Medical Dialogue Review
An undergraduate medical journal

Volume 8

Spring 2011




## Letter from the Editors:

Dear MDR Readers,

We are proud to present the eighth edition of Medical Dialogue Review! In keeping with the mission of the journal, this volume contains a wide range of perspectives that remind us that medicine is not an isolated discipline. Indeed, we believe the field of medicine is rooted in the lived experiences of health and disease. MDR seeks to unravel the social realities and consequences of disease by providing a forum to discuss the intersection of science and medicine with society itself.

Each volume contains articles written by enthusiastic writers with a passion for science and humanity. Some choose to discuss the effects of a specific illness while others critically analyze health policies, the stigmas associated with certain diseases, or global health issues. Regardless of the topic, each article offers a unique perspective and lens through which we can understand the field of medicine's impact on humanity as a whole.

We welcome readers from all disciplines to open the pages of this journal and enter the medical dialogue. We would like to thank all of you for your support and continued interest in MDR. We hope that our contents provoke you to become a critical, active, and engaged participant in ongoing debates about medicine, and we welcome your reactions in the next edition of the journal. view of science and its place in society, and that you maintain passionate and sincere attitude towards the field of science as a whole. Be ready to read on, and enjoy an amazing dialogue with others about interesting subjects in medicine and society.

Sincerely,

The Editors of Medical Dialogue Review

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## Cover Image: *Nude Etching*

**Katelyn Norman**
**Multimedia**

The nude etching was inspired by nineteenth century medical illustration. The antiquity of etching lends itself to academic plate making, and the subject, the nude female in an expanse of cloth, is also a well established trope within art history. The idea was to take these classic, iconic themes and find a middle ground between art and diagram.

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## Introduction: A Look at What's in the Spring 2011 Issue

## Chemotherapy: A Good or Bad Treatment Option?

**Youngho Park**

Cancer includes a class of diseases in which a group of cells proliferates uncontrollably, leading to the destruction of surrounding tissues or the spread of cancerous cells to other parts of the body. One of the most prominent treatment protocols currently available is chemotherapy, a method that involves destruction of cancer cells in a patient's body. This article raises the question of how efficient chemotherapy really is in destroying cancer cells, and describes not just the benefits of chemotherapy, but particularly the detriments- its toxicity, its tendency to destroy normal cells as well as cancer cells, and a plethora of unpleasant side effects that result from this treatment. Park brings forth an alternative to chemotherapy, urging the medical community to raise awareness of the precautions of chemotherapy and to advocate the adoption of less toxic forms of cancer treatment and prevention.

## Non-Heroin Narcotics: Why Teens Are Looking in the Medicine Cabinet to Get High

**Allison Maidman**

The recreational use of "non-heroin narcotics," a term that refers to prescription painkillers (such as oxycodone and hydrocodone), has been a major concern in recent years, as the abuse of and dependence on these drugs has increased substantially (especially among adolescents). Maidman informs us of the magnitude of this problem and investigates the factors that contribute to the progressive increase in non-heroin narcotic drug abuse, pointing to the ease of accessibility and the illusion of safety associated with these drugs as potential factors. In doing so, she begs answers to the questions: What preventive measures can be taken to reduce this problem? And how effective might such measures be?

## The Spotlight Effect: Embarrassment as a Psychological Phenomenon

**Alisa Liu**

All of us have experienced the discomfort of embarrassment after an awkward or mortifying situation- a loss of coordination, a wardrobe malfunction, lateness…the list is endless. The resulting feeling of embarrassment invokes the belief that everyone is judging you based on the mistake you just made. In this insightful piece, Liu reveals that in reality, people often overestimate others' reactions to them, generally overanalyzing how they are perceived by others. This is a phenomenon known as the spotlight effect. What are the causes of embarrassment and self-consciousness? What are the potential repercussions of experiencing embarrassment for the socially anxious? And what steps can be taken to deal with embarrassing situations and live free of social anxiety?

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# Perceptions and Management of Hypertension in New York City

Serra Akyar

**Abstract**

Hypertension, or high blood pressure, is a chronic condition that affects 74.5 million adults in the United States. It is commonly called the "silent killer" because it cannot be qualified by pain, regularly lacks signs or symptoms, and contributes to two of the top three main causes of death in the US: heart disease and stroke. Because of hypertension's silent nature, blood pressure screening is an important preliminary step to determine if someone has hypertension. In this study, 25 participants were screened to check their blood pressure numbers and surveyed for their perceptions and methods of managing high blood pressure. Perceptions and management methods were collected to assess the participants' level of knowledge of hypertension. Screening revealed 56% of participants presented normal blood pressure readings, 28% showed pre-hypertensive numbers and 16% scored in the hypertensive range. Meanwhile, the participants' responses revealed that hypertension is not easily understood; confusion and a lack of knowledge regarding the biomedical definition of hypertension, its risk factors, and possible methods of management were prevalent across the sample pool. This study's results suggest a need for New Yorkers to receive increased hypertension education and screening opportunities.

## Introduction

In order to gain a clear understanding of the biomedical definition of hypertension, high blood pressure, it is important to understand blood pressure. Blood pressure is the result of systolic and diastolic forces. Systolic pressure is the measure of the pressure on the walls of the arteries when the heart contracts; diastolic pressure is the measure of the pressure on the walls of the arteries when the heart is resting (when it is between heartbeats). A ratio of the systolic and diastolic pressures can be measured in millimeters of mercury using a sphygmomanometer. This ratio can then be used to classify a person's blood pressure as normal, pre-hypertension, hypertension stage 1, hypertension stage 2 or hypertensive crisis. **Table 1** displays the blood pressure categories currently used. Someone who is pre-hypertensive is not hypertensive but is likely to develop high blood pressure in the near future.

| **Blood Pressure Category** | **Systolic (mm Hg)** | | **Diastolic (mm Hg)** |
|---|---|---|---|
| Normal | Less than 120 | And | Less than 80 |
| Pre-hypertension | 120 – 139 | Or | 80 – 89 |
| High Blood Pressure (Hypertension) Stage 1 | 140 – 159 | Or | 90 – 99 |
| High Blood Pressure (Hypertension) Stage 2 | 160 or higher | Or | 100 or higher |
| Hypertensive Crisis | Higher than 180 | Or | Higher than 110 |

**Table 1**

Knowing one's status regarding high blood pressure is important. High blood pressure indicates that the pressure of the blood against the walls of the arteries is ex-

ceeding what is necessary for optimal nutrient delivery and gas exchange. Uncontrolled high blood pressure is dangerous and can lead to stroke, kidney disease, vision loss, memory loss, damage to the heart and coronary arteries, heart attack and heart disease. It is important to know one's status because high blood pressure is not a condition one can *feel*.

This study therefore aims to assess the degree of knowledge that 25 New Yorkers have about hypertension through an analysis of their perceptions of hypertension and methods of management.

## Method

This study collected data from 25 participants: 14 females and 11 males, ranging in age from 19 to 64, who self-identified as either Mexican- or Hispanic-American. Participants were asked about their medical history and access to medical care, screened for their blood pressure measurements, and surveyed for their knowledge of hypertension using a series of true or false, multiple choice and open ended questions. Through these questions, perceptions of hypertension and methods of management were targeted to assess the levels of knowledge of hypertension held by participants.

## Results

*Sample Background*

Fourteen study participants indicated that at the time of the interview, they did not have access to a doctor, clinic, or other health center where information and treatment for heart and overall health problems can be obtained. Additionally, 84% of the participants had not been screened for high blood pressure within the past month. This includes three participants who reported that they had never been screened for hypertension.

When participants were screened for their blood pressure readings, four participants scored in the Hypertensive region, seven scored in the pre-hypertensive region and 14 participants had normal readings. Readings were not used to diagnose hypertension, but simply to screen each participant and inform them of their blood pressure measurements at the time of the interview.

*Perceptions of Hypertension and Methods of Management*

Participants were asked open-ended, true or false and multiple-choice questions to gain insight on what they believed hypertension to be, what factors might lead someone to become hypertensive and if the condition can be controlled.

When participants were asked for a definition of high blood pressure, 12 participants indicated that they did not know what high blood pressure is at all while five participants linked the condition to dizziness. Other participants responded with: "when I get hot, it is high; when I get cold, it is low," when "cholesterol increases in the veins and then the heart can't function properly," "bacteria in the body," when the "heart pumps blood fast and the heart is overworking," "it deals with cardiac rhythm," and when "the numbers are out of the established range."

Next, participants were asked how they believed someone gets high blood pressure. This was a multiple-choice question, which allowed the participants to select from a list of risk factors the ones they believed contributed to the onset of the condition. Included in the answer choices were risk factors that did and did not contribute to hypertension and a fill in option. **Figure 1** displays the risk factors and number of participants who believed that risk factor contributed to becoming hypertensive.

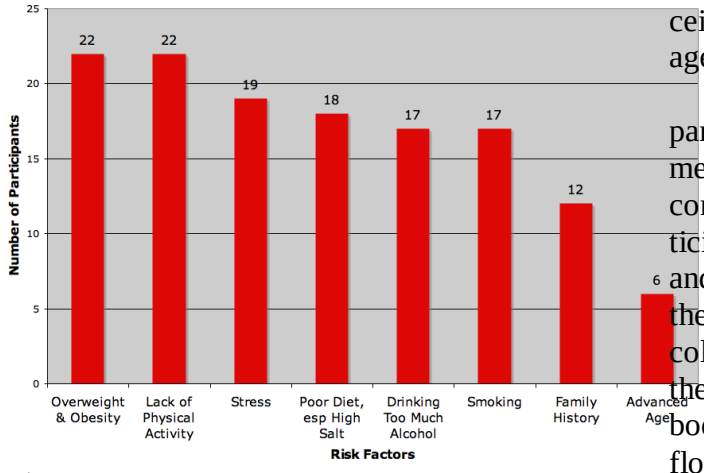


**Figure 1**

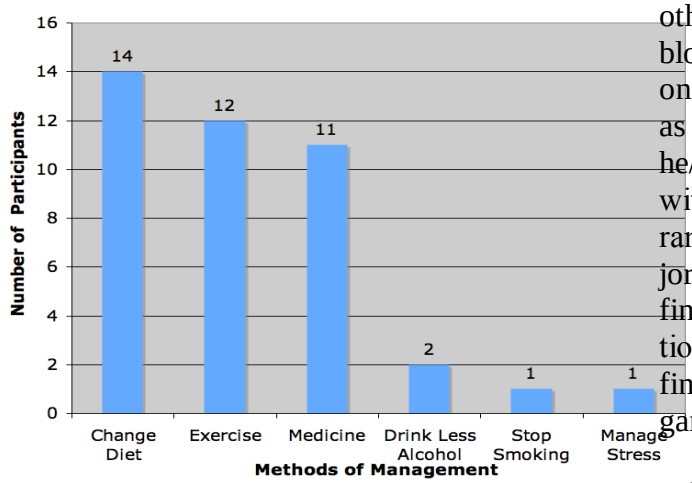


**Figure 2**

Afterwards, the participants were asked through an open ended question what they believed were methods for managing hypertension. While three participants believed that hypertension cannot be controlled, twenty-two participants believed that hypertension can be controlled. **Figure 2** displays their responses.

## Discussion

From the participants' perceptions of hypertension, it is clear that there is a varying degree of knowledge regarding the condition. This study focused on three main areas: the definition of hypertension, its perceived risk factors, and its methods of management.

First, it is evident that most of the participants are not familiar with the biomedical definition of hypertension or are confusing it with other illnesses. Some participants linked the condition to the heart and others defined hypertension as states they can feel (i.e. dizziness, feeling hot or cold). Hypertension *is* related to the heart; as the heart pumps blood to other parts of the body, it creates a pressure that enables blood flow. However, as described earlier, hypertension is *not* a condition that can be felt. This dizziness is a symptom of stroke and other complications to which chronic high blood pressure can contribute. Meanwhile, only one participant explained hypertension as a condition based on numbers when he/she described hypertension as congruent with "numbers... out of the established range." The responses indicated that a majority of the participants were unable to define hypertension by its biomedical definition as "high blood pressure" – the basic definition used by US doctors and health organizations.

Second, although participants had difficulty defining hypertension, they were able to recognize controllable risk factors. Obesity, not exercising, poor stress management, a poor diet– especially one that is high in salt, excessive drinking, and smoking are all controllable risk factors that contribute to the onset of hypertension. These are important factors that increase the likelihood of developing hypertension, as well as other chronic conditions such as cardiovascular disease, diabetes, certain types of cancers and osteoporosis (Center for Nutrition Policy and Assessment). Though participants recognized controllable risk factors, less than half identified having a family history for the condition as a factor, and only six indicated advanced age as a risk factor. Advanced age is a significant risk factor to

be aware of since aging causes blood vessels to lose flexibility, which can contribute to an increase of blood pressure throughout the body.

Third, although participants were able to identify controllable risk factors of hypertension, this knowledge did not translate into expected methods of management. Given the responses for controllable risk factors, it could be expected that participants would manage hypertension by taking control of the mentioned risk factors. However, the data collected presents a disparity between this knowledge and its application in managing the condition. **Figure 3** shows a comparison of the perceived risk factors (S2, in the back) and the methods of management (S1, in the front). From this figure, it is clear that there is a missing link between perceived risk factors and methods of management.

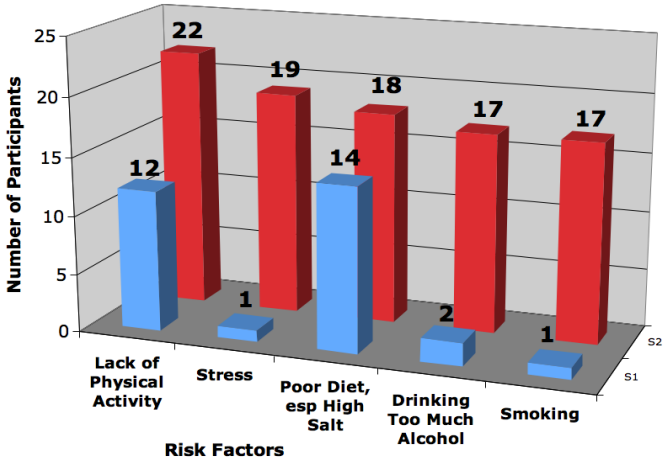


**Figure 3**

## Recommendations

From the responses received in this study, it is clear that more public education on hypertension is needed. Specifically, answers to the following questions should be more widely known in relation to hypertension: what is it, what are the risk factors for developing the condition, and ultimately what methods can be used to manage high blood pressure? In order to develop ways to reach out and educate communities, an understanding of the community's culture and behavior needs to be met to develop interventions that are appropriate and that will be effective. Additionally, it is important that to develop ways to improve the access to medical care and information to all communities.

## Future Research Questions

While this study was open to people of all ethnicities, the entire sample pool comprised of participants who self identified as Mexican- or Hispanic-Americans. It would be interesting to study in greater depth the effects of their cultural methods of healing in how they manage and understand hypertension. Also, how do these ideas change cross-culturally?

Understanding the answers to the above questions can help in developing a response to the following: what is an effective, appropriate way to reach out to populations in need of better hypertension education? An understanding of how a culture behaves, views illness, and manages health on a daily basis and at times of illness is important in designing effective interventions and approaches to solving health issues.

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# Using Statin Drugs to Prevent Diabetic Retinopathy

Christopher Catalano

Statins are an important class of drugs that act as competitive inhibitors of the enzyme HMG-CoA reductase, which controls the rate of cholesterol production in the liver. As LDL ("bad") cholesterol reducers, they are often used in the treatment of heart disease and are one of the most widely prescribed classes of drugs in the United States. The statin atorvastatin, more commonly known as Lipitor, was the most frequently prescribed medication in the United States in 2009 (as measured by total number of units sold).[1] According to the Center for Disease Control's National Health and Nutrition Examination Survey (NHANES), between 2005 and 2008, 25% of Americans over the age of 45 were taking statins.[2]

Recent research has indicated that statins may help reduce morbidity and mortality associated with cardiovascular disease not only by lowering cholesterol, but also by decreasing inflammation, which like cholesterol acts as an important contributing factor in heart disease. Inflammation is often caused by reactive oxygen species, which are extremely unstable and chemically reactive molecules containing oxygen, sometimes referred to as "free radicals". High levels of reactive species in the body can lead to severe damage to the body's cells due to oxidative stress. Statins are believed to decrease inflammation by acting as antioxidants that interact with the free radicals, neutralizing them before they have the opportunity to react deleteriously with other substances in the body.[3] This antioxidant capacity may be the reason that several studies have recently found statins to be effective in the treatment not only of heart disease, but also of diabetic retinopathy.

Between 2005 and 2008, as reported by the CDC, diabetes affected 11% of all US adults over the age of 20, including 27% of those over the age of 65. As of 2007, there were also estimated to be 200,000 children under the age of 20 living with diabetes in the United States.[4] This high prevalence of diabetes makes diabetic retinopathy, one of the most common long-term side effects of the disease, a major public health concern. In 2010, Zhang et al. found that 28.5% of diabetic adults over the age of 40 had been diagnosed with diabetic retinopathy. This is already a significant percentage of our population, and the number is expected to grow even larger as the population ages. Currently, diabetic retinopathy is the primary cause of new cases of legal blindness in US adults aged 20-74, and costs the United States approximately $500 million every year.[5]

Diabetic retinopathy is a direct result of hyperglycemia; elevated sugar levels cause damage to the blood vessels in the retina (the highly vascular, light-sensitive layer of tissue at the back of the eye), which leads to damage to these vessels, causing hypoxia in the retinal tissues and the initiation of a pathway that releases a factor called VEGF-A (vascular endothelial growth factor A), leading to the formation of new capillaries in the eye. Damage to vessels by high blood sugar and resulting leaking of fluid from those vessels can also lead to ma-

cular edema, or swelling of the center of the retina.

Currently, the only treatment available for diabetic retinopathy is surgery. Often, if a patient's diabetic retinopathy is in the early stages, he/she will receive no treatment at all until his/her condition worsens, as the only treatments available (i.e. surgery) have risks that may outweigh the benefits at this early a stage of the disease. Tight blood sugar control and smoking cessation have been shown to help slow the progress of diabetic retinopathy, but at present, there are no treatments available to prevent angiogenesis (new blood vessel formation) completely in a patient with diabetic retinopathy. Scatter laser treatment, or panretinal photocoagulation, is the treatment presently used to control abnormal blood vessel growth in the retina. During this procedure, non-macular areas of the retina are treated with scattered laser burns. These burns cause the abnormal new blood vessels to shrink and scar. The procedure can sometimes result in loss of peripheral or night vision.[6]

In a paper published this past October, researchers at the University of Georgia College of Pharmacy found that oral statin therapy using the drug atorvastatin (Lipitor) blocked formation of free radicals in the retinas of diabetic rats. This caused normalization of nerve growth factor (NGF) levels, which in untreated diabetic rats were usually artificially low due to the oxidative damage caused by hyperglycemia. Restoring the normal balance of NGF in the retinas was associated with the prevention of neuronal cell death and the preservation of barriers between the blood and the retina, preventing microaneurysms and hemorrhages, which by initiating hypoxic pathways and causing edema can have devastating effects on quality of vision.[7]

The prospective availability of statins as a method of treatment for diabetic retinopathy would be a significant improvement over the current range of therapies. Statins represent a minimally invasive, inexpensive therapy which could be used as a preventative measure before symptoms became severe. Side effects of statin use are generally mild, especially when compared with the risks of surgery. Additionally, Pfizer's patent on Lipitor will be expiring this coming June, and the first generic version will be released on November 30th, 2011, making this an even more accessible and affordable option for those who may benefit from it.[8]

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[1]Vector One National Accounts (VONA). 2009. Verispan.

[2]Center for Disease Control."Health, United States, 2010: In Brief." CDC National Center for Health Statistics.

[3]Stoll, L.L. et al.. "Antioxidant effects of statins." *Drugs Today.* 2004, 40(12):975.Stoll, L.L. et al.

[4]Zhang, et al. Prevalence of Diabetic Retinopathy in the United States 2005-2008. *Journal of the American Medical Association.* 2010, 304(6):649-656

[5]Mayo Clinic. "Diabetic Retinopathy Information." Mayo Clinic Staff. http://www.mayoclinic.com

[6]Center for Disease Control."Health, United States, 2010: In Brief." CDC National Center for Health Statistics.

[7]Ali, et al. Diabetes-induced peroxynitrite impairs the balance of of pro-nerve growth factor and nerve growth factor, and cause neurovascular injury. *Diabetologia.* March 2011. 54(3):657-668. Epub 2010 Oct 19.

[8]Associated Press. "Pfizer: US ruling maintains Lipitor patent term." Los Angeles Times. 7 January 2009. http://articles.latimes.com/2009/jan/07/business/fi-lipitor7

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# Dispensing the Indispensable Human Right: Access to Healthcare in America

Hewett Chiu

He looked imploringly at me, wondering what the catch was. Quite apprehensive, he finally extended his arm. I wrapped the blood pressure cuff around his upper arm, put the stethoscope inside my ears and listened. As I watched the pin slowly drop from 200 mmHg, I noticed that he had severely high blood pressure. I then asked him if he was taking medications for blood pressure. In broken English, he responded that he prescribed himself his own dosages of herbal medicine, and that he just took them whenever he felt like it. Wondering why he didn't just see a doctor and take an antihypertensive that's been tested and proven to be effective, I asked when his last doctor's visit was. His response astounded me. "I have never seen a doctor in my life. I've always taken care of myself, by myself. I just can't afford it."

## Healthcare as a Human Right

There is no doubt that health insurance has always been a problem in the United States. Just five years ago in 2006, for example, there were 43.6 million people uninsured in the United States. To put this figure in context, the total population in the United States was estimated to be roughly 299 million in mid-2006 (U.S. Census Bureau, 2006). Of the estimated 299 million people in the United States in mid-2006, there were 54.5 million Americans uninsured for a portion of the year and 30.7 million having been uninsured for more than a year (Cohen & Martinez, 2006). The number of people uninsured constitutes roughly 15% of the entire population; unfortunately these numbers are just too large, and they are not improving each year. Just how many uninsured families there are and the effect that has on their ability to receive healthcare is astounding.

With the lack of insurance and the inability to gain access to healthcare even if an uninsured patient actively seeks it, we, as a society, can provide our underprivileged community members with only a few options. Humans, like all other animals, are born to survive. The fundamental reason for existence, arguably, is to reproduce and further the existence of our species. As such, we hold the right to take care of ourselves. We hear all the time that the basic necessities of human life include water, food, shelter, and clothing, but what about healthcare? Should we all have the basic human right to healthcare in order to ensure our wellbeing and the sustenance of society's overall health as a whole? Even if we have all of the other basic necessities, what do they mean without good health and the ability to take care of our bodies? We are operating under the premise that we are alive and well in the first place, before we are able to consume the food and water and use the shelter and clothing. If that is the case, then why have some of us been denied that right because of factors outside of our control?

**Knowing the Problem, Not the Solution**

The lack of access to healthcare is not a new concept or issue. We have known for a while that there are others out there who suffer day after day because they can't access needed resources. To date, our society seems to address this issue by providing more services from our current healthcare providers. More services are being provided at low and discounted rates to those less fortunate by various community organizations, clinics, and hospitals. Doctors in private practice, who truly do care about their patients' needs, do take a lower payment in exchange for their usual services. Hospital systems have "charity care expenses" factored into their operating statements, knowing that they will never receive payments from underprivileged patients. Despite these individual efforts, we have yet to see a grand scale movement to the underprivileged without sacrificing the current care and infrastructure in place. We have yet to see different organizations and industries come together to give back to their communities. In fact, over time, it seems that there is an increasing and disparate separation in the healthcare field. Private insurance companies, non-profit and for-profit hospitals, and the government seem to be all working for their own interests, and not together for the betterment of society. In fact, we so often hear about what happens in the "big" companies, what decisions these "big" players make, and how that affects some part of society.

When seeking aid from a government service or a large corporation, which are ubiquitous in the media, the uninsured community members are usually quite hesitant. They normally are not given access to healthcare because of their socioeconomic status, but when they are given access from these organizations, they are usually skeptical. They constantly think there is a "catch" to receiving these services and are afraid of partaking in free government programs. No matter what, they will always believe that there are strings attached to healthcare access, because current society dictates such a limited access to receiving healthcare.

To address these particular concerns, many non-governmental organizations have organized widely publicized free community screenings and health fairs. This movement of humanitarian efforts is certainly a start. However, at these health screenings and fairs, the most that a clinician can do for a patient is to check his vitals, plus a few extra tests, such as cholesterol or lipid levels, urinalysis, and blood glucose. Once a patient knows that he has an abnormality with any of these conditions, they can't do anything about it. To properly follow up for a confirmed diagnosis and treatment, they would need to see a physician, which they would not be able to do since they lack the insurance or needed resources to begin with.

Having founded and incorporated a medical and public health services non-profit organization in New York City, I have had the privilege of organizing and working with other organizations in community health screenings for the underprivileged. Every time I see a patient, screen him, and tell him that he has high blood pressure or an abnormal heart sound, I always get asked the same question. "What can I do?" I really wish I can give him advice or treatment on the spot. However, I can only tell him to see a doctor for further advice because of current state legal restrictions. As screeners, we cannot diagnose or act in the capacity as their providers. We can only tell them their own values as compared to baseline values and send them off on their way. At this point, they usually look back at me, somewhat disappointed, smile, and walk away. I know that they will not follow up. They really can't do anything, which is the reason they came to the free screening. If we were

able to provide some treatment on the spot, we would truly have a greater impact in each patient, and eventually in entire communities.

**Shifting the Focus: a New Societal Paradigm**

Non-profits and other community-based organizations are usually built within the roots of their respective communities. They are founded on the principle of bringing about a social change from an identified need. They know what each individual community needs, as they were established to serve those needs. It seems only sensible that we make use of this already-established model to meet a great societal need. Since these organizations are established with these needs in mind, it would be reasonable to use these groups to work towards better healthcare.

As a society, we need a system that provides better and increased medical care to all members of our communities. The non-profits and community organizations already have the infrastructure in place to do just that. We should individually start to shift the healthcare focus more towards social entrepreneurship with a humanitarian focus, rather than continue with trying to alter the business of healthcare. Doing so allows us to take advantage of the resources we currently have in place and to do more for the people we serve, with a greater focus on improving our quality of care, without focusing on finances. After each individual society defines the best practices within the philanthropic sector, we can then start identifying problems and working together as a whole to correct. However, true meaningful changes occur one step at a time.

In order to fully ensure the viability of this decentralized, yet universal system, the foundation needs to be built first. This foundation may not lie in a centralized government or a federal program, but in the individual communities and the non-profits that support these communities. These community organizations know exactly what specific issues or conditions exist and how to best handle such issues. After these conditions and possible solutions are identified, the next step would be to bring these already working infrastructures together under set standards and regulations within local jurisdictions; then on a state and national level. This will create the first supplementary healthcare system that can be tailored to individual communities, yet powerful enough to be implemented in any large-scale environment. Once this system has been put in practice for a certain period, it may then transition from being only a supplemental system to one that can be a viable aspect built directly within the national healthcare system itself.

After tapping into the non-profit service sector as a base to establish the foundation for greater healthcare access and delivery, how exactly will we begin to take the patient encounters beyond more than just informing them of their conditions at a health screening? Most health-oriented non-profits, community organizations, health centers and hospitals already hold screenings, but there is a limit to what can be done at these screenings. If we are to build a healthcare delivery system by means of using this community-based infrastructure to our advantage, we will need to expand the scope of what we can do at the health screenings.

The natural step would be to start small. We can start with recommending natural remedies. After seeing a patient who has hypertension, for example, we can start by telling him to get more exercise instead of just telling him he has hypertension. I always like to explain to patients I see that they were born to with two legs for locomotion. However, they should take full advantage of the side effect of walking with their

two legs as well – the side effect being better health. Many times, just that little a lifestyle change can add up to a big difference later on in life. If all organizations start together with simple patient recommendations and eventually progress to more treatment options, we can actually make a change in our society. If enough organizations believe in this method, see the value and impact that this will cause, and come together to start extending patient encounters just a few more minutes to make a big difference in a person's life, it will be the norm very soon. Other organizations will see that it works and will be eager to give it a try.

There really is no use in wasting what we already have and not exploiting the full opportunities in our resources. We already have these community organizations performing screenings, we already have medical personnel volunteering or working for these organizations willing and able to see underserved patients. Perhaps it is time to turn the spotlight on a new era of social medicine by focusing on the philanthropic sector. The term philanthropy comes from the Greek word "philanthropos", meaning "loving man". It only makes sense to have something as important as a man's wellbeing be put in the hands of organizations founded to love and embrace mankind. After all, if life is so precious, why are we playing around with it? If time truly is money, why are we wasting it?

**Healthcare Networking and Resourcing**

Transitioning into a new generation of healthcare by focusing on the long-neglected community organizations is a great step to take. Because many organizations do not have enough or sufficient resources and staff to regularly see patients or hold health events, forming partnerships and working together with other organizations is crucial to the success of community programs. Working with organizations sharing a similar mission, focus, industry, or target audience would be mutually beneficial, allowing resources to be pooled together to create a stronger program that can provide the best possible services to the community. This "healthcare networking" is an essential principle at the cornerstone of any community service approach.

The ability to be flexible and expand to meet the needs of specific communities is indispensable, and to smaller organizations, this may be impossible without healthcare networking. The establishment of this principle allows for health screening networks, where organizations currently partaking in screenings can come together to share their staff and resources. In my own non-profit, we hold our own in-house screenings every month. However, we are only able to see so many patients with the limited volunteer staff we have. Therefore, in order to increase our impact in our community, we actively seek other non-profits to partner with and partake in their screenings as well. Our goal is not to replace or compete with these other organizations, but to complement their services and their resources so that we can fill in the gaps of what they can't provide, and in turn, they can fill in the gaps of what we can't provide. As humanitarian organizations seeking to do a greater good for society, we are actively engaged in ensuring that we can help each other grow and become stronger instead of competing with each other. This way, the patient is not forced to choose between services, which ultimately only harms the patient. This very competition is seen today in differing insurance plans, physicians and providers accepting different plans, and discrimination in what types of patients can enroll in what plans. As a result, fewer patients are seen, and more patients are left untreated.

Many times, new organizations do not have the appropriate staff or resources to initiate such a program. Therefore, partner-

ing with other organizations would allow them to share resources across a continuum of different institutions. Creating such healthcare screening networks can help new organizations initiate their own specialized or focused screenings, empowering them with the ability and opportunity to make a difference. In addition, having all available resources at hand, and taking the time to build a resource database for patients is another crucial principle in effectively addressing the needs of a wide range of community members. This "healthcare resourcing" can lead to better communication between both providers and between providers and patients. In my non-profit, we actively practice healthcare resourcing by researching and building our staff, information database, literature, handouts. Once we have built a strong enough resource network, we actively put it to use in health screenings, by giving patients pertinent information to take with them about how to make positive changes in their lives. In addition, we are able to refer patients to other free clinics within the vicinity of their desired locations for follow up care that we don't currently provide. Overall, this practice of healthcare resourcing has been greatly accepted by both the community members we serve and our staff members, who participate in the process.

This new model of healthcare access combining healthcare networking and healthcare resourcing should be implemented to complement each other, in order to establish a strong healthcare system to meet today's needs. Incorporating both these principles requires increasing education on various levels, for providers, administrators, and patients. Providers and administrators should be willing to adjust and integrate effective practices, and patients should have the right to learn about their conditions, what they can do for themselves, and sources of additional resources and assistance.

At the end of the day, if the current system doesn't work, we need to look elsewhere for a solution. There are many neglected and unrecognized opportunities that can be exploited. Non-profits and community organizations have been providing care to our underprivileged community members for decades, but have received little recognition for their efforts. Yet, after all this time and the difficult economic circumstances of today's world, they still continue to serve our society without hesitation. Such determination is what truly drives the success of a large-scale program that impacts every single community member in every community. As such, I truly look forward to the day I can do more than telling a patient at a screening to "see your doctor for more information", and actually help him right there.

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# Medicinal Meditation

Marcus Cimino

Buddhism is widely practiced around the world and is considered a major world religion. Unlike other religions, which are often at odds with scientific knowledge, Buddhism's teachings and practices rarely conflict with science. The practice of meditation represents one of the shared views between traditional Western science and Buddhism. Meditation, an essential component of Buddhism, has been found to have beneficial effects on a person's health. The scientific legitimacy and ancient beliefs about meditation's effects show the strong connection between two seemingly disparate fields.

Meditation is an essential tool used by Buddhists to attain enlightenment. Although meditation is commonly perceived as one defined activity, it varies greatly among different sects, depending on the vehicle (a term used to describe the approach to Buddhism) and specific school of the Buddhist. In Theravadin Buddhism, one of the oldest vehicles, "a mental image is formed... augmented by the mental repetition of its name"[1]. This method has allowed countless individuals to focus solely on the teachings and gain valuable insight into the world. Some Theravadin practitioners also meditate specifically on the Buddha and hold his image in their mind. The sense of identification with him leads to happiness and bliss as well as faith, understanding, mindfulness and merit.[2]

Another vehicle known as the perfection vehicle posits that "wisdom is acquired through meditation on emptiness." [3] This wisdom, along with the other teachings, helps practitioners work their way towards enlightenment[3].

Zen Buddhism (known as Chan Buddhism in China) has yet another approach to meditation. Zen Buddhists use kōans as their subject for meditation. A kōan is "a logical [puzzle] designed to break through the barriers of thought" and "are memorized, recited, analyzed, and expounded on like any other Buddhist text"[4]. By meditating on a kōan, one reveals "a flash of insight" leading one to enlightenment quickly.[5] This differs from Indian and Tibetan schools which rely on a continual process of "reasoned analysis".[6]

These meditation styles appear disparate in the subject that the practitioner meditates on, and how long he or she meditates. When examined, however, one can see they all aim to hone the person's mindfulness through "a series of reflections...sitting in [a] formal posture" so that they may come to understand the true nature of reality. [7] Comparing the vehicles demonstrates that meditation is used in many ways to reach the same goal.

While meditation is utilized in a myriad of ways, there are only a few concepts used in the medical sciences. In some research, the physicians and scientists have described the meditation as mindful. To elucidate this, one can compare the difference between the meditation utilized in this research and that of the Theravadin approach.

When using mindful meditation, "the main component is cultivating awareness, acceptance, non-judgment, and attention to the present moment"[8]. Patients are taught to focus on their physical position and their senses so as to sharpen this "awareness".[8] They will not be explicitly told to derive a Buddhist meaning from this meditative exercise, nor will they be told to concentrate on the Buddha or any other religious figure or object. Another type known as transcendental meditation is also used and varies significantly from the types of meditation described earlier. Here the patient recites a mantra, or phrase, while sitting calmly.[9] Subjects are then surveyed on their level of stress and examined for any physiological changes, such as blood pressure.

In addition to selecting what practices are used, the experimenters must decide on how to apply the use of Buddhism. One possibility is to train the subjects how to do the specified meditation. This was done in one study where college age students were taught how to perform transcendental meditation, and then asked if it affected their perceived level of stress.[10] Another type is a comparative study where people who meditate regularly are compared to people who do not. In one such study, the blood flow patterns of long-term meditators were compared to those who had never practiced meditation.[11] While the aforementioned method demonstrates the ability for improvement for the short run, the comparison method allows those who have never studied to be gauged against those who have done it for a long time. Regardless of the approach to research, significant, beneficial short term and long term effects have been shown to arise from meditating.

In the studies conducted, meditation has been shown to create immediate effects in people. One of these effects is a change in the blood flow patterns of the brain. When examining subjects performing chanting meditation, blood flow increased in the left frontal–temporal region, an area known to be involved in working memory.[12] They also found a deactivation of the subgenual cingulate gyrus, an area known to be related to the feeling of sadness[13]. While the subjects had meditated before, the changes only occurred once meditation was initiated. Other research suggests that a person does not even need to be experienced. In a case study, a woman with a history of hypertension sought advice on how to reduce her blood pressure. Over a 24 hour period, her blood pressure was taken continuously. Results showed that when the patient performed transcendental meditation, the same kind in the previous study, her blood pressure dropped significantly. While meditating, it was 100/65 mm Hg whereas an hour before it was 155/105 mm Hg.[14] Her blood pressure was even lower than when she was asleep, which is when most people's blood pressure is at its lowest. The study briefly mention earlier, which provided college students a seven step training program in transcendental meditation also contained significant findings. The students who meditated regularly for ninety days had decreased blood pressure, and felt less stressed.[15] Despite being a randomized trial and the subjects were not experienced meditators, there were still beneficial effects. These two experiments show meditation has immediate effects; the act itself causes sudden beneficial biological changes.

While the findings from types of short term meditation from above show the benefits, there are even more to be gained from long term meditation. Significant physiological differences occur in a Buddhist's body as they have meditated for years. These differences lead to improved physical and mental well being. In one paper from NueroReport, they examined Buddhists practicing the Dzogchen tradition of Tibetan Buddhism using high-resolution MRI scans

and compared them to non-Buddhists who do not meditate. Their findings showed that in the people who meditate, multiple areas of the brain had denser gray matter. Particularly, specific areas in the medulla oblongata were denser then the non meditating counterparts [16]. According to the paper, these areas correspond to the process of stressful situations and retrieval of memories. With these results and reports from Buddhists that describe having "increased resistance to stressful stimuli, increased attentional skills, and the increased sense of calmness" a strong connection appears between meditation and its therapeutic effects.[16] Another long-term effect from meditation is an increased pain threshold. When subjected to painful stimuli, Zen Buddhists require a stronger signal than non-meditators before they requested removal of the stimuli. [17] These findings were correlated with fMRI scans of the subject's brains, and it revealed that the pain centers in those of the Zen Buddhists were less active. A third notable study conducted at Columbia University, College of Physicians and Surgeons, has found that meditation, in conjunction with a healthy diet can increase one's lifespan.[18] The findings from these research articles show that regular meditation substantially improves long-term health and quality of life.

Medical research is slowly coming to the same conclusion Buddhism came to long ago; meditating is beneficial. Although the forms of measurement are different, both view meditation as a means to reduce suffering. In the randomized trial of college students, the meditators had lowered blood pressure and reduced stress. From a Buddhist's perspective, this would be seen as letting go of unnecessary desires, aversions and becoming "disenchanted with the things of the world."[19] The use of meditation may allow students to realize it is not necessary to be the best in their class and that they do not need to go the most prestigious law school or medical school. This decreases the pressure put on these students, which eliminates the physical suffering by lowering blood pressure and the stress incurred by not getting the grades or acceptance letters one desires. While only scientists measure stress through a survey and a blood pressure cuff, the shared goal of reducing suffering is still achieved. Another way to view this is through the altered interpretation of pain due to meditation. Pain is relative, so if one can distance oneself from the experience of pain, it becomes more manageable. Medical research shows that through meditation, the pain centers of the brain have become less active in Zen Buddhists when compared to their non-Buddhist counterparts.[20] In Buddhism, pain is interpreted as merely a transitory feeling and meditators become "increasingly aware of [its] impermanence."[19] For medical practitioners, this is helpful because it makes pain management easier for patients. At the same time, it allows Buddhists to further their practice because as they view pain as an impermanent thing, the pain centers of the brain desensitize which would strengthen one's resolve to practice Buddhism. In addition to decreasing pain and suffering, there is also a focus on the quality of life. This is usually described as the happiness a person feels. Through meditating over happiness, one discovers it is not for sale. Matthieu Ricard, once a cell biologist and now a Buddhist, as well as the Dalai Lama's French interpreter, describes what happiness is best:

> Happiness is a way of being rather than an endless search for experiences. Pleasure is fine but depends on things that are subject to change: people, places, things… But happiness is a more durable state. It's a cluster of basic human qualities that nurture a state of fulfillment, flourishing, of appreciating your life. It's

> inner freedom, inner strength, inner peace.[21]

By understanding happiness through this lens, Buddhists nourish an "inner peace" which allows them to have a mindset which improves their quality of life.[21] The findings from all the research presented here show that meditating can have beneficial effects which coincide with the ideas and belief system of Buddhism. However, while the correlation is strong, questions arise when examining mediation's role in medicine and science.

Despite the strong parallels between the purposes for the use of meditation in Buddhism and Medicine, it is still perceived as an exotic alternative. This is not due to lack of evidence for the beneficial effects of meditation, but rather to the way information has been collected. The nature of the research so far has not enabled the scientific and medical communities to fully embrace the benefits of meditating. A paper from The Journal of Alternative and Complementary Medicine elucidates this fact: "What is needed is a model, a better understanding of mechanisms of action, and better designed and larger studies."[22] Since there are numerous approaches to meditation, and each researcher has approached it in his or her own way, the data collected by studies becomes difficult to quantify when comparing studies. Additionally, the format of contemporary research makes it difficult to defend hypotheses. Matthieu Ricard describes this difficulty arising from the "entrenched belief[s]" that prevent scientists from accepting the "concept of levels of consciousness"[23]. It is hard for scientists to accept the purported benefits when the methods to test it are not yet perfected. Specifically, there has not been a way to make sure people in an experiment are meditating the same way. Without empirical evidence, physicians will likely be hesitant to recommend it as a method of treatment. As time progresses however, evidence from the accounts of those who do meditate gain credence. Accepting that some aspects of meditation cannot be measured in the same way as a drug or procedure, "scientists are beginning to be more flexible in their attitude toward the firsthand investigation of consciousness."[24] The current approach to research is not compatible with Buddhism because the perspective and methods of researchers is not equipped to examine the beliefs and practices such as meditation, which can vary greatly between people. For now, more research should be done in a structured way so that a coherent image of meditation's effects is visible. Two possible research approaches have yet to be attempted by the scientific community could give data that is acceptable. First, twin studies could be conducted where one sibling meditates (either specifically for the study or who has been meditating for many years) and the other does not. This would limit uncontrolled variables because the two subjects would have similar, if not identical brain chemistry. The other is a longitudinal study. This would compare the health of people over a long time span and examine the effect of meditation. As research approaches improve, meditation will become accepted not only in the scientific community, but also in the general population. Through understanding the biological phenomena, further discoveries will be made and the mutual goal to end suffering can be achieved.

Like other religions, there are numerous ways to practice Buddhism, and this is seen through the myriad of ways to meditate. Unlike other religions however, there has been consistent evidence linking meditation and medicine. Buddhism is somewhere in between the realms of science and religion. It is a "contemplative science" and meditation is the "key component. [25] Through understanding this world, positive physiological effects occur immediately, as

well as in the long term. As Buddhists eliminate suffering from their lives, their bodies abide automatically. Physicians also aim to eliminate suffering through treatments and cures. Unfortunately, the different methods have made it difficult for medicine to integrate. As long as people are cognizant that both Buddhism and Medicine aim to eliminate suffering and maximize the intangible happiness in everyone, efforts will be made to combine the two for the benefit of everyone.

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# Exploring Factors Responsible for Cancer Stem Cell Formation

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Cancer is one of the most common diseases plaguing today's population. Millions of people around the world are diagnosed with cancer and die as a result. Fortunately, that number is decreasing due to increased medical understanding about the mechanism behind tumorigenesis and metastasis. Using DNA sequencing in bioinformatics, model systems such as mice, and stem cell research, we are enriching the practice of cancer chemotherapy and other treatments. The use of stem cell cultures from different sources has led to proposed treatments to diseases such as leukemia, lymphoma, and other cancers. Although extensive progress has been made in the field of cancer research, there are still obstacles to overcome. This paper discusses factors that induce differentiated cells to become cancer stem cells in vivo, or in a live organism.

A cancerous tumor is a disease which is caused by errors along a cell cycle pathway, which in cells that disobey inhibition factors and apoptosis, or controlled cell death, causing them to infinitely divide. There are two types of tumors. One type is a well-differentiated tumor, which cannot be deciphered from the cell of origin (Yan et al, 1591). This form of tumor is detectable as the cells form homogenous tissues, which can be compared to a similar tissue in body. Most non-malignant tumors are well-differentiated and easy to treat through chemotherapy. On the other hand, poorly-differentiated tumors have properties similar to those of embryonic stem cells. They differentiate as they grow, and the higher the number of differentiated cancer cells in a tissue, the easier it is to analyze tumorigenesis, or tumor growth. This means that at larger sizes, embryonic stem cell-like cancer cells are more visible for histopathological investigation (Ben-Porath et al, 501). Partially-differentiated tumors contain triploblastic tissues, which generate all three germ layers, such as nerves, epithelial blood vessels, and muscles. As a "heterogeneous population of cells," cancer stem cells are lethal and malignant, and can metastasize more quickly than normal somatic ones (Fillmore et al, 21737; Ben-Porath et al, 502).

Stem cells have the capacity to divide indefinitely, form daughter cells, and differentiate into one or many types of tissues (Campbell et al, 415). For a cell to be characterized as a stem cell, at least one of two daughter cells reproduced by mitotic division must remain totipotent, or be able to form any cell types. The ability to form tissues of various functions is important for cellular processes, such as immune defense, nutrient exchange, and transport of micromaterials, which are major components of homeostasis. Homeostasis is the process by which an organism maintains certain sets of conditions to survive and reproduce. Organismal and cellular metabolic processes are regulated by integration centers known as the pon, medulla, and hypothalamus in the human brain. Sensors in various locations in the system detect stimuli, an outcome of altering homeostatic set points in the body. The sensors relay the signals to integration centers, which in turn influences effectors

such as muscles to mediate a behavioral response. Stem cells are essential for many metabolic activities, and an imbalance in homeostasis can result in disease.

One property of stem cells is plasticity (Ben-Porath et al, 499), which is the ability to differentiate into many types of cells. Plasticity can be initiated by genetic and epigenetic factors such as pluripotent factors and regulatory hormones (Doi et al, 1350). Pluripotent factors are molecules, which are capable of creating and maintaining a cell's fate by tampering with default states of genes.The internal and external environments influence the function of a cell by modifying genetic expression. Genetic regulation at the transcription and translation levels can affect gene activations and products, which determines the type that a cell would become after deactivated genes are switched on (Ben-Porath et al, 504).

In stem cell cultures, regulatory genes that code for pluripotent factors are inoculated in vitro (in a test tube) into tissues containing differentiated cells. Through a series of pathways, these regulatory factors enter the genome and change which genes are activated, which in most cases is greater than five hundred (Kim et al, 313). In addition, factors within the genome such as DNA repair, signal transduction errors, and chromosomal translocation may act independently of signals from extracellular environments (Riggi et al, 917). The genome contains repair kits such as polymerases and nucleases to repair DNA coding errors or epigenetic mutations, but errors during the repair process may result in irreparable damage. Also, if an error occurs during one of the signaling pathways in a cell, resulting in a hyperactive protein, excess products of such pathway can drastically alter genomic activities of a cell.

There are several ways of regulating genetic expressions. Chromatin modification through DNA methylation (Doi et al, 1350), acetylation (Hemberger et al, 598), and phosphorylation, can predetermine the function of a cell. Acetylation or deacetylation of histones by regulating the presence of acetate in histone tails de-condenses chromatin structure, which controls whether or not genes are transcribed. Phosphorylation performs the same function as acetylation by unwinding histones around DNA to allow transcription factors to bind and initiate gene transcription. However, DNA methylation can both condense and de-condense chromatin depending on its location and receptors in the genome. Histone modification is not applicable to the whole genome as some genes are activated whereas others are not.

The process of acetylation, methylation, and phosphorylation is specific to a gene or sets of genes. The type of gene(s) that would be (de)condensed are targeted by the presence of complex factors, which recruits enzymes such as acetylases, phosphatases, and methylases, to the loci that require genetic regulation. In other words, stem cells play major roles in controlling a cell's fate by controlling genetic modification at the chromatin level.

Another property of stem cells is self-renewal. The ability of a cell to reproduce itself to an earlier point in time when it is pluripotent is important for the maintenance and reproduction of microcellular molecules, which are required for metabolism. Although a cell with totipotent characteristics cannot work by itself without depending on assistance from others, it can code for the production of cells that would differentiate and supply the missing materials such as blood vessels to transport wastes and nutrients, cell junctions and hormones to communicate with neighboring cells, and so forth. In addition, differentiation to other types of cells with different functions is a gradual process. A cell loses the potential to infinitely differentiate along each line of mitotic division (Bethesda, II). The number of

divisions that a cell would make in its lifetime is destined by the telomere ending of the chromosomes in the nucleus. For every DNA replication rounds, there is an infinitesimal chance of base mutation (Neum et al, 2676) which may not be deleterious but will accumulate per rounds of replication. As each round progresses, nucleases degrade the mutated region of chromosomes, leaving no template for polymerases to synthesize the nascent DNA version of the mutated bases. As a result, the chromosome becomes shorter, and the number of genes to code for the survival of a cell decreases, which leads to apoptosis or cell death When a cell that cannot renew itself dies, body processes, which are important for survival and reproduction will be detrimentally affected.

However, the questions that would be asked are: Should there be a limit to self-renewal and differentiation, and should some cells exhibit pluripotency whereas others are disallowed? Most artificial and natural processes in life have limits. Processes at the cellular level occur when needed, and are controlled by microfactors, which receives stimuli from the cell's environment and respond by stimulating or inhibiting gene products and transcription factors. The presence of specific protein complexes around a gene can surmises a type of genetic expression. When a process occurs without being switched on by the appropriate mechanism prefabricates products beyond the set point of the cell system, it may have dangerous effects for an organism. Constant self-renewal and plasticity can consume nutrients and spaces must be available for other cells. The extracelluar environments release density-inhibition factors, which warn and control dividing cells, but a defect in signaling may cause over-renewal and differentiation. Therefore, through homeostasis, the number of times that a cell would divide before senescence [death] is destined.

Proliferation is the major property of stem cells that accounts for the behaviors of immune cells and red blood cells. Immune cells are always dividing to ensure the protection of the human system as the body is exposed to pathogens and lethal molecules. Humans need an adequate number of hemoglobins to transport oxygen to and from tissues to perform aerobic respiration to power microcellular activities. Proliferation is the number of times that a cell can replicate and born daughter cells (Bethesda, II). Two daughter cells born of the same mother by mitosis may perform distinct functions if there is an unequal distribution in the cytoplasmic and DNA contents inherited (Neum et al, 2675). An incongruent willing of a portion of genome may result in protein products, which perform a function in one sister cell that is absent in the other. Thus, asymmetric division can account for the sudden (Neum et al, 2676) transformation of a proto-oncogene to an oncogene.

Asymmetric division affects cell size and thereby affects cell shape (Ibid 2677) as shown in Fig.1. The location of the cleavage furrow in a cell undergoing mitosis influences the outlook and mass of the daughter cells. Unequal division during telophase is accomplished by regulatory proteins such as the αPKC, which is Par protein complex (Ibid, 2679). At metaphase of mitosis, astral microtubule polymerizes and attaches to the kinetochore of the sister chromosomes along the metaphase plate. Polymerization of microtubule fibers is generated by attractive forces at the anterior and posterior region of the cell - higher at the posterior end (Neum et al, 2677). Dynein proteins, which are powered by ATP, bind and walk along the positive end of the spindle fibers, depolymerizing them towards the negative region (Neum et al, 2678). A spindle formation in the center of the dividing cytoplasm would result in an equal distribution, but an unequal allocation at any other region. Also, asymmetric

division can be a continuous process in the case of an incongruent distribution of centrosomes, resulting in aneuploidy and an increase in the potential of a cell to infinitely divide and born other abnormal daughter cells. Therefore, by determining the location of the astral fibers in a mitotic cell, Par protein complex accounts for differences in cell size, shape, and behavior of a cell [cancer stem cell].

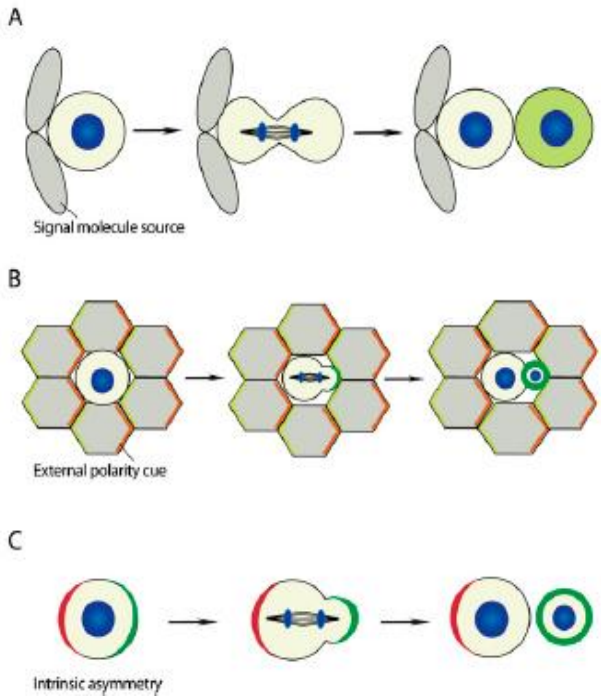


**Figure 1: (A) Signaling cue can initiate unequal distribution, though the division is symmetrical. (B) External factors can cause asymmetric division. (C)Intrinsic factors such as molecules released in a cell can also cause asymmetry (Neum et al, 2676).**

There are different types of stem cells: embryonic, adult, induced pluripotent, hematopoietic, and cancer initiating stem cells. Embryonic stem cells [ESCs] are multipotent cells with frequent expression of methylated genes (Hemberger et al, 598-99). They can be extracted during the blastocyst stage of the embryonic period. As the embryo matures, ESCs migrate from the placenta, spleen, liver, to the bone marrow to become adult stem cells (Bethesda). Adult SCs are found among fully differentiated somatic cells. They may be found in the communities of non-stem cells or in isolation in a region of the body such as the brain, stomach, and bone marrows. Hematopoietic cells (HSC), a type of adult SCs, codes for blood and immune cells renewal (Bethesda). They can form precursors, such as lymphoid, myeloid, and undifferentiated daughter cells. Lymphoid cells codes for lymphocytes [immune cells], which further differentiates into B and T cells. The myeloid cells, however, code for many progenitors and precursors (Bethesda), such as macrophages, blood platelets, and red blood cells (Campbell et al, 913-14). On the other side, iP (induced pluripotent cells) and CSC (cancer stem cells) are influenced by a similar principle, which is to exhibit characteristics of ESCs (embryonic stem cells) (Bethesda, VI). The presence of induced pluripotent stem cells accounts for the malignancy of most tumors.

There are several factors that can cause tumorigenesis. A cause of tumor can be epigenetic (Doi et al, 471), which influence changes at the cellular level. Epigenome are modifications to genetic expression without any change in genetic sequence (Hemberger et al, 598). A mutation or silencing of tumor suppressor genes such as p53, p21, and INK4A/ARF locus, by extrinsic factors such as a bacteria, virus, an overexpression of oncogenes, can cause cancer. According to Yap et al, ANRIL, a noncoding RNA [ncRNA], can facilitate the repression of INK4A/ARF genes by recruiting the Polycomb Repressive Complex [PRC]. PRC is categorized into PRC1 and PRC2. PRC2 contains minor transcription factors, which are mostly proteins that are encoded by regulatory genes, such as EZH2, methyltransferase, Suz12, and EED, and functions in “trimethylating” (Yap et al, 662) tumor suppressor genes. PRC1 is also a protein complex and includes CBX7, a protein famous for its interaction with ANRIL to control

genetic expression, but PRC1 functions by keeping chromatin structures in a condensed state. The histone methyltransferases in the PRC imprints INK4A/ARF genes by condensing chromatin region around the genes loci. In addition, there is an inverse correlation in DNA methylation in cancer and normal cells (Doi et al, 1352). An increase in methylation in cancer stem cells is followed by corresponding decrease in normal cells with the converse true as well, which means that the transcription start loci overlaps in normal and poorly-differentiated stem cells (Doi et al, 1353).

Tumor cells can also be formed by the transformation of differentiated somatic cells into cancer stem cells. By coercing the genome to discharge hOCT4, hSOX2, hFOXP2, Lin28, and other transcription factors, normal cells may be reprogrammed to form stem-cell-like tumors (Ezashi et al, 10993-94). During lysogeny, a provirus can accidentally mutate loci that enforce the silencing [deactivation] of master regulatory genes that code for the former transcription protein complex. As a result, the presence of the regulatory factors, most especially OCT4 and SOX2, is superfluous enough to convert a somatic cell to an embryonic stem cell. Although embryonic stem cells do not encode an apparent danger, a lack of differentiation and plasticity regulation can cause the accumulation of actively dividing stem cells that will ignore growth regulatory factors such as cell-cell inhibition and cell-cycle traffic signals. At this cellular stage, a cell is characterized as malignant with the ability to spread from its point of origin to other tissue locations, forming a poorly-differentiated tissue.

Integrin can also interact with other complexes to promote carcinoma as shown in Fig.2. Teratomas are "benign tumors" (Block et al, 265) or carcinoma that forms poorly-differentiated cancer stem cells, in vitro, with inoculation of ES cells into experimental models. Integrin play a major role in causing cancer if a gene that encodes it is mutated. As a member of membrane surface proteins, integrin is categorized into α and β types and facilitates communicative pathway among cells, most especially ES cells and their environments. The location and degree of socialization within the integrin community decides "cell's shape, motility, survival" (Block et al, 265) and reproduction. Upon signal reception, integrin facilitates cascades of phosphorylation that activates pathways enzymes such as the decomposition of $PIP_2$ into DAG and $IP_3$[Inositol Triphosphate] (Bloch 265-67), which binds to membranes of ER [Endoplasmic Reticulum] and other calcium storing organelles releasing $Ca^{+2}$ ions into the cell. Therefore, if a surface protein such as integrin does not pass stop signals that activate phosphatases, , a cell may continue to overexpress a process that may initiate tumor formation with sufficient concentration.

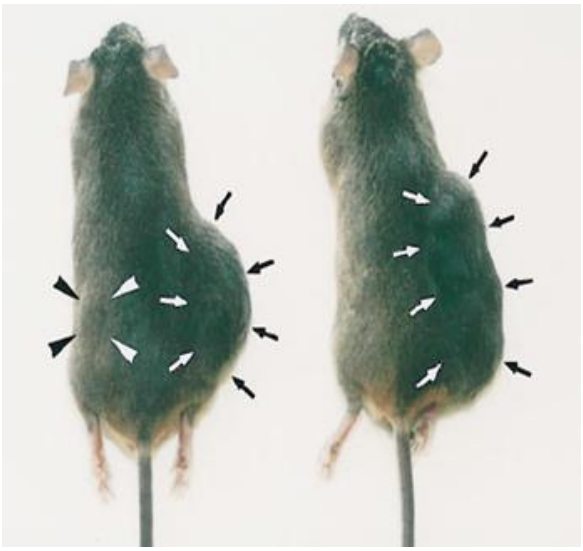

**Figure 2: Comparison of mice with and without Integrin, most especially the αvβ3 present. Starting from the left to right, are tumor tissues with and without presence of integrin respectively. (Bloch et al, 267)**

Integrin initiate tumorigenesis by controlling angiogenesis. The survival, reproduction, and migration of carcinoma are highly depended on a constant supply of nutrients (Bloch et al, 266), which is processed

by the circulatory system. An increase in the rate of proliferation and metastasis surmise an increase volume in blood demand. Angiogenesis is the generation of blood vessels in the body to meet metabolic demand (Li et al). The blood vessels are generated by hematopoietic stem cells, and as pluripotent cells, code for all the components of the blood tissue including the erythrocytes, squamous epithelial cell that lines the inner layer of the vessel, plasma, and so forth. Tumors, most especially poorly-differentiated stem cells affect blood flow by initiating a self-induced angiogenesis. In an experiment involving αvβ3, a type of integrin, angiogenesis was halted as a result of apoptosis of endothelial tissues, which encodes the rooting blood vessels (Bloch et al, 268-75). As a result of the death of the endothelial tissues, and consequently the absence of blood vessels to supply nutrient and locomotion, poorly-differentiated cancer cells could not divide and migrate to other tissues This research shows that cancer cells containing integrin have increased angiogenesis, whereas cells with a mutated and functionless integrin show reduced or no angiogenesis. Therefore, the absence of integrin disconnect cancer stem cells from the ECM [Extracellular Matrix Environment], which contains growth nutrients and essential protein factors, but a functional mutated version can promote onset of teratoma.

As stated, integrin socialization affects "cell shape" (Bloch et al, 265). Neum et al in another paper also discovered that asymmetric division influences cell-shape and sizes. These two ideas show a correlation between the function of integrin, asymmetric distribution, and initiating factor for cancer stem cell. Stem cells are responsible for maintaining and initiating tumors, as already mentioned (Neum et al, 2690). Many genetic regulators of cell shape and sizes after cytokinesis also work as tumor suppressor. Tumor formation starts with a cell cycle congestion possibly due to aneuploidy, a condition, in which a cell contains extra chromosomes due to mitotic error. Chromosomal aberrations resulting in centrosome disjunction can be caused by asymmetric distribution of centrosomes to daughter cells, which may make one to have more beyond normal. An excess number of centrosomes in a cell may cause misalignment of astral microtubule fibers at the spindle poles (Neum et al, 2692). A disorientation of spindle fibers, most especially of their attachment to the kinetochores of chromosomes during metaphase may result in an anomalous cell composition, thus producing a cell that would not follow cell-cycle signals. From another perspective, "defects in asymmetric division" (Neum et al, 2691) can result in more or less cytoplasmic composition beyond the set point, which is needed to control proliferation, resulting in carcinoma formation.

Stem cell research has changed our perspective of tumorigensis. Research with ES cells offers tremendous hopes. It can prevent limitations and aberrations associated with somatic cells and can serve as simple research models for studying diseases, thereby reducing the number of model organisms used for experimentation (Ezashi et al, 10995). In addition, embryonic stem cells have more advantages than both the current and prospective model systems. The cell lines are reusable over time as long as conditions are maintained, whereas primary human or model animal's tissues are discarded after trials (Yeung et al, 8). Also, the type of tissues to be formed and, consequently, to be used are fully controlled, which prevents systematic errors such as stroma contamination in tissue environments (Yeung et al, 8); in other words, stem cells offers for precise recording of data. This paper discussed factors that induce differentiated cells, in vivo, to be pluripotent, which also applies to cancer stem cells.

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# The Spotlight Effect: Embarrassment as a Psychological Phenomenon

Alisa Liu

Imagine this scenario: you're ten minutes late for Chemistry lab. You rush through the doors and apologize profusely to the TA as you throw your things on the table. Suddenly, as you turn to help your lab partner, you accidentally knock over a test tube. It slowly falls to the floor, and you cringe as the tube loudly shatters into pieces. *Everybody* is looking at you. You feel your face and neck heat up as an inevitable blush creeps across your face. The TA grabs a dustpan and sweeps up the pieces and everyone turns back to their work. Yet, you feel embarrassed and clumsy for the rest of lab. What if everyone who witnessed the accident thinks you're a klutz? What if they go back to their dorms and tell their friends what happened? What if no one wants to be your lab partner next semester?

In reality, hardly anyone cares. Even the people who noticed the accident will forget about it in a few minutes. If the same thing happened to someone else, you would have easily forgotten about it, but since it happened to you, the situation seems much worse than it actually is. We as individuals are chronically unable to accurately judge the way others see us. At Cornell University, Thomas Gilovich, Victoria Husted Medvec, and Kenneth Savitsky studied the tendency to overestimate others' reactions. In their research paper, "The Spotlight Effect in Social Judgment: An Egocentric Bias in Estimates of the Salience of One's Own Actions and Appearance," they compile the results of a series of studies that prove people "overestimate the extent to which their actions and appearance are noted by others" (Gilovich et al 2000).

The initial experiment required the volunteers to put on an embarrassing T-shirt and then enter a crowded room. Afterwards, they were asked to predict the number of people in the room that thought the shirt was embarrassing. The participants' predictions of the number of people who noticed the shirt were twice as high as the actual number. The tendency of an individual to overanalyze what others think of is called the "spotlight effect" (Ibid).

Researchers concluded that individuals who are conscious of their actions or appearance are more likely to overestimate what others think of them, whereas individuals who are less focused on themselves are less likely to feel like they are in the "spotlight" (Ibid). These results raise some new questions about the nature of embarrassment. Is it caused by external social interaction, in which one's peers are actually making judgments? Or does embarrassment only stem from an individual's inability to correctly gauge what others think of him? In other words, is embarrassment a physiological response to a mental phenomenon, or does it actually exist outside of the conscious realm?

In his novel, *The Psychology of Embarrassment*, Robert J. Edelmann claims that embarrassment is a combination of internal and external factors, and supports this claim by compiling evidence from a few research papers. He defines embarrassment as the sinking feeling that occurs when "an un-

desirable event" causes "a perceived discrepancy between one's current unintended self-presentation and one's desired self-presentation" (qtd. in Asendorpf 93). This self-presentation, or "identity," is an internal, mental "theory" of "how one is and should be perceived, regarded, and treated in social life" (qtd. in Schlenker 104). In other words, each person has his own ideal self-presentation. When something happens that causes others to view him in a way that deviates from his ideal self-presentation, he may feel embarrassed. For example, if a runner who wants to be viewed as "athletic" tripped over a hurdle, he would be embarrassed because the people who saw him trip might think he is "unathletic." But once again, chances are that no one saw him.

The study done at Cornell proved that people overanalyze how people will change their opinions of them after a potentially embarrassing situation happens. The participants predicted that more people were judging them for wearing the embarrassing T-shirt than actually were, they felt like they were under the "spotlight." The study proves that embarrassment is mental, but Edelmann acknowledges that social interactions also play a very important role.

Embarrassment can also be caused by visible physiological responses to an unintended situation that others can see and comment on. Edelmann summarizes the affect of physical changes on degree of embarrassment with two statements:

1. The outward sign of embarrassment can cause embarrassment to be experienced even in the absence of an external eliciting stimuli
2. The presence of nonverbal signs of embarrassment can intensify the feelings of embarrassment (94)

For example, if the runner started blushing profusely after falling, his peers would recognize what happened as an "embarrassing situation." And if they pointed this out to him, he would feel even more uncomfortable. Edelmann reported that the highest frequency (#/100) physiological responses to embarrassment were increased temperature (blush 52; heat 17), faster heartbeat (35), muscle tension (21), and avoidance of eye contact (44) (Edelmann 86). When others notice these physical changes, they can contribute more to the feeling of embarrassment than the actual event. Therefore, embarrassment is both a mental and a social phenomenon. If one of the participants in the Cornell study began to blush, more people may have noticed his shirt and his feelings of embarrassment would have intensified.

Most people can easily brush off an embarrassing situation. But for socially anxious people, embarrassment is what they've always feared. Social anxiety is defined as "the fear and anxiety of being judged and evaluated negatively by other people, leading to feelings of inadequacy, embarrassment, humiliation, and depression" (Richards 1997). Embarrassment, for the socially anxious, is more than a deviation from the ideal self-presentation; it leads to loss of self-worth and depression. But understanding embarrassment can greatly improve treatment. The best treatment for social anxiety disorder is cognitive-behavioral therapy. It is "gentle, challenging, and works by hierarchy." In addition to listening to audio recordings, the patient must also practice the techniques they have learned in actual social situations. Two of the goals of cognitive-behavioral therapy are "calming down in social situations and remain in control" and "stopping automatic negative thoughts" (Richards 1996). By addressing both the mental and social aspects of embarrassment, cognitive-behavioral therapy helps many socially anxious people overcome their fears.

Even people who are not diagnosed with social anxiety disorder can be exposed to the discomfort of embarrassment, and the

unprecedented situations that inevitably come with everyday life can be dealt with by remembering a few things. Martha Beck, in her online article "The Cure for Self-Consciousness," suggests that her readers remember three tips:

1. Double everything: "Small gestures look embarrassed, so they're embarrassing. If you're going to do something, and you don't want to look foolish, do it big."
2. Act as if no one is watching: Act as if you don't care about what others think, because they are never watching you as closely as you think they are. That way, you can overcome the limitations of possibly embarrassing situations that only exist in your head.
3. Ask the universal question: Whenever you are about to stop yourself from doing, ask "So?" It is important to not dwell upon what others think since most of the time, they don't even care.

Embarrassment is a mental experience that is intensified by social factors when it causes a physical change in a person's appearance. Even then, it is important to remember that people are rarely as judgmental as perceived. Gilovich, Medvec, and Savitsky found that when thrown into a potentially embarrassing situation, subjects overestimate that twice as many people notice them as the number of people who actually do. The spotlight effect exists in the mind, so by changing the way we think, we can alleviate the anxiety that unexpected situations may bring us.


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# Non-Heroin Narcotics: Why Teens Are Looking in the Medicine Cabinet To Get High

Allison Maidman

## Introduction

The phrase "non-heroin narcotic" has had an increasing presence in the news in recent years. This term refers to prescription painkillers, which are considered to have a high risk for abuse and dependence. The drugs most commonly associated within this group are oxycodone and hydrocodone, the main active ingredients in OxyContin, Percocet, and Vicodin. In the United States, abuse of these drugs has steadily increased, especially in adolescents. Thus, the recreational use of these medications is a major concern in contemporary health issues.

## Trends

Since 1991 there has been an increase in non-heroin narcotic abuse among adolescents. Monitoring the future, an annual report by the University of Michigan, has documented an increase in annual prevalence of 5.7% in 12th graders, 4.9% in college students, and 5.9% in young adults. These numbers reflect the increased percentage of individuals who use the drug recreationally each year, as well as those who have used the drug at any point during their life. In 2009 the numbers were much different: 9.2% of 12th graders, 7.6% of college students, and 8.4% of young adults who used non-heroin narcotics that year.[1] These numbers are alarming and have served as the motivation for more extensive research to be conducted.

## Speculation about Causes

The increase of non-heroin narcotic drug abuse has often been linked to their easy accessibility. Demand for these drugs is high and, consequently, drug companies have been increasing production of these substances by millions of doses.[2] This has created an abundance of pills in the market ripe for distribution. Many adolescents do not obtain these drugs through theft or illegal purchase. Most often, adolescents are able get a hold of non-heroin narcotics from the prescriptions of parents or friends. According to one study, more than 60% of teens noted that these pain relievers were easy to find in parents' medicine cabinets. Additionally, 50% said they could even obtain them through other people's prescriptions.[3] Many adolescents can get these medications from their own home, which makes the acquisition of these drugs much easier than that of other drugs.

Another important issue in the recent increase in non-heroin narcotic abuse is the illusion of safety that emanates from them. Many adolescents have learned the dangers of common illegal substances and understand the risks associated with their abuse. Since non-heroin narcotics are prescription medications, many believe that there is some inherent safety in using these drugs. There is a "perception among youths that pills are safe because they are 'medicine'" and do not

carry the same risks that street drugs do.[4] The survey statistics supporting this idea are quite frightening: 40% believe that prescription medications are "much safer" than illegal drugs and almost 30% of teens believe non-heroin narcotics are not addictive. Even more surprising is that both of these statistics are relevant even if a doctor does not prescribe the medication.[5] These beliefs indicate that there is some disconnect between what researchers have found and what adolescents understand about these drugs.

**Prevention**

Since many adolescents lack information concerning the use of non-heroin narcotics, there are a variety of preventative steps that can be implemented. First, adolescents should be educated about these drugs so that they are informed of the risks. But it is not just information that is important in preventing abuse; it has been shown that "combining information with skills, methods, and services produces more effective results" [6] Thus information must be presented along with tactics in which adolescents can learn to cope with pressures they may face regarding drug use. Programs that focus on social and academic skills, self-control, and the enhancement of peer relationships have shown positive results. It is also important to correct the common misconception that a large number of peers are using drugs.[7] Although there has been an increase in use, adolescents must recognize that most students are not abusing non-heroin narcotics. In addition to these items, it has also been shown that using multiple successful programs "can be even more effective than a single program alone." [8] Therefore it is advantageous to create multiple areas, such as the school, home, or other community organizations, that utilize these effective measures to prevent drug abuse in adolescents.

**Concluding Remarks**

There has been an increase of 5.5% in adolescents in 12th grade or above using non-heroin narcotics without a legitimate prescription since 1991. Such an increase has been associated with availability and ease of access, most commonly from friends or from a parent's medicine cabinet. The ease of obtaining non-heroin narcotics along with the illusion of safety in using a prescription medication have created a very dangerous condition. To prevent this adolescent drug abuse, preventative measures should be taken in multiple settings in the adolescent's life. It has been proven most effective that when adolescents are not only taught about the dangers of non-heroine narcotic abuse, but are also given preventative tactics, abuse is much less likely.

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# Chemotherapy: A Good or Bad Treatment Option?

Youngho Park

Chemotherapy is a method of treating cancerous disease by destroying the cancer cells. Chemotherapy, however, also includes the use of antibiotics or other medications to treat any disease. Chemotherapy is one of three main treatment protocols of conventional medicine, which millions have been prescribed. Unfortunately, some of us know someone who suffered and finally passed on after a futile course of chemotherapy prescribed by his or her doctor. In fact, a recent study in Britain has raised serious questions about chemotherapy lately. The questions were particularly about the role it plays in hastening and even causing the death of late-stage cancer sufferers. Some would even say chemotherapy must surely have caused or hastened more than a quarter of the deaths. After all, chemotherapy is a severely toxic treatment method, and a person's body has to be strong enough to withstand it. Therefore, it would be essential for patients to know and understand the process of chemotherapy thoroughly as well as be cognizant of the side effects when it comes time for patients to decide if this therapy is right for them. I believe that one can avoid chemotherapy if they follow regular routine every day.

A course of chemotherapy may just be a one-day treatment or it can last for a few weeks or months or even years. The length of chemotherapy treatment is determined by a variety of factors. These factors include the type of cancer, the extent of cancer, the types of drugs that are given as well as the expected toxicities of the drugs and the amount of time necessary to recover from these toxicities (McCarron). Many chemotherapy treatment schedules, including the type and length of chemotherapy treatment, have been determined through clinical trials that compare them and determine which had the most benefit and was most well tolerated.

Normally, cells live, grow, and reproduce in a predictable way. Cancer occurs when certain cells in the body keep dividing and forming more cells without the ability to stop this process. Cancerous tumors are characterized by cell division, which is no longer controlled as it is in normal tissue. "Normal" cells stop dividing when they come into contact with like cells, a mechanism known as contact inhibition. Cancerous cells lose this ability. In other words, cancer cells no longer have the normal checks and balances in place that control and limit cell division. The process of cell division, whether normal or cancerous cells, is through the cell cycle. The cell cycle goes from the resting phase, through active growing phases, and then to mitosis (division). Chemotherapy involves destroying cancer cells by keeping somatic cells from further multiplying. Unfortunately, in the process of undergoing chemotherapy protocols, healthy cells can also be affected, especially those that naturally should divide quickly. Chemotherapy protocols strive to maximize the elimination of cancer cells while minimizing the negative effects that these protocols have

on healthy cells. Yet, chemotherapy does more good than harm otherwise it would not exist as a treatment. Much progress in developing successful chemotherapy protocols has been made, including the identification of many different types of cancer and the corresponding development of effective chemotherapy protocol solutions. But there is still much work to be done (Medical News Today).

The key to the functionality of chemotherapy is the ability of chemotherapy to kill cancer cells. Usually, cancer drugs work by damaging the RNA or DNA that tells the cell how to copy itself in division. If the cancer cells are unable to divide, they die. The faster that cancer cells divide, the more likely it is that chemotherapy will kill the cells, causing the tumor to shrink. They also induce cell suicide (self-death or apoptosis). There are two types of chemotherapy drugs. Chemotherapy drugs kill cancer cells only when they are dividing are called cell-cycle specific. Chemotherapy drugs that kill cancer cells when they are at rest are called cell-cycle non-specific. The scheduling of chemotherapy is set based on the type of cells, rate at which they divide, and the time at which a given drug is likely to be effective. This is why chemotherapy is typically given in cycles. Chemotherapy is most effective at killing cells that are rapidly dividing. Unfortunately, chemotherapy does not know the difference between cancer cells and the normal cells. The "normal" cells will grow back and be healthy but in the meantime, side effects occur. The "normal" cells most commonly affected by chemotherapy are the blood cells, the cells in the mouth, stomach and bowel, and the hair follicles; resulting in low blood counts, mouth sores, nausea, diarrhea, and/or hair loss. Different drugs may affect different parts of the body. Chemotherapy is divided into five classes based on how they work to kill cancer. Although these drugs are divided into groups, there is some overlap among some of the specific drugs because some of these methods involve same basic procedure (Chow).

Chemotherapy drugs can be given in a variety of different ways. The method of administration of chemo treatments along with the dose is determined by rigorous testing called clinical trials. During this testing process, scientists and doctors determine how specific chemo drugs are absorbed in the body and how they work. Sometimes stomach juices can destroy different chemicals of chemotherapy, making some medications impossible to give as a pill. Other substances are found to have better anti-cancer action if given intravenously (needle in the vein). Some medications can be given as an injection into the muscle and still others are absorbed when given directly into the bladder or the abdominal cavity. The types of chemotherapy drugs are selected based on a variety of information and factors.

Finally, although doctors use the latest chemotherapy research and the best response rates to select the best treatment protocols for their patients, there is no guarantee that an individual will achieve the desired response. It is impossible to predict the outcome of therapy for any individual. However, response rates have improved dramatically and new drugs are being developed continuously so outcomes will continue to improve (Chow).

For a newly diagnosed person who has been prescribed chemotherapy for cancer, the number of treatments is set. For example, an oncologist will prescribe a specific number of chemotherapy cycles based on the treatment protocol. Responses may be measured during the chemotherapy, but the number of cycles does not generally change unless the cancer grows. If the cancer grows, the chemotherapy will likely be stopped or changed to different drugs mean-

ing patient would be prescribed to a different drug.

For a person who has had a recurrence or has advanced disease, a specific number of cycles may not be prescribed. Rather, two to three cycles are given and then response is evaluated. If the disease is stable or shrinking, additional chemotherapy may be given as long as responses are maintained, provided the toxicity of the chemotherapy is tolerable. In general, a minimum of two to three cycles of chemotherapy is required in order to measure response. One cycle of chemotherapy may not be adequate to evaluate its effectiveness (Medical News Today).

The problem with chemotherapy is it is extremely toxic. It will obliterate cancer cells and will also obliterate healthy cells. Because of its toxicity, chemotherapy generally has a five year survival rate. Chemotherapy has terrible side effects that go far beyond nausea and hair loss, hearing impairment, fatigue, neutropenia, susceptibility to infections, and loss of appetite. Therefore, there is a belief among patients that the doctors who prescribe chemotherapy want money rather than a good, positive outcome. I think so too because with the negative economy, doctors try in many different ways to make more money as much as possible. So the next question becomes how one should treat cancer so that they can avoid using chemotherapy treatment. They say that it is a symptom or result of some imbalance happening inside your body. As a result, the key should be to treat the underlying causes of the problem, so that the problem will no longer exist. Cancer lives and thrives in certain environments; it loves low oxygen levels, weakened immune system, high acidity, sugar, and grows and feeds off sugar. If you change the environment to one where cancer simply cannot survive, it will no longer feel the need to live inside your body. Killing cancer cells without harming healthy cells is the key to success. There is a whole world of gentle, non-toxic treatments out there that will do what chemotherapy never could, and these include gentle electrotherapy and GEIPE (Mccarron). All you have to do is take action of seeking for non-toxic treatments and avoid circumstances that will cumulate to become cancer.

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# Bringing Ayurveda to the West

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For centuries, traditional medicine systems have developed and spread. Complementary and alternative forms of medicine (CAM) have been on the rise in the West, and new CAM treatments are currently being researched. The oldest medical system in the world is Ayurveda, which developed thousands of years ago. It is an ancient Indian non-allopathic system which is heavily in use today. The herbal products used in Ayurvedic medicine are cheaper than Western therapeutic methods and are easily accessible. Even though there are multiple benefits to this system, there are disadvantages to using it including the toxicity of certain metals and the possibility of poor quality herbal products. Poor quality can be a result from pesticides, the changing environment, and the availability of so many herbs that can be combined. The availability of many herbs may cause experimental combinations of known substances to have weaker or dangerous side effects.

The word Ayurvedic means "the science of life" in Sanskrit. It is a holistic system that targets all of the body. This system cleanses the body of certain elements like infections, fatigue, and chronic health problems. It strives to keep a balance between the body, mind, and spirit.

Ayurvedic medicine includes eight branches of medicine: toxicology, surgery, gynecology/obstetrics/pediatrics, internal medicine, treatment of head and neck disease, care of the elderly and rejuvenation, sexual vitality, and psychiatry. Ayurveda is based on three main concepts called *doshas*, *prakriti*, and a universal connectedness. Doshas are the life energies that constitute how the body's activities are balanced. Disease is caused when doshas are in a state of imbalance, meaning the physical body and mental factors are not balanced. There are five basic elements that are part of doshas: fire, water, earth, air, and ether. Two of these elements make up one dosha, and each person has three unique doshas, which are modified constantly by body processes and food. Because each dosha has its own unique aspects, each has its own reasons for imbalance. Too much stress, an improper diet, chemicals, and age are some examples of imbalances.

The vata dosha is made from ether and air. It is the most powerful of all doshas and controls activities like breathing, cell division, the mind, and the heart. Difficulty sleeping is an example of the effect of vata dosha imbalance. People whose vata dosha is the most imbalanced have problems such as cardiovascular diseases, insomnia, anxiety, skin and neurological conditions, and rheumatoid arthritis.

Another dosha is the pitta dosha which is made from water and fire. It is in charge of the digestive system and hormones. An example of an imbalance includes heartburn after consumption of spicy food. The pitta dosha causes problems like cardiovascular problems, improper digestion, hypertension, and infectious diseases. As a specific example, Crohn's disease is a

digestive condition in which an inflammatory bowel emerges.

Lastly, the kapha dosha is made out of earth and water. It plays a factor in controlling growth and maintaining an immune system. A possible cause of imbalance is overeating. Emerging problems are obesity, cancer, diabetes, and respiratory issues, including asthma. Smoking also disrupts the kapha dosha by contaminating the alveoli.

The second foundation of Ayurveda is prakriti which is defined as "constitution". The foundation refers to the general health of the person and his/her health problems. It is understood that each individual has unique psychological and physical traits. Some individuals are generally more susceptible to sickness than others. Ayurveda considers the whole, rather than just the disease itself. The natural state of the individual has to be looked at. The main things taken into account are face shape, bone structure, complexion, texture of skin, and hair color.

Interconnectedness is the third and final concept. It connects relationships and the universe around humans with health. The concept is very spiritual in nature and maintains the idea that the body should be one with the universe, or health issues will arise. Meditation, which has been adopted by the West, is important for this foundation. The West has started to acknowledge the interrelatedness between the universe and an individual. One of the most famous types of meditation in the West is yoga, which means, "to unite," in Sanskrit. Meditation helps one connect with his/her emotions and relieve anxiety, depression, and many other chronic health problems.

CAM has been invigorated for many reasons, including high medicine cost, emerging diseases, antimicrobial resistance, and side effects from continuous use of Western drugs. Many Ayurvedic treatments involve a change in lifestyle, habits, or diet. Practitioners usually have to determine which dosha is the most important for each person and discover the imbalance between the three doshas. To accomplish this, the practitioner examines the patient's diet, illnesses, lifestyle, behaviors, and the ability to recover. The patient is physically examined, including eyes, weight, height, skin, mouth, voice, pulse, urine, and stool.

There are many parts to a treatment practice. Firstly, symptoms need to be reduced with exercise activities, such as stretching, and diet modification, including eating specific herbs. A lot of herbs are taken with honey to make it easier to digest. In some cases, other metals and minerals, such as iron, are given in small amounts. A second focus of treatment is stress reduction. Thirdly, the body is cleansed by eliminating the impurities through a process called *panchakarma*. Panchakarma is a purifying procedure to increase the metabolic processes of the body. Massages, oils, and nasal sprays can help achieve the cleansing. Also, treatments are used to increase resistance to disease. Tonics are made with herbs, plants, spices, and oils, based on ancient formulas. There are over 250 plants mentioned in the ancient texts as well as 600 herbal formulas. The plant drugs are grouped according to their effects. Sometimes, these herbs are mixed with metals. There are also ayurvedic medicines that can be used for multiple purposes. For example, Kailas Jeevan is a type of paste that can be externally applied for skin problems, and can also be taken orally. It is very effective on pimples, stretch marks, rashes, scars, and uneven skin tone. When taken orally, it helps heal ulcers, diarrhea, and constipation. Many of the Ayurvedic treatments are natural and have minimal side effects. Some of these remedies can be made at home making them a lot cheaper than many of the prescribed drugs that are sold.

Ayurvedic products have to be used properly or they can pose a risk. Two medi-

cations in use together can increase or decrease the effect. For example, certain herbs may cause side effects if they are used simultaneously with modern medical drugs. Guggul is one of the most famous detoxifying herbs in Ayurvedic treatment. Since it has blood-thinning effects, it should not be used simultaneously with other drugs that reduce platelet aggregation. Therefore, a trained practitioner should guide the treatment.

The main problem with Ayurvedic treatment is that certain treatments can be toxic. Some materials have not been thoroughly researched. In the United States, since Ayurveda is considered a CAM, it is not required to meet the safety standards that all conventional medicines have to meet. Most Westerners use Ayurvedic medicine as dietary supplements. A few of the lead poisoning cases are related to Ayurvedic medications. Other medications can include harmful levels of arsenic and mercury. About 35% of Ayurvedic treatments contain at least one metal. More research is being conducted to see which practices are very effective and safe. Current research includes Gotu kola, an herb used to help Alzheimer's disease, and the cowhage plant, a plant used to prevent side effects from Parkinson's disease drugs. Also, ginger, turmeric, and boswellia, are being used to treat inflammatory disorders like asthma and arthritis. Turmeric has many antioxidant properties and curcuminoids found in turmeric are being researched for cardiovascular benefits. Also, it can be used as an anti-aging product and for skin lightening. Curcumin, the principle curcuminoid, may even be a gateway into treating Alzheimer's disease permanently.

As expected, most of the populations who use Ayurveda are those from South Asia. In India, it is used by almost 80% of the population by itself or combined with Western medicine. On average, only about 200,000 people in the U.S. use Ayurvedic medicine. In India, there are more than 150 undergraduate and 30 graduate colleges that teach Ayurveda. It is the only country to offer degrees in Ayurvedic medicine. In the West, there are no colleges that give Ayurvedic medicine degrees, but there are colleges that teach certain Ayurvedic treatments. Two examples are the California College of Ayurveda and the New England Institute of Ayurvedic Medicine. Every year, more and more people are starting to practice Ayurvedic medicine. Under the guidance of an Ayurvedic practitioner, anyone can start to change their diet and lifestyle in order to tackle health problems. Many plants have countless benefits without any side effects. Hopefully, CAM will one day be seen as a type of conventional medicine and more people will start to use it.


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# Diagnosing Primary Care: Predicting Physician Supply

Daniel B. Shulkin

The Patient Protection and Affordable Care Act enacted by the 111th United States Congress in March of 2010 has made its way to physicians' and hospital executives' desks and is now being implemented in many medical practices. Yet many healthcare insiders, such as our hospitals' chief medical officers remain skeptical about what healthcare reform will accomplish. While this bill aims to make health care more accessible and affordable, it also relies heavily upon the ability of Americans to receive care provided by their primary care physician. As patients gain greater access to insurance and are therefore have the ability able to afford care, primary care physicians are being asked to see more patients and perform more services. Currently, primary care physicians often work more hours yet are paid a much lower wage than their specialist counterparts. Dr. Merle Bari, a Philadelphia area dermatologist can afford to see patients three days a week each for two hour intervals. It is likely that, as the bill's provisions are implemented, primary care physicians will only bear a greater burden.

Even before the passage of reform due to the difficulties and lifestyles choices associated with primary care, fewer medical students were choosing this as their specialty. According to the American Medical Association, only about two percent of current medical students are choosing to enter Primary Care. During the 1990s, the American Academy of Family Physicians found that medical students were 51.8% more likely to go into primary care. Today the percentages of medical students choosing primary care is much lower. In addition, primary care physicians are retiring early or even dropping out of clinical medicine and entering non-clinical fields such as administrative medicine. The Academy found that within the next decade the United States will have a shortage of 40,000 primary care physicians. An administrator at Morristown Memorial Hospital part of the Atlantic Health System in Northern New Jersey commented, "these numbers are significant since the hospital currently relies upon primary care physicians to bring patients to our hospital".

Before the healthcare reform bill was passed at a federal level, the Massachusetts Medical Society conducted a study to explore how a similar policy that they had enacted might impact the rest of the country. The study found that in 2009, with the influx of so many new patients into the Massachusetts healthcare system, over half of the primary care physicians in the state closed their doors to new patients. In response, the state announced it would give physicians a 10% bonus in areas with primary care shortages to lure in new doctors to treat patients. But the new bonus was not enough to address the shortage of primary care physicians. The ten percent increase in salary was not seen as making a significant difference in these primary care physicians' lives. A recent study in the Journal of General Internal Medicine conducted at Cambridge Health

Alliance found that primary care physicians make half of their income from government sponsored health insurance, such as Medicare or Medicaid. Yet specialists still get reimbursed more since insurance companies see specialists as more essential to the healthcare world, even though primary care physicians make the initial assessment and serve a vital role in patient care and diagnosis.

Doctors suggest that these salary discrepancies hurt patients because the care the American consumer most often needs, primary care, is in limited supply in the United States. Private health insurance companies are lowering reimbursement to primary care doctors, yet at the same time the federal government is looking at ways of enhancing payments to primary care doctors, while lowering payments to specialists. While paying primary care doctors more money may be a step in the right direction, it alone is not likely to solve the problems of the growing difficulties involved in running a primary care practice.

Low reimbursement rates among primary care physicians are not the only concern in running a successful practice. Primary care physicians require new tools to meet the complexities of today's healthcare environment. A growing number of physicians are utilizing electronic patient records to organize medical information and lab reports and to decrease the office space required to store records. Additionally, electronic charts help the primary care physician in sending notes to specialists and populating the patients' personal records. New technology also helps with electronic billing processes that have become increasingly complex. Perhaps electronic records can reduce the need for additional office staff and reduce the cost and complexity of running a practice. In a time when insurance reimbursements are low, hospitals and medical practices need to cut unnecessary costs in order to continue treating patients.

Even with better pay and advanced technologies, primary care physicians still have trouble keeping their practices afloat. For an increasing number of doctors, the long hours and growing practice costs make it increasingly impractical to run an independent office. The shortage of primary care physicians has forced many hospitals to recruit and hire these doctors as employees of the hospital, a sensible opportunity for physicians struggling to maintain their practice. Hospitals across the country are developing large groups of primary care physicians, and subsidizing their costs, in order to staff hospital clinics and to meet the healthcare needs of their communities. One example of this is the Physician Recruiting Network at Beth Israel Medical Center in New York City. Hospitals are also seeing a new group of healthcare professionals step in where primary care shortages exist. Both nurse practitioners and physician assistants are increasingly seeing patients for common visits such as suture removal and providing routine and preventive healthcare services. These professionals are able to treat patients without a physician present.

As the primary care shortage worsens, other parts of the healthcare system are responding. The nation's pharmacies, once known for its old fashion soda fountains, are developing primary care centers staffed by nurse practitioners and physician assistants to help treat patients. These centers see patients for simple medical problems, such as taking blood pressures and giving vaccines. In addition, new clinics are popping up in shopping malls and grocery stores. These walk-in clinics are becoming more popular as patients seek new ways to obtain convenient care. Even the internet is making primary care practices more efficient. New websites, such as www.opendoctors247.com, work with clin-

ics all over the country to post appointment availabilities for various medical practices either for the same day or the next day. Patients then get to choose the location, time, and provider they want to see. These new companies help eliminate the long wait time to see a physician and reduce costs for primary care physicians. Through resources like this website, physicians can avoid paying staff to answer phones and schedule appointments. These changes help patients find physicians who are accepting both their insurance plan and new patients.

More recently, some of the momentum in reforming the healthcare system has been threatened. Less than a year after the Healthcare Reform Bill passed through Congress and was signed into a law by President Barrack Obama, the Democratic Party lost the majority support in the House of Representatives. A bill designed to repeal the 2010 reforms was passed by the House, though it is unlikely to find support in the Senate. Nevertheless, there is real potential for parts of the healthcare bill of 2010 to be changed by the 112th Congress. A repeal of healthcare reform will require two-thirds support of both houses. While the odds of a full repeal are slim, changes to the bill are possible. Any changes that would repeal that help that is being promised to primary care physicians could have a very negative impact on our healthcare system. Without adequate primary care, hospitals will certainly see increased visits to the emergency room and an overall rise in costs.

As old models of medical care make way for new ones that involve innovative healthcare delivery, we need to make sure that we have adequate supplies of primary care providers, whether they are doctors, nurse practitioners, or physician assistants. We are entering an era where fewer medical doctors are choosing to enter primary care. In future systems of care, hospital administrators will seek new ways to deliver care focusing on prevention, advanced technology, self-care, and other use of highly trained medical professionals. It is essential to fix our healthcare model now so that our primary care physicians do not have to leave clinical medicine.

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