies exercise programming. Each prescription is created with respect to the client's goals, disease states and capabilities according to the criteria found in the American College of Sports Medicine Guidelines for Exercise Testing and Prescription.9 Inclusion of exercise in a patient's healthcare plan can prevent a deviation from optimal health, including the prevention of an initial cardiovascular event. Overseeing the patient's program and helping them prevent disease state development is an important role exercise physiologists play in primary prevention.

An additional primary preventive service that healthcare professionals can fulfill is being a legal advocate and impacting public policy. As drug experts, pharmacists should have a large impact on legislation that affects healthcare and medications. Pharmacists may be employed by organizations, such as the U.S. Food and Drug Administration, that help pass laws concerning drugs.11 There are many other ways that a pharmacist can become involved in advocacy, such as through their local board of health or state board of pharmacy. It has also been noted that pharmacists in underserved areas have become proponents for various environmental programs including water pollution control and sanitation. Again, many other healthcare professionals can be legal advocates for many different causes. Dentists have taken public policy advocacy roles to help with water fluoridation efforts to improve oral health.10 Also, nurses who have graduate-level public health training can help plan and implement public health initiatives on the local, state and national level.

Roles in Secondary Prevention
Secondary preventive medicine focuses on patients who are at high risk for a particular disease and can be achieved through screenings to detect these diseases in their early stages. These screenings can be completed by various healthcare professionals. One of the main focuses of primary care physicians is to provide preventive screening services to patients.10 Dentists also provide secondary preventive medicine by checking their patients for dental caries and oral cancer. Pharmacists can also provide many screening services such as hypertension screenings.5 Some patients identified by these screenings will benefit from professional assistance in making the lifestyle changes necessary to prevent the development of a disease. For example, exercise physiologists can help patients understand their own risks and the benefits of physical activity, while helping them increase their sense of self-efficacy.9 Including high-risk patients in exercise programs can reduce the risk of symptom development of chronic diseases. An exercise physiologist must act as a patient advocate to inform, develop and motivate patients through an exercise program to help them improve their level of risk.

Roles in Tertiary Prevention
Tertiary prevention is important in limiting the impact of a disease on a patient's quality of life.2 While doctors diagnose and prescribe medications for chronic diseases, pharmacists educate patients on how to most efficiently manage their medication regimen to control their disease states.10 One example would be a patient diagnosed with diabetes and prescribed medication by a physician. In addition, this patient is taught by a pharmacist on how to check their blood sugar and use their medications properly to best control their diabetes. Community pharmacies that have incorporated diabetes management programs have shown to increase patient satisfaction while also reducing overall healthcare costs. Patients diagnosed with disease states will collaborate with their healthcare team to develop the best treatment plan for them. In combination with drug intervention, exercise is beneficial to this population as well. Exercise programming can change a patient's prognosis, including improving glucose tolerance, increased insulin sensitivity and improvement in cardiovascular risk factors.9 These advancements can reduce a patient's need for exogenous insulin and combat the need for weight loss and maintenance in these patients.

Conclusion
Preventive medicine plays a crucial role in reducing healthcare costs. Through routine screenings and immunizations, medical professionals can support healthy lifestyle choices. Intervention during good health can prevent the onset of most disease states, and has the greatest impact on patients' lives. Secondary and tertiary interventions also provide opportunities to increase a patient's overall health and sense of well-being. Prevention of chronic disease states can eliminate the need for some medications and future hospital stays to reduce the amount of money spent on healthcare. Exercise is also a key component of any healthcare plan, and requires patient effort and professional support. Every mem-

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ber of the healthcare team must participate in methods of prevention. As a result, the opportunity to influence patients through preventive medicine can last a lifetime and may extend a patient's length of life.


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