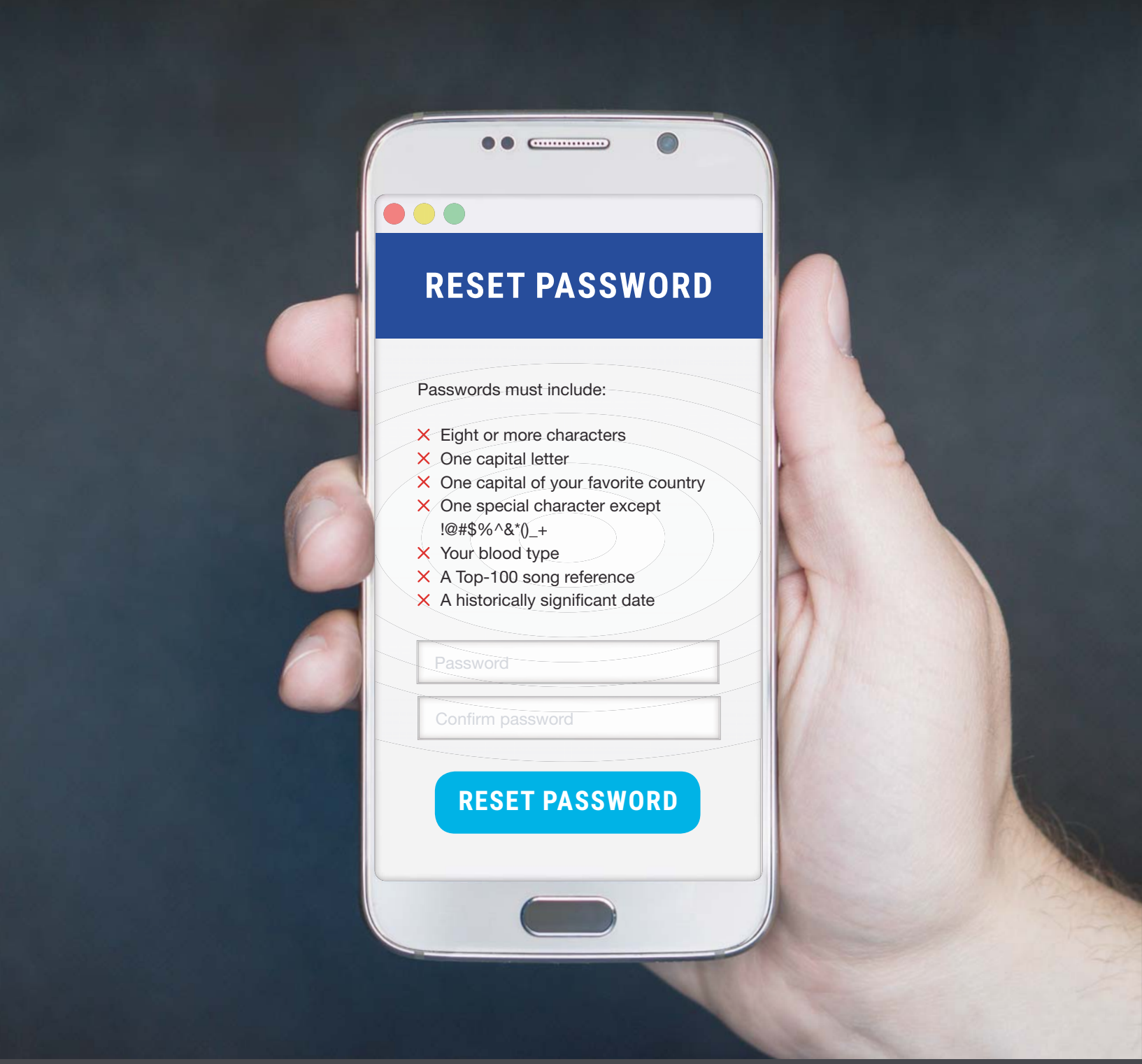
PANHANDLE HEALTH

A QUARTERLY PUBLICATION OF THE POTTER-RANDALL COUNTY MEDICAL SOCIETY

Summer 2019 | VOL 29 | NO. 3

Preventative Medicine



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On The Cover: Chip Coscia Photography

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Editor's Message:

Guidelines to Prevention

by Walter Bridges, MD

In selecting "Prevention" as the theme of this issue we (Editorial Board) looked at several areas with significant and possibly controversial (?) changes to guidelines. There have been recent discussions about vaccination: whether it causes more harm than good especially in diseases which we haven't seen in decades. Also included are articles about hypertension in children, cancer screening guidelines, prevention of surgical infections and preventing sports injuries.

In respect to guidelines one must remember that medicine is constantly changing and guidelines will always trail medical advances. This is one reason why "off-label" uses of approved medications is permitted. I hope that you will find this issue both educational and enjoyable.

Executive Director's Message

by Cindy Barnard, Executive Director

This quarter, the articles of *Panhandle Health* will discuss "Preventive Medicine". Obviously, the goal of preventive medicine is to prevent sickness before it starts. It is practiced by all physicians in an effort to keep their patients healthy. The overall goal is not only to maintain the health of patients but also to prevent disease, disability, and death in individuals and in defined populations. Primary care physicians have an excellent opportunity to help their patients stay healthy. However, some physicians choose to specialize in preventive medicine, either in clinical medicine or in public health. Clinical preventive medicine specialists actually see patients, while non-clinical preventive medicine specialists usually see fewer individual patients but work in public health, combining prevention-based clinical knowledge with population-based public health strategies and programs. Occupational medicine specialists seek to prevent injury, disability and death in employees in the workplace, identifying health and safety risks while working to cut down on occupational hazards that could result in injury, disability, or even death. In addition, the practice of preventive medicine lowers costs. Chronic diseases (e.g. diabetes, heart disease) account for seven out of ten deaths according to the CDC, explaining why screening and detection have become critical. The CDC says the practice of preventive medicine in the U.S. also helps lower costs as "75% of annual health spending goes toward chronic and largely preventable diseases." in summary, preventive medicine not only "helps patients and population groups thwart illness and disease but also keeps health costs down."

Our Next Issue Of

Panhandle Health

Features:

Weird Science

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**those groups of seven or more*

Potter-Randall Alliance NEWS

by Ashley Troutman, President

JUNE 2019

The Potter-Randall County Medical Alliance is looking forward to a fun and impactful summer of events. We will start off the summer by hosting the annual family social on June 28 @ 7pm at the Sod Poodles ballpark. Join us for food, fireworks and baseball! We will then gather in August for our quarterly general meeting to stuff backpacks for our annual community outreach project. We are partnering with the national non-profit organization, Give More HUGS, for the 3rd year in a row to provide backpacks and supplies to local students in need at a Back to School event with Heal the City. We are looking for volunteers to help with backpack stuffing as well as handing them out at the event. If you are interested in serving, email me at potterrandallalliance@yahoo.com.

Please consider supporting our efforts to fulfill our backpack commitment by donating today. $20 will provide a backpack and supplies for 1 student. We accept donations by mailing a check made out to PRCMA to 1721 Hagy Blvd Amarillo, TX 79106 or PayPal.me/PRCMA. For those who have already donated, thank for your help in supporting these families at the start of the upcoming school year!

Everyone can now join or renew your membership online!
www.texmedalliance.org

Please check Facebook and email for a list of upcoming events.

SHOUTOUTS

Thank you Shelby Neichoy, Judy Permian and Irene Jones for providing meals to the Ronald McDonald House in March, April and May. Thank you Dr. Taute for planning our upcoming Family Social at the Ballpark. We appreciate your service!

UPCOMING EVENTS

Friday, June 28: Family Social @ Sod Poodles Hodgetown Stadium 7pm (RSVP to potterrandallalliance@yahoo.com or Brittany 806-683-4077 - $10/person, under 3yr free)

Thursday, August 8: Quarterly Meeting – Backpack Stuffing @ the home of Kristen Atkins 6pm (8400 New England Dr)

Saturday, August 10: Back to School service project with Heal the City (Time & Location TBD)

Sincerely,
Ashley Troutman-PRCMA President
www.potterrandallalliance.com

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Cover Artist - John Coscia, MD

I lived in Memphis, TN from birth through medical school. The Air Force then sent me to Lackland Air Force Base in San Antonio for residency. I had wanted to be a surgeon since a teenager until the third month of a surgical residency. While making 4:30 am rounds I realized I could not work for 48 hours straight and that I had to choose another specialty. Since I had never given a thought about being anything else I didn't know what to do. The department chairman recommended I take off 2 weeks and think about it. Two things determined my fate: I had an interest in photography and my med school radiology professor asked if I had ever heard of anyone getting out of radiology. I hadn't, so since radiology was somewhat like photography and with my professor's mention of the retention rate in radiology, I switched residencies and never regretted it. A few years after getting out of the Air Force and having worked with a general radiology group, I became interested in subspecializing in breast imaging. I left the group and started my own practice limited to breast imaging. I later started a breast imaging rotation for radiology residents at UT Southwestern Med School in Dallas and subsequently was asked to come to Amarillo to start a breast imaging section at the Harrington Cancer Center. My family moved here in 2002. I then became the medical director at Texas Breast Specialists at Texas Oncology in 2008. I retired in 2017 and am now looking for places to go and subjects to shoot photographically. The change in my medical direction reminds me of what I heard a long time ago: Life is what happens while you're making other plans.

Chip Coscia

Cancer Screening Guidelines in the U.S.

by Hena Tewari, MD; Steve Urban, MD; Ravindra Bharadwaj (Ravi), MD, MPH

Prevention is better than cure - Desiderius Erasmus (1466–1536).

Over a period of time, The medical community has learned that this statement holds true for cancers. Preventive measures not only reduce the burden of the disease and improve quality of life of the humans but also reduce the financial burden on society. Surely, we cannot screen and prevent all kind of cancers with present knowledge and resources, but there are many common cancers that can be easily screened for early detection and easy cure. The US Preventive Service Task Force (USPSTF) was established in 1984 for recommendations for various preventive measures including cancer prevention. Various medical societies, such as the American Cancer Society (ACS), also have given their cancer screening recommendations pertaining to their field of expertise. These guidelines may slightly differ from each other but at core they are similar. Center for Disease Control and Prevention (CDC) supports screening for breast, cervical, colorectal (colon), and lung cancers as recommended by the U.S. Preventive Services Task Force (1).

Breast Cancer Screening:

After skin cancer, breast cancer is the second most common cancer of women in the US (1). Each year in the United States, about 237,000 cases of breast cancer are diagnosed in women and about 2,100 in men (1). Breast cancer can begin in different parts of the breast tissues including lobules, ducts, and connective tissue. Regular screening can pick up cancer in very early stages. USPTF (2) suggest that all women between age of 50 and 74 years should be screened biennially with mammography (Grade B*). Screening for women between age of 40 and 49 yrs can be done based on individual preference, for women who place higher value on benefit than potential harm. Women with a parent, sibling, or child with breast cancer are at higher risk for breast cancer and thus may benefit more than average-risk women from beginning screening in their 40s. Potential harms include false positive cases leading to unnecessary biopsies. USPSTF does not recommend screening beyond age 75 years, while the American Cancer Society (ACS) (3) recommends continued screening as long as life expectancy is more than 10 years for an individual.

***Table 1: Breast cancer screening recommendation ACS vs. USPSTF** (2,3)*

CANCER SITE	ACS/USPSTF	POPULATION	TEST OR PROCEDURE	RECOMMENDATION
Breast	ACS	Women aged 40-54 yrs.	Mammography	Regular screening mammography starting at age 45 yrs.; women aged 45-54 y should be screened annually; women should have the opportunity to begin annual screening between ages 40 and 44 yrs.
		Women aged ≥55 yrs.		Women aged ≥55 y should transition to biennial screening or have the opportunity to continue screening annually; women should continue screening mammography as long as their overall health is good and they have a life expectancy of 10 yrs. or longer
	USPSTF	Women aged 50-74 yrs.	Mammography	all women between age of 50 and 74 years should be screened bienially with mammography (Grade B*)
		Women aged 40-49 yrs.		Screening for women between age of 40 and 49 can be done based on individual preference, for women who place higher value on benefit than potential harms. Women with a parent, sibling, or child with breast cancer are at higher risk for breast cancer.

Cervical Cancer Screening:

Cervical cancer is highly preventable because of screening tests and vaccine to prevent HPV infections. The incidence of cervical cancer in the United States has decreased more than 50% in the past 30 years because of widespread screening. Almost all cervical cancers are caused by HPV and, when detected early, are highly treatable and associated with long survival and good quality of life. Thus screening for cervical cancer is strongly recommended (unlike for other gynecologic cancers). It usually take years to develop cervical cancer so, if you're

***Table 2: Cervical Cancer screening comparison ACS vs. USPSTF**(2,3)*

CANCER SITE	ACS/USPSTF	POPULATION	TEST OR PROCEDURE	RECOMMENDATION
Cervix	ACS & USPSTF*	Women aged 21-29 yrs.	Pap test	Cervical cancer screening should begin at age 21 yrs.; for women aged 21-29 yrs., screening should be done every 3 y with conventional or liquid-based Pap tests
		Women aged 30-65 yrs.	Pap test and HPV DNA test	For women ages 30-65 y, screening should be done every 5 yrs. with both the HPV test and the Pap test (preferred) or every 3 y with the Pap test alone (acceptable)
				*USPSTF also supports screening every 5 years with HPV virus testing alone in women aged 30 to 65 years
		Women aged >65 yrs.	Pap test and HPV DNA test	Women aged >65 yrs. who have had ≥3 consecutive negative Pap tests or ≥2 consecutive negative HPV and Pap tests within the last 10 y, with the most recent test occurring in the last 5 yrs., should stop cervical cancer screening
		Women who have had a total hysterectomy		Women who have had a total hysterectomy should stop cervical cancer screening

getting screened regularly (every 3 or 5 years), you are extremely unlikely to develop cervical cancer.

Screening guidelines for cervical cancer for the general population are joint recommendations of the ACS, ASCCP and ASCP.

In summary: 1) Most women don't need a Pap test every year. For women younger than 21 years, no screening required. 2) Women aged 21-29 years – Pap alone every 3 years. 3) Women aged 30-65 years- Pap and HPV virus co-testing (preferred) every 5 years or Pap alone (acceptable) every 3 years. 4) Women aged 30-65 years- screening by HPV testing alone is not recommended. 5) Women older than 65 years or after hysterectomy-No screening is required after adequate negative prior screening results.

The USPSTF agrees with above joint recommendations of ACS, ASCCP and ASCP; however in addition, USPSTF also supports screening every 5 years with HPV virus testing alone in women aged 30 to 65 years.

Colon Cancer Screening:

Colorectal cancer is the second leading cause of cancer-related death in both men and women combined. Screening can find early precancerous growths in colon called polyps; these polyps can be removed before they turn into full cancer. USPSTF (updated in 2016) recommends that all adults between age of 50 and 75 years should be screened. In these recommendations, the USPSTF did not specify any specific method of screening due to underutilization of the screening modalities. Adults between 75 and 85 years should be screened if they have never been screened before or if they are healthy enough to undergo cancer treatments and do not have significant comorbid conditions. Various screening tests are available: 1) Stool based tests: these includes testing for guaiac based occult blood (gFOBT), Fecal immunochemical test (FIT) and multigated stool DNA (FIT-DNA) testing. FIT testing improves sensitivity over gFBOT. FIT-DNA is an emerging strategy and tests FIT along with altered DNA shed in the stool. FIT-DNA offers increased sensitivity but is less specific than FIT and results in higher colonoscopy rate and adverse effects from colonoscopy. In addition, FIT-DNA is much more expensive than FIT alone. 2) Direct visualization tests: Flexible sigmoidoscopy reduces the deaths from colon cancer but FIT combined with flexible sigmoidoscopy is better than sigmoidoscopy alone. Similarly colonoscopy can also reduce the risk of death from colon cancer. 3) Serologic tests: FDA has approved a blood test to detect circulating methylated *SEPT9* DNA (Epi proColon; Epigenomics) in April 2016, but it has a low sensitivity of only 48% for colon cancer.

Similarly, the ACS recommends (2018): Average-risk adults aged 45 years and older should undergo regular screening with either a high-sensitivity stool-based test or a structural (visual) exam, based on personal preferences and test availability. As a part of the screening process, all positive results on non-colonoscopy screening tests should be followed up with timely colonoscopy.

American College of Gastroenterology: (Last updated in 2009) Colonoscopy every 10 years, beginning at age 50, remains the preferred CRC screening strategy.

Screening Interval: Screening strategies include 1) annual screening with FIT, 2) screening every 10 years with flexible sigmoidoscopy and annual screening with FIT, 3) screening every 10 years with colonoscopy, and 4) screening every 5 years with CT colonography.

Lung Cancer Screening:

Smoking is the biggest risk factor for lung cancer and is linked to 80%-90% of lung cancer deaths. Smoke from other people's smoking is also harmful. Other risk factors include radon gas from rock and dirt (in homes), asbestos, arsenic, diesel exhaust, some forms of silica and chromium, family history, radiation therapy and certain dietary exposures.

USPSTF recommends (2013) annual screening for lung cancer with low-dose computed tomography (LDCT) in adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery. Risks of low-dose CT include false positive results leading to biopsy and surgery, radiation exposure and diagnosing cancer that may never grow. ACS guidelines are also similar for yearly low-dose CT for high risk patients.

Prostate Cancer Screening:

All men are at risk for prostate cancer. Thirteen out of 100 American men will get prostate cancer. Age is the biggest risk factor. Being Afro-American and having a positive family history are linked with increased risk of prostate cancer as well. Prostate cancer screening is done by detecting increased levels of Prostatic Specific Antigen (PSA) in the blood. PSA

Table 3: Colorectal Cancer screening comparison ACS vs. USPSTF*(2,3)*

CANCER SITE	ACS/USPSTF	POPULATION	TEST OR PROCEDURE	RECOMMENDATION
Colorectal	ACS & USPSTF*	Age 45-75 yrs. *USPSTF recommends screening age 50 -75	Fecal immunochemical test (annual), or high-sensitivity guaiac-based fecal occult blood test (annual), or multitarget stool DNA test (every 3 yrs, per manufacturer's recommendation), or colonoscopy (every 10 yrs), or CT colonography (every 5 yrs), or flexible sigmoidoscopy (every 5 yrs)	Adults aged 45 yrs. and older should undergo regular screening with either a high-sensitivity, stool-based test or a structural (visual) examination, depending on patient preference and test availability. As part of the screening process, all positive results on non-colonoscopy screening tests should be followed with timely colonoscopy. adults in good health with a life expectancy of greater than 10 y should continue screening through the age of 75 y
		Men and women aged 76 through 85 yrs.		Screening decisions should be individualized based on patient preferences, life expectancy, health status, and prior screening history; if a decision is made to continue screening, the patient should be offered options as listed above
		Men and women aged >85 yrs.		Individuals should be discouraged from continuing screening

| *continued on page 10*

***Table 4: Lung Cancer screening comparison ACS vs. USPSTF**(2,3)*

CANCER SITE	ACS/USPSTF	POPULATION	TEST OR PROCEDURE	RECOMMENDATION
Lung	ACS & USPSTF	Current or former smokers aged 55-74 y in good health with at least a 30–pack-y history of smoking	Low-dose helical CT	Annual screening in adults who: Currently smoke or have quit within the past 15 yrs.; *and* Have at least a 30–pack-yr. smoking history; *and* Receive evidence-based smoking cessation counseling, if they are current smokers; *and* Have undergone a process of informed/shared decision including information about the potential benefits, limitations, and harms of screening with low-dose CT; *and* Have access to a high-volume, high-quality lung cancer screening and treatment center

can also be increased in certain non-cancer conditions such as: enlarged prostate, medical procedures and prostate infections.

USPSTF suggests (2018) that men who are 55 to 69 years old should make individual decisions about being screened for prostate cancer with a prostate specific antigen (PSA) test. Before making a decision, men should talk to their doctor about the benefits and harms of screening for prostate cancer, including the benefits and harms of other tests and treatment. Men who are 70 years old and older should not be screened for prostate cancer routinely.

ACS recommends screening all men of age 50 or more with average risk for prostate cancer and life expectancy of at least 10 more years. Screening should be started at age 45 for those with increased risk for prostate cancer. This includes African Americans and men who have a first-degree relative (father, brother, or son) diagnosed with prostate cancer at an early age (younger than age 65). If no cancer is found, then men with PSA of less than 2.5 ng/ml may only need to be retested every 2 years. Screening should be done yearly for men whose PSA level is 2.5 ng/mL or higher.

Many men with prostate cancer never experience symptoms and, without screening, would never know they have the disease. Screening offers a small potential benefit of reducing the chance of death from prostate cancer in most men. However, many men will experience potential harms of screening, including false-positive results that require additional testing and possible prostate biopsy; overdiagnosis and overtreatment; and treatment complications, such as incontinence and erectile dysfunction. In determining whether this service is appropriate in individual cases, patients and clinicians should consider the balance of benefits and harms on the basis of family history, race/ethnicity, comorbid medical conditions, patient values about the benefits and harms of screening and treatment-specific outcomes, and other health needs. Clinicians should not screen men who do not express a preference for screening.

***Table 5: Prostate Cancer screening comparison ACS Vs. USPSTF**(2,3)*

CANCER SITE	ACS/ USPSTF	POPULATION	TEST OR PROCEDURE	RECOMMENDATION
Prostate	ACS	Men aged ≥50 yrs.	Prostate-specific antigen test with or without digital rectal examination	Men who have at least a 10-yrs. life expectancy should have an opportunity to make an informed decision with their health care provider about whether to be screened for prostate cancer after receiving information about the potential benefits, risks, and uncertainties associated with prostate cancer screening. Prostate cancer screening should not occur without an informed decision-making process.
	USPSTF	Men aged 55 to 69 yrs.	Same as above	men who are 55 to 69 years old should make individual decisions
		Men aged ≥70 yrs.		Men who are 70 years old and older should not be screened for prostate cancer routinely.

Skin Cancer Screening:

Skin cancer is the most common type of cancer in United States. Two common types of skin cancers, basal cell carcinoma and squamous cell carcinoma, are highly curable but disfiguring. Melanoma is the other type and is more dangerous and responsible for most skin cancer deaths. Most skin cancers are caused by exposure to ultraviolet radiation from sun, tanning bed and sunlamps.

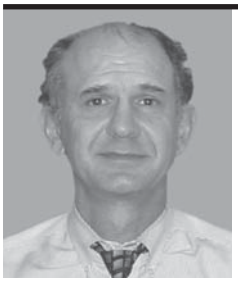
The USPSTF states that the current evidence is insufficient to assess the balance of benefits and harms of visual skin examination by a clinician to screen for skin cancer in adults.

The CDC recommends staying in the shade during middle hours of the day, wearing hat, sunglasses, and clothing to cover arm and legs, and using sun screen with a sun protection factor (SPF) of 15 or higher.

ACS also suggests that, along with preventive measures, one can get skin checked by their physicians and also perform a self skin check (https://www.cancer.org/cancer/skin-cancer/prevention-and-early-detection/skin-exams.html).

References:

1. Center for Disease Control and Prevention. https://www.cdc.gov/cancer/dcpc/prevention/screening.htm
2. US Preventive Service Task Force. https://www.uspreventiveservicestaskforce.org/
3. American Cancer Society https://



Prevention of Surgical Infections

by Steve Urban, MD

Introduction

Four fundamental advances have made modern surgery possible. Of these, the first was a detailed understanding of internal anatomy. The Roman author Galen was worshipped uncritically for centuries; most medieval medical treatises were simply explications of Galen. The relaxation of strictures against post-mortem anatomical studies led to the publication of Vesalius' *De Humani Corporis Fabrica* in 1543, and the subsequent development of post-mortem anatomy and pathology fostered a gradual unveiling of the structure of the internal organs.

The second important advance was the development of methods of hemostasis to replace the somewhat unpopular and often ineffective method of pouring boiling oil on a bleeding wound. The ligation of major arteries at time of amputation by the French battlefield surgeon Ambroise Pare in the mid-1500s initiated modern methods to control surgical bleeding. The third crucial advance was the development of ether anesthesia by Long, Morton and others in the 1840s, supplementing the formerly used agents such as alcohol (whiskey) and morphine (the so-called soporific sponge). Less dangerous non- flammable anesthetic agents soon followed.

Interestingly, it was not until the 1860s that doctors recognized that cellulitis and suppuration at the surgical site (now known as surgical site infections or SSIs) were caused by bacteria. Over the next 150 years, methods to minimize the risk of SSIs have constituted a crucial task of surgical research and practice. In this paper, I will review some of the ways we decrease (but have not yet eliminated) the risk of surgical site infection.

Bacteria as cause of surgical site infections: history

Contagious diseases had been recognized for millennia and microorganisms known about since Leewenhoek in 1673, but nobody put the two together until the Frenchman Louis Pasteur and the Scotsman Joseph Lister did so in the 1860's. People still believed Galen's supposition that plagues were caused by miasma (bad air), and most surgeons felt that inflammatory and septic changes after surgery were caused by the chemical process of tissue oxidation (developments in chemistry had preceded developments in microbiology).

It is interesting to note how many medical advances follow the development of new technical procedures. In medical microbiology, these were culture and staining techniques. Pasteur used nutrient broth as a culture medium; in the 1880's the German Robert Koch developed the agar-plate method still used today, and specific media to enhance the growth of certain organisms was developed by the Dutch microbiologist Martinus Beijerinck a few years later. The Danish physician Hans Christian Gram developed his tissue stain while working in the Berlin city morgue in 1884.

Although we celebrate the insights of Semmelweis (1849) in discovering that unwashed hands of medical students were spreading puerperal infection, and of John Snow (1854) in discovering that the cholera outbreak in London's Soho district was spread by the fecal-oral route, neither of these physicians understood that microbes were spreading the contagion. Snow speculated that the contagious principle was some kind of cell but lacked the techniques for further insight. Only when the microbiological techniques of Pasteur (1860) were applied by the dogged and brilliant Lister to the problem of surgical site infection was progress made. It took decades, especially in America, however, for surgeons to wash their hands before surgery and to stop the practice of stropping their scalpels on their bootsoles in the operating theater!

Current understanding of surgical site infections.

It is important to point out that not all postoperative infections are SSIs. Catheter-associated urinary tract infections (CAUTIs), central-line associated bloodstream infections (CLABSIs), and ventilator-associated pneumonias (VAPs) are common, and their incidence can be decreased by well-described methods (which will not be further discussed here). Another very important postoperative infection is *Clostridium difficle* associated colitis, the risk of which can be minimized by careful antibiotic stewardship.

Surgical site infections occur in approximately 2% of clean wounds, 10% of clean contaminated wounds (a clean contaminated wound occurs when there is no overt infection but a non-sterile body area in entered during surgery), and 20% of contaminated wounds. SSI, when they occur, are classified as superficial, deep, or deep-space infections. Even superficial infections are a hassle, but deep infections carry the risk of sepsis, wound dehiscence, and infection of implanted prosthetic devices—all of which are expensive and potentially disastrous outcomes.

Almost all SSIs in clean wounds arise from the patient's own microbes, usually with the skin or nares as a reservoir. Although surgical infections from the environment can arise, as in Semmelweis' day, modern methods to decontaminate the environment have rendered point-source outbreaks in the OR quite rare. Infections in clean-contaminated cases can arise either from the skin of from microbes in the organ which has been entered, such as the GI tract after colectomy or the female urogenital tract after hysterectomy or C-section.

Risk factors for surgical site infections

In addition to the site and sterility of the surgery, several other factors have been demonstrated to increase the risk of surgical site infection. These include age above 65 (probably due to immune senescence), hyperglycemia, both obesity and malnutrition, prior radiation to the site, cigarette

| *continued on page 12*

smoking, and use of immunosuppressive medications. I will discuss potential modification of some of these preoperative factors below. Important intraoperative risk factors, including the development of hypothermia, hypoxia, and tissue underperfusion due to hypovolemia, are carefully managed by the anesthesiologist. The modification of some postoperative risk factors will be mentioned below, but the importance of prompt removal of indwelling catheters and devices and the avoidance of unnecessary antibiotics should not be overlooked.

Preoperative preparation

A recent WHO publication (1) critically reviewed various elements in preoperative preparation of the surgical patient. The authors recommended preoperative whole-body bathing either with plain soap or chlorhexidine gluconate soap and water and either no hair removal or hair removal with clippers before surgery. Hair removal by shaving increases microtrauma to the skin and significantly increases the risk of postoperative SSI. Surgical hand preparation is, of course, crucial, but chlorhexidine was not found superior to povione-iodine, and hand scrubbing was not found superior to hand rubbing. Alcohol-based hand rubs, while superior to hand preparation with water-based antiseptics in reducing the number of bacteria on the skin, were not better in preventing SSIs. Either method is acceptable.

The WHO study group found that preoperative nutritional support with enhanced-nutrient oral or enteral preparations, although expensive, could be beneficial in some malnourished patients. Multiple-enhanced feeding (i.e. formulas supplemented with arginine, glutamine, omega-3 fatty acids, or nucleotides) were superior to single-nutrient enhanced formulas, although the quality of evidence was judged to be low.

Since skin organisms are the major source of SSIs, and since nasal carriage is an important reservoir for *Staphylococci*, the role of nasal decontamination for *Staph* nasal carriers has been extensively studied. The usual protocol is to culture the nares for *Staph* 2 weeks before an elective procedure, and then to treat positives with mupirocin nasal ointment twice daily for 5 days. This measure has been demonstrated to decrease the risk of SSIs in orthopedic and cardiovascular procedures by 50%. Whether nasal decontamination should be accompanied by skin decontamination with chlorhexidine is uncertain but usually practiced. The WHO recommends against preoperative discontinuation of immunosuppressives, although this evidence is heterogeneous and of low-quality.

Perioperative antibiotic prophylaxis

Preoperative antibiotic prophylaxis is directed against skin bacteria in clean surgeries and against both skin and GI or GU organisms in certain clean contaminated surgeries. A table of all recommendations can be found at the IDSA website (4); I will just provide an overview here. For low-risk clean surgeries (e.g. low risk laparoscopic surgery), no antibiotic prophylaxis is needed. For clean surgeries where SSIs are more likely and potentially more serious and where the likely pathogens are skin flora, cefazolin is the antibiotic of choice. Clindamycin or vancomycin are alternatives in the beta-lactam allergic patient. In clean contaminated surgeries where the GI or GU tract is entered, extended gram negative and anaerobe coverage (e.g. cefoxitin, cefotetan, ampicillin/sulbactam, ertapenem) is usually employed. Some surgeries (e.g. cochlear implants) have their own specific regimens. Colon decontamination with oral antibiotics (plus mechanical cleansing) is superior to mechanical bowel preparation alone in elective colon surgery. Again, the IDSA website provides a thorough review of each surgery and the recommended regimen.

Prophylactic antibiotics should be at therapeutic concentration at the time of skin incision. Randomized studies indicate that they should be started within 2 hours of surgery, but a time of less than 1 hour is recommended by most accrediting organizations. If a short-half life antibiotic (e.g. beta lactam) is used, the dose should be repeated after 4 hours if the skin is still open at this time. Many studies suggest that postoperative antibiotics are superfluous, but in any case antibiotics should rarely be extended more than 24 hours after the surgery. Cardiovascular and orthognathic procedures may represent exceptions to this rule, as prolongation of the prophylactic antibiotics has been demonstrated in several (low-quality) studies to decrease the risk of SSIs by 50%. In other surgeries, prolongation of antibiotic prophylaxis increases the risk of complications including *Clostridium difficile* infection. Recent observational data showed that prolonging antibiotics for more than 24 hours after surgery increases the incidence of both *C diff* infections and acute kidney injury significantly, with a number needed to harm between 9 and 4, according to the duration of antibiotic use. Importantly, prolongation of antibiotics because of intraperitoneal contamination or in the presence of external drains is not supported by the evidence.

Intraoperative and postoperative factors

Several intraoperative factors to decrease infection risk are managed by the anesthesia service. Measures that have been shown to decrease SSI risk include (2): perioperative oxygenation with 80% oxygen, avoidance of intraoperative hypothermia (prevalent especially in surgeries lasting more than 2 hours) and maintenance of euvolemia during the surgery. Perioperative glucose control decreases the

risk of infection in both diabetic and non-diabetic patients, but the target for glucose control continues to be controversial, as tight glucose control (probably) decreases infection risk but does so at the cost of hypoglycemic episodes. Most recommendations for general surgery target a glucose level of 180-200 mg/dL or below.

The panel recommended chlorhexidine-based alcohol solutions for skin preparation at the operative site. Gowning and draping can be accomplished equally well with sterile disposable non-woven or sterile reusable woven gowns and drapes. The WHO did not find evidence to support the use of plastic adhesive incise drapes or laminar airflow ventilation in operating rooms, even in total arthroplasty cases. The WHO finds strong evidence in favor of antibiotic skin sealants. Prior to wound closure, irrigation of the wound with aqueous povione-iodine solutions was recommended in clean and clean contaminated cases. Wound irrigation with antibiotic solutions is not recommended. Postoperative "advanced" wound dressings (e.g. hydrocolloid or hydrogel dressings) were not found superior to standard sterile dressings.

Conclusion

When the surgical care improvement project (SCIP) was initiated (in 2006), the goal was to decrease surgical site infections by 25%. Recent studies have suggested that this goal has been met, although QI projects still indicate room for improvement. Careful preoperative management, prophylactic antibiotics judiciously used and properly timed, and attention to removal of unnecessary catheters and lines postoperatively have all contributed to this improvement. Frequent and often devastating infections from the times of Lister and Cushing, although not eradicated, are gradually yielding before modern advances and preventive techniques.

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Controversies in Human Papilloma Virus Vaccination

by Paul Tullar, MD

Abstract: Human Papilloma Virus (HPV), especially 16 serotypes, including types 16, 18, 31, 33, 34, 35, 39, 45, 51, 52, 56, 58, 66, 68, and 70 are a necessary and mostly sufficient cause of squamous cell cancer of the cervix, vagina and vulva (in women) and anus, rectum, and naso-pharynx in both men and women. Vaccinations have been developed and are successful in reducing infection rate. Medical and surgical management of HPV infection related pre-cancerous changes in the cervix have reduced cervical cancer and death from cervical cancer 50-65%, since 1950s in, the USA. Immunity to and reduction of HPV infections will likely reduce pre-cancers and development of cervical cancer and other HPV dependant cancers. Risks of vaccines are reviewed, as is herd immunity of vaccines both for vaccinated and unvaccinated women. Parental concerns for safety may limit effectiveness of the vaccines by limiting numbers of people vaccinated, hereby limiting or eliminating "herd immunity" benefit.

Key Words: Human Papilloma Virus, cervical cancer, vaccinations, squamous cell, herd immunity

History: Human **P**apilloma **V**irus (HPV) was found to be necessary, if not entirely sufficient, for the cause of cervical cancer (1, 2), the primary cause of cancer in women, and the primary cause of death from cancer in women before the 1950s. This was when George Papanicolaou, a Greek pathologist, won the Medal of Honor from the American Cancer Society. Father of the Pap Smear, Papanicolaou was searching only for a screening test that would determine who did and didn't have cervical cancer, and yet found a test which found not only who did and didn't have cancer, but also found who would likely develop cancer years into the future. This gave physicians years to follow closely, study, and treat patients with an abnormal Pap smear, in order to prevent that progression to cervical cancer, thus lowering the death rate for cervical cancer by 50-65%. Once HPV was identified (by German virologist Harold zur Hausen (1, 2), and then "recognized as responsible for 99.7 % of cervical cancers worldwide" (6), the search began for a vaccine against HPV to prevent cervical cancer. Several vaccine producing pharmaceutical organizations Merck (4), Glaxo-SmithKline (5) began working on a vaccine against HPV.

It was at first difficult to ascertain that HPV was both necessary and sufficient as a cause for squamous cell cervical cancer, as there are over 150 different serotypes of HPV, and only about 16 (specifically serotypes 16, 18, 31, 33, 34, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68, and 70) have been proven to cause cancer ("oncogenic") (2,3). Other serotypes may cause warts in palms or feet (plantar surface) but do not cause cancer. Of the serotypes that are oncogenic, some cause cancers in North America (HPV serotypes 16 and 18- cause up to 75%, of all squamous cell cancers of the cervix in North America and Europe), others are more common in South America (16, 18, 39, 59, with 39 & 59 almost entirely confined to Central & South America) (2). Yet others are more common in Sub-Saharan western Africa (serotypes 16 & 18 most common, with serotype 45 clustering in western Africa) (2), while yet still others are most common in South Asia (Shanxi Province, China, serotypes 16 &18 are found only 35% prevalence, while serotypes 31 & 33 are 10%, and, serotype 45 is 1-2%, and "other" serotypes are found in about 49% of the prevalent HPV serotypes detected" (7). These different human HPV serotypes are characterized by DNA analysis and can be detected by PCR and other methods. Vaccines against them are directed against proteins and polysaccharides in the viral envelope. Protein and polysaccharides in the viral envelope are produced by recombinant segments of viral DNA that code for the envelope, and after elaboration in yeast (Gardasil ®) or bacteria (Cervarix ®) form "virus-like particles" that are immunogenic for specific serotypes, but incapable of infecting the host or causing cancer (8), and are among the more effective antigens for vaccine development. Another example of polysaccharide immunogenic vaccines, to prevent disease includes pneumococcal polysaccharide injectable vaccine (Pneumovax23®) (9).

Other diseases known to be caused by HPV include penile cancers in men, anal & rectal squamous cell cancers in men and women, and nasopharyngeal (base of tongue and larynx) mucosal cancers in men and women. It is believed that HPV vaccination in boys and girls, before the onset of sexual activity, and men and women may prevent or decrease all of these, if the vaccinated person has not yet been exposed to that HPV virus serotype. HPV is spread by skin-to-skin direct contact. Prevention of or reduction of the virus responsible has been proven to be protective in cervical cancer, and likely will prove to be protective in these other cancers. (4)

Released first in 2006, the first of the two pharmaceutical companies produced a quadrivalent (4v-HPV) vaccine against HPV: serotypes 6, 11, 16 and 18. Serotypes 4 & 11 are not oncogenic, but a cause for external condyloma accuminata of the vulva and vagina, rectum and anus. This is not a fatal disease, but a cause for infectious morbidity, with expensive and painful treatment; these viruses are contagious, and potentially contagious to the

newborn, and against HPV serotypes 16 and 18 (definitely oncogenic): Gardisil-4 ® was produced 2006-2016 by Merck (5). Later, another company produced a bivalent vaccine (against HPV serotypes 16 & 18, which are responsible for over 50% of cervical cancer worldwide): Cervarix®, Glaxo-SmithKline, produced 2009-2016 in the U.S., but stopped production as it could not compete with quadravalent competitor, "due to very low market demand"(10). Most recently (2017 and beyond) a 9-valent vaccine ("9v-HPV", Gardasil-9 ®), has been released, always including 6, 11, 16 and 18, among other oncogenic serotypes 31, 33, 45, 52, 53), and replaced Gardasil-4 in 2017. (4)

Vaccine background: Live vaccines ("live virus"), such as the cowpox virus, could be potentially fatal to the vaccinated person, but was certainly less virulent and had a much lower fatality rate than the smallpox virus that vaccine protected against. Live vaccines have a higher risk than other types of vaccines, but long lasting immunity. Live attenuated virus vaccines, and non-live vaccines (may be killed viruses or viral particles, like the HPV vaccine), are less dangerous, as they (non-live vaccines) cannot cause the disease as live attenuated vaccines can, but may be less immunogenic, so "booster" doses may be necessary before a large number of vaccine recipients are successfully resistant to the disease. Measles (Rubeola) vaccine has 2 doses series of primary and booster, as up to 10% of children may yet come down with the measles disease, if exposed to the Rubeola virus, after receiving only the first vaccination (so only 90% effective after only 1 vaccination), before the booster doses are given. Rubella, or 'German Measles', a fairly mild disease in children, but very teratogenic if acquired during pregnancy for the fetus, has up to 15-20% "non-take" rate for any 1 vaccination. What of other adverse events that might happen after vaccination, even with "safer" vaccines?

The United States had a permissive reporting program (the Vaccine Adverse Events Reporting System (VAERS) and 'no-fault' compensation program, the Department of Health and Human Services' National Vaccine Injury Compensation Program, which (to 2011) had recorded 88 injury and 8 death claims related to the HPV vaccines and two legal settlements. This is with over 30 million doses of HPV vaccine and approximately 15 million recipients to 11/2010. The Vaccine Adverse Events Reporting System, co-sponsored by the CDC and the FDA had, to 2010, received reports of 18,000 adverse events, whether or not they were caused by the vaccine. The information helps the agencies analyze and track the most common complaints. Most complaints are minor, such as fainting after an injection, while some are more serious (such as DVT or Guillian-Barre Syndrome), but no direct cause by the vaccine has been established. Considerable "push-back" by parents, worried about safety has been encountered to vaccinating children, regarding many vaccines: measles, tetanus, whooping cough, as well as HPV. (11,12) have convinced parents to refuse to vaccinate their children. This has limited vaccination percentages in certain parts of our U.S. population.

One specific type of protection well documented by vaccinating "most" (up to 90+%) of a population, well-described in its effect is "herd immunity", where non-vaccinated individuals (maybe those who cannot receive a vaccination, due to reasons such as immune compromise or just those who chose not to become vaccinated) are protected from a disease if enough of their surrounding neighbors are immunized. This is well-known in rubella, where vaccination of men and non-pregnant women protects non-immune pregnant women from becoming exposed to rubella during pregnancy, putting the unborn fetus in harm's way. To achieve "herd immunity" for measles, the measles virus is so virulent, that 93- 95% of the population must be vaccinated. (15) "Herd immunity" is also used in Pertussis, where immunized older family members, including older siblings, parents and even grandparents prevent Pertussis exposure to the infant. Pertussis is more virulent and more likely fatal to the infant than to the adult, but immunization that protects the adult from a milder disease, more importantly protects the newborn from a potentially fatal disease. Long theorized in HPV disease, this "herd immunity" protective effect has recently been demonstrated in a pediatric and young adult population with HPV vaccination.

A recently published study (13) demonstrated that before the vaccination program, 35% of woman were HPV + before vaccination, and 11 years after, vaccinated

| *continued on page 16*

women were only 6.7% HPV+. (HPV vaccination rates in this study ranged from 0% in controls to 84% of women.) Interestingly, in unvaccinated women, prevalence of vaccination–type serotypes of HPV, went down during the study time from 32%, down to 19%, thought to be due to "herd" immunity. (13) An advantage of vaccination with the 82% of study participants who received the full 3-dose course of the quadrivalent vaccine (4v-HPV) who had lowered prevalence to the 5 additional (in the 9v-HPV) serotypes when the next wave of participants were given the 9v-HPV beginning in 2017. Non-vaccinated women in the study did not enjoy any additional level of protection against these additional 5 viruses, during the same time. It is thought that this represents some cross-protection conferred by immunization against some of the most virulent HPV viruses (HPV 16 & 18), while noting that infection with multiple HPV serotypes reduces the host's defenses against the HPV as well as defenses against progression on to cervical cancer.(14)

Recent testimony before the Health, Education, Labor and Pensions Subcommittee in the U.S. Senate, Tuesday, March 5, 2019 (15) detailed the breadth and some depth of mixed feelings about vaccine safety, primarily measles vaccine safety, after 211 cases of measles confirmed across 10 states this year (as of 3/7/2019): California, Colorado, Connecticut, Georgia, Illinois, Kentucky, New York, Oregon, Texas and Washington, according to a report released by the CDC this spring. So many parents in certain locations within these states (including Texas) have chosen not to vaccinate their children for measles (and mumps and rubella) that pockets of significant numbers of children have had significantly serious outbreaks of measles. Even Senator Rand Paul (R-KY), a physician, who stated he's had all his children vaccinated, expressed empathy with parents who were reluctant to immunize their children (taking a rare chance for potentially fatal complications), "for a non-fatal disease". Senator Paul spoke to the benefits of voluntary compliance with recommendations. Other U.S. Senators in that hearing were willing to look at the "greater good" of requiring immunization for school attendance for school-age children, to protect them, as well as children who could not be immunized, especially from measles, speaking to the coercive power being worth the benefit of protection from such outbreaks. Similar parental objections derailed attempts by then-Governor Rick Perry when he tries to get HPV vaccination required for "usual childhood vaccinations" for 12 year old girls in Texas in 2007. Will our vaccination rate be great enough to deliver on the promise of prevention (or at least considerable reduction) of squamous cell cervical and other skin and mucous membrane cancers? Only time will tell.

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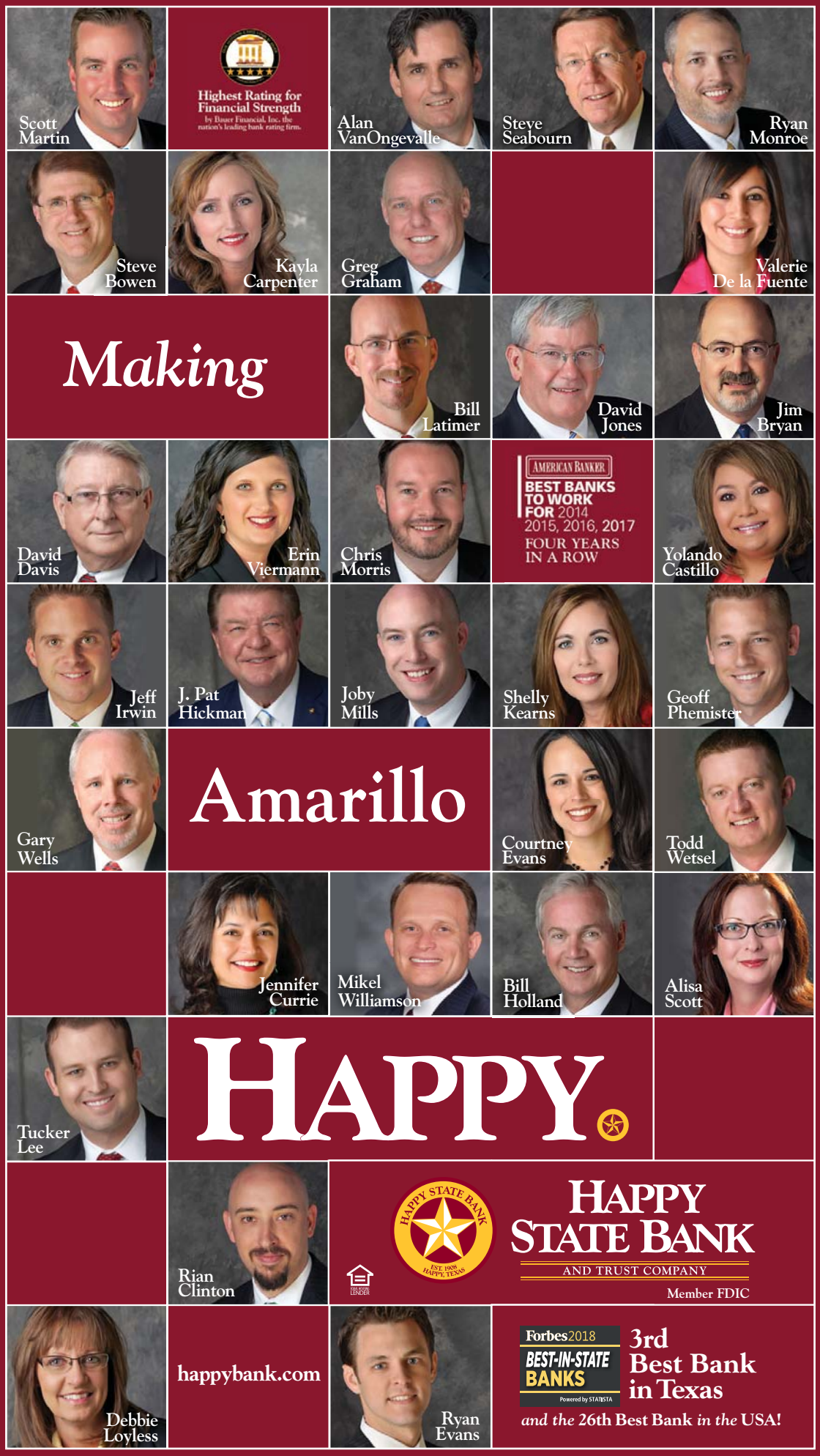
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Vaccine Controversies

by Amanda Griffin, MD

As a pediatrician, I frequently have discussions about vaccine controversies. The public is continuously bombarded with information and misinformation regarding the risks of vaccines, while their primary care provider often serves as their only medically trained contact with whom to discuss these concerns. Below, several common questions are discussed.

Why do we need vaccines when we don't see these diseases?

As Benjamin Franklin said "An ounce of prevention is worth a pound of cure." It is better to prevent a disease than to treat it after it occurs. Vaccine preventable illness have decreased dramatically since vaccines were introduced, yet controversy still remains regarding their use. For example, prior to the availability of polio vaccines, polio caused more than 15,000 cases of paralysis each year in the United States. Polio has now been eliminated in the United States due to the success of vaccination. Smallpox was declared eradicated worldwide in 1980 after a global immunization campaign (1). According to the World Health Organization (WHO), vaccination currently prevents 2-3 million deaths a year and could avoid 1.5 million more if global coverage of vaccinations improved. Recently, falling immunization rates have been linked to resurgences of vaccine preventable diseases. For example, in 2010, California saw over 9000 cases of whooping cough, more than any year since the vaccine was introduced in the 1940s (2). The World Health Organization identified vaccine hesitancy as one of 10 major threats to global health in 2019 (3).

Is it dangerous to give so many vaccines at once? Are you going to overwhelm a baby's system?

Another controversy surrounding vaccination is whether too many vaccines are given too early. To address this, it is important to understand how vaccines work. A vaccine causes the body to produce a response to what is in the vaccine (the antigen), so that the body can respond to that particular virus or bacteria if it is exposed to it later. Our bodies are exposed to thousands of antigens daily, beginning for an infant as early as the passage through the birth canal. The number of antigens in vaccines has decreased over the past 3 decades, even though the number of diseases that children are vaccinated against has increased. By age two, children are now immunized against 14 different diseases, with each vaccine containing between 1 and 69 antigens. With these immunizations, they are exposed to up to 320 antigens in vaccines throughout those 2 years. This is actually fewer antigens than vaccines contained 30-40 years ago, by over 20 fold! For a comparison, an exposure to strep throat involves about 25-50 antigens (4, 5).

Immunizations are timed according to the vulnerability of the child, and vaccine recommendations are based on studies that examined how recipients responded to multiple vaccines given simultaneously. By delaying these vaccines, the infant may miss the critical time that they are most vulnerable to the disease. In addition to leaving children vulnerable for a longer amount of time, if immunizations are given on a "delayed schedule" or one at a time, this increases the child's risk of adverse reactions. There is no tested, approved, or recommended alternative or delayed immunization schedule.

Are the additives in the vaccines dangerous?

The additives in vaccines are necessary components. Some additives ensure that the vaccine does not become contaminated. Others, such as aluminum, actually make the vaccine more effective by providing an earlier and more potent response, so that fewer antigens are needed to provide protection against the disease. Infants are exposed to aluminum in their environment and in vaccines. A study in 2011 confirmed that the amount of aluminum an infant is exposed to through both diet and vaccination is extremely low risk (6). Thimerosal, historically added to multi-dose vaccine vials to prevent the growth of bacteria and fungi, has made the news with claims to be associated with the development of autism. A study done in Denmark of over 450,000 children vaccinated with a thimerosal-containing vaccine compared to those vaccinated with a thimerosal-free formulation of the same vaccine showed no significant difference in the risk of autism spectrum disorders between the two groups. Despite this, thimerosol was removed from childhood vaccines in the United States in 2001.

Do the vaccines cause autism?

The most well known vaccine controversy in the modern era is due to a paper published in 1998 in the prestigious journal, The Lancet. The primary author on this paper was Andrew Wakefield. In this article, he claims there is a link between the measles, mumps, and rubella (MMR) vaccine and autism. The study was based on 12 patients and found to have falsified data. Since its publication, The Lancet has retracted the article and Andrew Wakefield has lost his medical license. Numerous studies have now proven there is no link between any vaccines, including the MMR vaccine, and autism. As recently as this year (March 2019), a decade-long study of over 650,000 children in Denmark "strongly supports that MMR vaccination does not trigger autism in susceptible children, and is not associated with clustering of autism cases after vaccination" (7).

The unfounded fear of the MMR vaccine causing autism has in part led to the resurgence of measles in the United States. As of May 31, 2019, the Centers for Disease Control and Prevention (CDC) reports 981 individual cases of measles in the U.S from 26 states, including Texas. This is the highest number of cases since 1992 and since measles was declared eliminated in 2000 (8). This number will have increased by the time of publication of this article, though as of the time of writing, no cases of the measles have been reported in Potter or Randall County. This measles outbreak is linked to travelers who brought measles back from other countries where outbreaks are occurring. Measles spreads more quickly in the US in areas where the vaccination rate is lower, especially where there are pockets of unvaccinated people. It is important for the general public to have access to the information published in these well done studies, to calm the fears about immunizations and to curb the spread of this once eradicated disease.

Does my 11 year old need a vaccine that protects against an STD? Can't we wait until they are older?

The Human Papillomavirus (HPV) Vaccine is recommended for all children at ages 11-12 and protects against the virus that causes a large number of cancers of the mouth and throat, cervix, and genital organs. Controversy around the HPV vaccine has mainly related to concerns about teens increasing their sexual activity after receiving the vaccine and whether it should be given in children as young as ages 11 and 12. A 2012 study specifically looked at sexual activity after administration of the HPV vaccine and concluded that the vaccine given in the recommended ages was not associated with increased markers of sexual activity (pregnancy, STIs, or contraceptive counseling). A different study showed that antibody levels after the vaccine were 2-3 times higher in patients age 9-15 than those aged 16-26, which may lead to improved protection from the vaccine (9). Protecting patients before they are exposed to what they are being immunized for is the goal. By giving the vaccine at age 11, more patients are immunized before they are exposed (10).

Should doctors continue to see patients who refuse to be vaccinated?

Of all of the questions addressed today, this is the one with the least clear cut answer and the least amount of data to support each side of the controversy. Many providers feel that their trust with the patient is breached when the family has refused vaccinations. There is concern that, if they do not trust the physician's advice on vaccines, they may not trust their advice on other topics as well. Additionally, many providers are concerned about the safety of the other children who share the same waiting space as the unvaccinated children. Many of these other patients may be too young or are immunocompromised, preventing them from being immunized against these potentially lethal diseases to which they are more susceptible and from which they are more likely to have serious complications. Physicians on the other side of this debate feel that over time they may gain the family's trust and convince them of the safety and importance of the vaccines. Others believe that, by severing this relationship, we are punishing the child for the fault of the parents. Currently, the decision of whether to dismiss these patients from a practice is left up to individual providers or practices, as long as they follow the applicable state laws prohibiting abandonment of patients.

There is an abundant amount of information available to address the above topics further or others that are beyond the scope of this article. The CDC's website is a good place to find information, as is Healthychildren.org. If you have any further questions, please feel free to ask your health care provider.

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Neonatal Sepsis - Prevention and Management

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Introduction

Neonatal sepsis continues to be a feared birth complication associated with significant morbidity and mortality. It is classified according to the age of the child at onset of symptoms. Early-onset sepsis (EOS) is defined as onset before 7 days of age, whereas late-onset sepsis (LOS) is defined as onset of symptoms ≥7 days of age.

In the 1970's, the leading cause of EOS was found to be Group B *Streptococcus*. Over the years, the Centers for Disease Control (CDC), American Academy of Pediatrics (AAP) and American College of Obstetrics and Gynecology (ACOG) have put forth consensus guidelines for prevention and treatment of neonatal sepsis. This has resulted in decreased EOS rates secondary to GBS infection without much effect on LOS (*Figure 1*- Adapted from CDC guideline 2010). In recent years, the proportion of neonatal sepsis induced by *E. Coli* has been rising, more so in preterm infants. Other organisms like *Listeria monocytogenes*, *S. aureus*, and *Enterococcus* are also isolated in some cases.

Apart from GBS colonization, other risk factors for EOS are prematurity, prolonged rupture of membrane more than 18 hours and maternal chorioamnionitis. The incidence of neonatal sepsis is 0.2-0.5%, but due to the non-specific symptoms and significant mortality and morbidity without treatment, a high number of neonates undergo sepsis workup and treatment.

Intrapartum Prophylaxis

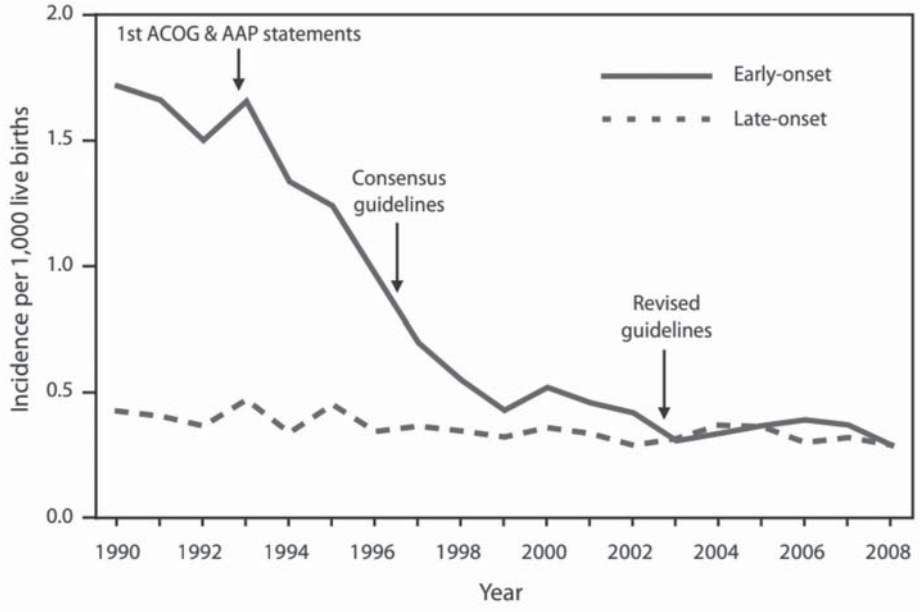
The term "chorioamnionitis" usually implies an infectious origin when this is not always the case and results in multiple laboratory tests and management decisions in both mother and newborn. As the criteria for the diagnosis are vague and there is much inter-personal variability, the term "chorioamnionitis" has recently been replaced by the term "Intrauterine Inflammation or Infection or Both" (Triple I). While diagnosis of intraamniotic infection is confirmed with amniotic fluid culture or placental histopathology showing evidence of infection or inflammation, the majority of Triple I is diagnosed by clinical symptoms. These symptoms include maternal intrapartum fever greater than 39°C (102.2 F) plus one or more of the following: maternal leukocytosis greater than 15,000 in the absence of corticosteroids, purulent cervical discharge with cloudy, yellowish, thick characteristics, or fetal tachycardia greater than 160 beats per minute for 10 minutes or more.

In terms of intraamniotic infection, intrapartum antibiotic therapy has been shown to decrease the rates of neonatal sepsis and bacteremia as well as to improve maternal morbidity. In suspected Triple I, choice of antibiotics used should be dictated by the most prevalent strains of bacteria. Ampicillin and gentamicin are most commonly used and will cover the most predominant microorganisms. In the case of penicillin allergy, alternatives such as cefazolin or vancomycin can be used in lieu of ampicillin. If a cesarean section is performed, an antibiotic that has coverage of anaerobic bacteria such as clindamycin or metronidazole, should be added to prevent postpartum infection such as endometritis.

Workup and Diagnosis

Blood culture is considered the gold standard for diagnosis of neonatal sepsis. It should be drawn from 2 different sites (1ml each) to rule out contamination. Other workup includes with CBC with differential, proinflammatory markers like C-Reactive Protein (CRP)/procalcitonin, cerebrospinal fluid culture and analysis and chest X ray. Findings such as thrombocytopenia (platelet count

FIGURE 1. Incidence of early- and late-onset invasive group B streptococcal (GBS) disease — Active Bacterial Core surveillance areas, 1990–2008, and activities for prevention of GBS disease



Abbreviations: ACOG = American College of Obstetricians and Gynecologists and AAP = American Academy of Pediatrics.
Source: Adapted from Jordan HT, Farley MM, Craig A, et al. Revisiting the need for vaccine prevention of late-onset neonatal group B streptococcal disease. Pediatr Infect Dis J 2008;27:1057–64.

<150,000 per microliter) neutropenia (absolute neutrophil count<1000) or band predominance (immature: total neutrophil ratio > 0.2) on the CBC are suggestive of sepsis. CRP has best utility when done 8-24 hrs after onset of symptoms and has good negative predictive value for sepsis. CSF cultures may be positive in the setting of meningitis. The important of the lumbar puncture as part of the diagnostic evaluation is subject to debate, and many protocols and predictive tools have been proposed. An alternative approach may start with blood culture and CBC with differential and subsequent lumbar puncture if findings are suggestive of sepsis. However, initiation of therapy should not be delayed by diagnostics, in the setting of an ill neonate.

Management

In general, empirical therapy should be directed against the most common organisms and guided by antimicrobial resistance patterns of bacterial isolates commonly found in the NICU or community settings. Ampicillin and an aminoglycoside (usually gentamicin), are the most common initial antibiotics started. With LOS, coverage should be provided for common hospital acquired pathogens like S.*aureus*, coagulase negative *Staphylococcus* and *Pseudomonas* species.

Directed antimicrobial or antimicrobials should be administered, once the pathogens have been identified, and their susceptibilities known, and the site or sites of infection identified. Management is usually continued until blood cultures and/or CSF cultures or sterile. This is usually 10-14 days for culture positive sepsis and 21 days for meningitis. If blood and CSF cultures are negative at 36-48 hours and the neonate is clinically stable, a general rule of thumb is to discontinue antibiotic coverage.

Continued antimicrobial therapy in the face of negative cultures may be associated with increased infant morbidity and mortality. Exposure to antibiotics poses several short and long-term risks for infants. For example, aminoglycosides are a commonly used antibiotic in the treatment of EOS but can cause renal and ototoxicity. Several other studies have shown an association between neonatal antibiotic exposure and other long-term outcomes, such as changes to the gut microbiome, atopic symptoms, and development of resistant organisms.

Several studies have been conducted to better predict the risk factors for neonatal sepsis. The Neonatal Sepsis Calculator is a free online calculator that can be used to assess the risk of sepsis in a newborn >34 weeks based on maternal and neonatal risk factors. It is based off a multivariate model for EOS risk developed in a cohort of >600,000 births. It provides estimated probability of EOS based on its incidence, risk factors known at birth and clinical condition of the newborn over first 6-12 hours of life. The utility of this calculator has been validated in several studies. It has shown to decrease in the use of antibiotics in neonates with no associated missed cases of sepsis or increase in readmissions for sepsis after initial dismissal from hospital. With the emerging evidence of long-term side effects of antibiotic, defining the risk of sepsis and appropriate prophylaxis is important in reducing morbidity.

A link to the neonatal sepsis calculator can be found here and is also available as an app for ios and android devices.
https://neonatalsepsiscalculator.kaiserpermanente.org/

Conclusion

The incidence of EOS has greatly decreased over the past several decades due to implementation of regular screening protocols and better definition of risk factors. However, the consequence of these protocols has led to increased exposure to antibiotics and subsequently a higher incidence of antibiotic side effects. This highlights the importance of accurately characterizing sepsis risk with the EOS calculator and of utilizing antibiotics appropriately to avoid unnecessary exposure antimicrobial agents.

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Diagnosis and Management of Hypertension in Children: Guidelines and Controversies

by Ayo Olanrewaju, MD; Tetyana Vasylyeva, MD

Introduction

In 2017, AAP came up with new guidelines for screening and management of hypertension in children and adolescents. This is an update to the 2004 guidelines and includes the following significant changes: (1) the phrase "elevated blood pressure" replaces "prehypertension", (2) pediatric normative blood pressure charts for age, sex and height are updated, (3) new simplified "screening" blood pressure table is provided and many other additional recommendations. This article is aimed at health professionals caring for children and adolescents in the outpatient setting.

"Hypertension" vs. "elevated blood pressure"

Hypertension is defined as blood pressure (BP) greater than the 95th percentile for the age, sex and height of the child (table 1). The normal distribution of hypertension in children is derived from measurements of approximately 50,000 healthy children. The 2017 blood pressure percentiles are several mmHg lower than similar tables in 2004 because they now exclude children with obesity and hypertension from the normative tables, which improves accuracy of diagnosis and decreases misclassification bias.

The guideline also includes a new simplified table (see table 2) which would typically be used by nursing staff to flag blood pressure measurements that may need further evaluation by a clinician in the outpatient setting. The table can also be incorporated into existing electronic health record infrastructure.

Epidemiology of hypertension in children

The prevalence of high blood pressures has been increasing since 1988, and this includes both elevated blood pressure and hypertension. High blood pressure is consistently greater in boys (15-19%) than in girls (7-12%), and the prevalence is higher among Hispanic and nonhispanic African American children compared with nonhispanic white children.

The prevalence of confirmed hypertension in outpatient settings among children and adolescents is estimated at 3.5%. Rates are higher among adolescents than among younger children. Higher blood pressures in childhood have been strongly correlated with higher BP in adults and with the onset of hypertension in young adulthood.

Prevalence estimates for hypertension in children also suffer from the iceberg phenomenon seen in adults. Of the 32.6% of US adults who have hypertension, almost half (17.2%) are not aware that they have hypertension. The prevalence of hypertension in children is also probably significantly underestimated, largely due to challenges in measuring and interpreting pediatric blood pressure readings.

Certain conditions increase the risk of hypertension in children. These include obesity, sleep-disordered breathing, chronic kidney disease and prematurity. The prevalence of hypertension ranges from 3.8% to 24.8% in youth with overweight and obesity, and there is a linear relationship between increased weight and increased blood pressure. Obesity is also associated with lack of circadian variability of blood pressure, with up to 50% of children with obesity not experiencing the expected nocturnal BP dip. Elevated BMI as early as infancy is associated with higher future BP.

Children who sleep less than 7 hours a night are also at increased risk of hypertension. Sleep disordered breathing also increases the risk of elevated BP and hypertension in children. Sleep disordered breathing includes primary snoring, sleep fragmentation and obstructive sleep apnea syndrome.

Abnormal birth history, including preterm birth and low birth weight, has been identified as a risk factor for hypertension and other cardiovascular dis-

Table 1. Updated definitions of BP categories and stages

	For Children Aged 1–<13 y	For Children Aged ≥13 y
Normal BP	<90th percentile	<120/<80 mm Hg
Elevated BP	≥90th percentile to <95th percentile or 120/80 mm Hg to <95th percentile (whichever is lower)	120/<80 to 129/<80 mm Hg
Stage 1 HTN	≥95th percentile to <95th percentile + 12 mmHg, or 130/80 to 139/89 mm Hg (whichever is lower)	130/80 to 139/89 mm Hg
Stage 2 HTN	≥95th percentile + 12 mm Hg, or ≥140/90 mm Hg (whichever is lower)	≥140/90 mm Hg

Table 2. Screening BP values requiring further evaluation

Age y	Boys		Girls	
	Systolic	Diastolic	Systolic	Diastolic
1	98	52	98	54
2	100	55	101	58
3	101	58	102	60
4	102	60	103	62
5	103	63	104	64
6	105	66	105	67
7	106	68	106	68
8	107	69	107	69
9	107	70	108	71
10	108	72	109	72
11	110	74	111	74
12	113	75	114	75
≥13	120	80	120	80

eases in adults. One retrospective cohort showed a prevalence of hypertension of 7.3% among 3-year-olds who were born preterm.

Clinical significance of hypertension in children

Numerous studies have shown that elevated blood pressure in childhood increases the risk for adult hypertension and metabolic syndrome. In the short term, children with uncontrolled hypertension are at risk of accelerated end organ damage requiring ICU admission and use of vasopressors. In the long term, patients with hypertension are at risk of end organ damage including nephropathy, retinopathy, neuropathy and cardiomegaly.

Measurement of Blood Pressure in children

Blood Pressure in children may vary considerably between visits and even during the same visit due to several factors, including anxiety or recent caffeine intake (certain sodas contain caffeine). It is therefore important to obtain multiple measurements over time before diagnosing hypertension. The initial BP measurement may be oscillometric (on a calibrated machine validated for use in children) or auscultatory. In most cases, BP should be measured in the right arm by using standard measurement practices. You can follow the link at http://youtu.be/JLzkNBpqwi0 to watch the AAP video instructions on how to accurately measure blood pressure.

BP should be measured annually in all children and adolescents 3 years of age and older. In obese children, children taking medications known to increase BP, or children with renal disease, history of aortic arch obstruction or coarctation of aorta or diabetes, BP measurements should be done at every visit.

Children younger than 3 years should have BP measurements taken at well child visits only if they are at increased risk of developing hypertension (e.g. preterm, low birth weight).

Outpatient management of pediatric hypertension

Normal BP

If the BP is normal or normalizes after repeat readings (i.e. BP <90th percentile), then no additional action is needed. If the BP reading is at the elevated level according to table 1, lifestyle interventions should be recommended (healthy diet, sleep, physical activity) and BP repeated in 6 months by auscultation. If BP remains elevated at the 6-month visit, upper and lower extremity BP should be checked (right arm, left arm and 1 leg) lifestyle counseling should be repeated, and BP rechecked in 6 months by auscultation. If BP continues at elevated level after 12 months, ambulatory blood pressure monitoring (ABPM) should be ordered and diagnostic evaluation conducted. Consider subspecialty referral at this time.

Stage I HTN

If BP reading is at stage I HTN level and patient is asymptomatic, provide lifestyle counseling and recheck BP in 1-2 weeks by auscultation. If the BP reading is still at the stage I level, upper and lower extremity BP should be rechecked (right arm, left arm and 1 leg) and BP should be rechecked in 3 months by auscultation. Nutrition and or weight management referral should be considered as appropriate. If the BP continues to be at the stage I hypertension level after 3 visits, ABPM should be ordered, diagnostic evaluation should be conducted and treatment should be initiated. Subspecialty referral should be considered (nephrology or cardiology).

Stage 2 HTN

If the BP reading is at the stage 2 HTN level, upper and lower extremity BP should be checked, lifestyle recommendations given, and the BP measurement repeated within 1 week. Alternatively, patient can be referred to subspecialty care within 1 week. If the BP reading is still at stage 2 HTN level when repeated, then diagnostic evaluation including ABPM should be conducted and treatment should be initiated. If the BP is at stage 2 HTN and patient is symptomatic, or the BP reading is >30mmHg above the 95th percentile, or >180/120mmHg in an adolescent, send to ED for immediate care.

Organizations with use of EHRs in an office setting should consider including flags for abnormal BP values both when the values are being entered and when they are being viewed.

Forearm and wrist blood pressures, although validated in adults, should never be used for the measurement of blood pressures in children.

What is an ambulatory blood pressure monitor?

An ambulatory BP monitor consists of a BP cuff attached to a box slightly larger

| *continued on page 24*

than a cell phone which records BP periodically (usually every 20-30 minutes) throughout the day and night; these data are later downloaded to a computer for analysis. ABPM is more predictive of future BP and can assist in the detection of secondary hypertension. The AAP recommends the use of ABPM in all children 5 or greater years of age who can tolerate the procedure and who have office measurements in the elevated category for a year or more, or with stage 1 HTN over 3 clinic visits. It is especially helpful in diagnosis of masked hypertension and white coat hypertension.

Masked hypertension (MH) occurs when patients have normal office BP but elevated BP on ABPM. It has been found in 5.8% of children studied by ABPM. Patient at increased risk of MH include patients with obesity and secondary forms of HTN such as CKD or repaired aortic coarctation.

White coat HTN (WCH) is defined as BP 95th percentile or greater in the office or clinical setting but <95th percentile outside the office or clinical setting. It is diagnosed by ABPM when the mean SBP and DBP are <95th percentile and SBP and DBP load are <25%; load is defined as the percentage of valid ABPM above a set threshold value. It is estimated that up to half of children with elevated BP in office have WCH.

The overall goals for treatment of HTN in children and adolescents, including both primary and secondary HTN, include achieving a BP level that reduces the risk for target organ damage. A review of medications used for management of hypertension is beyond the scope of this article. Interested readers can read the AAP guidelines (see bibliography).

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Prescribing Off Label: Ethical Issues

by Walter Bridges, MD

Off label use of a Food and Drug Administration (FDA) approved medication is very prevalent in the US. An FDA approved medication is a medication that has clinical trials or studies that demonstrate that the medication is safe and effective for a specific disease or symptom. Off label use refers to the prescribing of an approved medication for an indication for which it has not been approved by the FDA. Off label use would include use of the medication in populations or age ranges which were not studied in the clinical trials and therefore not approved for those populations or ages. Use of a dose that is different from doses studied and approved would be another example of off label use.

The overall incidence of off label use is estimated to be 10-20%; however, this may be underestimated. In certain populations, such as children, off label use is estimated to be more than 60%. In the pediatric population off label prescribing approaches 75%.

Off label use is not the same as research or experimental use. Studies of medications require evaluation and approval of a Institutional Review Board. Clinical research also requires informed consent of the patient. Off label use may not require informed consent.

Why or when would off label prescribing be appropriate? Medical advances occur at a much faster rate than the FDA's ability to evaluate and approve a medication. FDA approval of a new medication or new indications of an approved medication may take up to 8 years. The cost to a manufacturer to complete the entire process including clinical trials is estimated to be over 1 billion dollars. Many manufacturers feel the cost to get new indications for an approved medication is too high for them to recoup in increased use of that medication. Also only about 40-60% of medications submitted to the FDA are ultimately approved.

An example of off label use is aspirin. Aspirin was approved by the FDA for pain relief. In 1960 aspirin was noted to inhibit platelet aggregation. Aspirin was shown to decrease the incidence of heart attacks and stroke. The FDA required clinical trials to be completed before manufacturers of aspirin could advertise it's benefit in prevention of heart attacks or stroke. Off label uses cannot be placed in the package insert of a medication, and patient education materials cannot have information on off label use. The FDA approved aspirin for the prevention of heart attacks or stroke in 1998. During the clinical trials for aspirin physicians could prescribe aspirin for the prevention of heart attacks or stroke. Prescribing off label is legal.

| *continued on page 26*

However, should physicians disclose to patients that they are prescribing a medication off labels. Courts have consistently tended to side with physicians in regard to informed consent with off label prescribing. The term "off label use" is an FDA regulatory term. It is not associated with clinical risks or benefits. A physician's duty to the patient is to provide clinical information and participate in shared decision making with the patient.

Another more recent example of off label prescribing is Avastin (bevacizumab) and Lucentis (ranibizumab). Both are manufactured by Genentech and both inhibit vascular endothelial growth factor. Avastin is approved for colorectal, liver, glioblastoma, renal and ovarian cancer. It is being used off label in treatment of age relate macular degeneration (AMD). Lucentis was developed and approved for AMD, wet age related macular degeneration (wAMD), proliferative diabetic retinopathy (PDR), and diabetic macular edema (DME). Both drugs are given monthly as injections. The issue is cost. Avastin costs about $60 per injection and Lucentis costs about $2500 -$3000 per injection. There is some data showing that Avastin is as effective as Lucentis in treatment of AMD.

The issue of informed consent in prescribing off label tends to be an ethical one rather than a legal one. How much information must the patient receive to be able to give "informed consent"? Most patients believe that medications prescribed are FDA approved. However most physicians do not disclose that a medication is not approved for a specific indication.

Arguments for informed consent and disclosure of off label use include the stipulation that off label use should have some scientific support. It has been estimated that about 70% of off label use lacks sufficient scientific support. The lack of scientific data showing benefit of a off label use of a medication may be a risk that should be disclosed.

Arguments against obtaining informed consent in off label prescribing include economical issues, inaccurate presumption of increased risk and patient confusion. To get FDA approval for all uses of a medication is not economically feasible. Informing a patient that a medication is being prescribed for an indication that hasn't been approved by the FDA may cause confusion. The patient may refuse to take the medication since it is not FDA approved. Off label prescribing is an FDA regulatory term. It is not associated with the clinical risks or benefits of a medication. FDA approval of a medication does not guarantee safety of the medication. There have been several incidences (Vioxx) of medications that were approved and found to have serious side effects.

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Prevention of Injury in Sport

by Johnnie Faircloth, MD

Introduction

While participation in sport is associated with many psychosocial and physical health benefits, it is also associated with injury. These injuries affect the financial well-being of the participant and interfere with the health benefits of sport participation. This article will discuss some common sport related injuries, as well as risk factors for injury and prevention strategies.

Musculoskeletal Injuries

The most common injuries associated with sport participation affect the musculoskeletal system. Lower extremity injuries, such as sprains of the knee and ankle or contusions and strains to muscle groups, are the most common injury types. These injuries are usually self-limited, resolving in a matter of days or weeks, but can have long term consequences.

Risk factors for acute musculoskeletal injuries include participation in collision (football, hockey) and contact (soccer, cheerleading) sports that require cutting and agility maneuvers or sudden stops. These sports are also commonly associated with high energy collisions with the playing surface or other participants. Sprains of the anterior cruciate ligament of the knee and ankle sprains are common non-contact injuries resulting from a sudden change in direction on a planted extremity. Additional injury risk factors include previous injury, deconditioning and fatigue. Females also have a greater musculoskeletal injury risk over males when playing in similar sports (1,2).

The most important musculoskeletal injury prevention strategies utilize a training program which provides feedback on movement (biomechanics) and incorporates strength, plyometrics, agility, balance, and flexibility. One such program is the Fédération Internationale de Football Association (FIFA) 11+. Developed in 2006 to provide an injury preventing warm up program for soccer players, FIFA 11+ provides 15 exercises including core stabilization, eccentric muscle training, plyometrics and others, with a focus on proper postural alignment. This type of training has shown to reduce-in season injury risk when done at least 2 to 3 times per week, for at least 10 to 12 weeks and when started in the pre-season (3). Athletes with previous injury should strongly consider adopting preseason training program such as the FIFA 11+ (1-3).

Finally, the use protective equipment has been shown to reduce musculoskeletal injuries in athletes. Wrist guards have been shown to reduce the incidence of radius fracture and pads can reduce contusions and abrasions. Ankle braces of any type, including taping of the ankle, can prevent ankle sprains, especially in athletes with previous history of this injury. Knee braces have not been shown to significantly reduce the risk of knee sprain (2).

Overuse Musculoskeletal Injuries

Repetitive loading and shear stress causes micro trauma to the musculoskeletal system during training and sport participation. With adequate nutrition and time for rest the system recovers, adapts and becomes stronger. However, when the athlete fails to provide appropriate rest and nutrition and/or the stress applied to the system is excessive, overuse injury can occur. Injuries, such as stress fractures of the foot, leg, hip and spine are relatively common (1).

Risk factors associated with overuse injuries can be both intrinsic and/or extrinsic to the athlete. Intrinsic risk factors include the presence of open physes (growth plates), where bone growth occurs, and apophyses (sites for musculotendinous attachment to growing bones). Physes and apophyses contain cartilage which is weak and subject to repetitive stress during sport participation. Athletes seem to be especially vulnerable during a growth spurt. Apophysitis, such as Osgood-Schlatter, and stress fractures can occur at these vulnerable sites. Relative Energy Deficit in Sport (RED-s) occurs when inadequate nutrition results in poor recovery from exercise and may lead to endocrine dysfunction (amenorrhea) and poor bone health (stress fractures). Other intrinsic risk factors include level of conditioning, flexibility and history of previous injury. Extrinsic risk factors associated with overuse injury include early sport specialization, the playing environment, training schedule and equipment, such as running shoes (1).

Prevention of overuse injury demands attention to both intrinsic and extrinsic risk factors. Utilization of an injury prevention program in the pre-season, such as the FIFA 11+, can address conditioning and intrinsic biomechanical risk factors in the athlete. Attention to nutrition and over all metabolic health is important for recovery from the stress of sport and prevention of RED-s. Some extrinsic risk factors, such as worn running shoes or poorly fitted equipment, are easily addressed. However, as the demands of club and traveling teams seem to be increasing, over scheduling and early sport specialization risk factors are more difficult to avoid. Over scheduling risks may be minimized with longer rest periods during tournaments or reducing the amount of time that the athlete spends in practice. Youth pitch counts and mandatory rest periods after games have been implemented and may prevent injury in baseball players. Except in a few sports (gymnastics, diving), early sport specialization has not been shown to increase an athlete's chances of reaching elite status. Additionally, some evidence suggests that adolescent participation in multiple sports improves overall athleticism and skill while reducing the risk of overuse injury.

Delaying single sport specialization until late adolescence may be beneficial (1).

Head and Neck Injuries

Injuries to the head, neck and face are relatively common in those who participate in sport. It is not uncommon to see an accidental finger to the eye in basketball, and hematomas of the ear in wrestling are well known. Injuries to the head and neck, such as mild traumatic brain injury (concussion) and sprains of the cervical spine commonly occur in sport as well. Catastrophic injuries to the brain and cervical spine occur rarely but can be devastating.

Similar to musculoskeletal injuries, previous injury is an important risk factor for injury to the head and neck. It is well known that subsequent mild traumatic brain injuries occur with less force than when first suffered. The athlete may also require longer for recovery with each subsequent mild traumatic brain injury. Combat sports, such as boxing and wrestling, have a significantly increased risk for injuries to the head and neck. It is for this reason that the American Academy of Pediatrics discourages anyone under the age of 18 from participation in boxing. Collision sports like football and hockey have a high risk of injury to the head and neck, but surprisingly basketball players suffer more mild traumatic brain injuries per 100 hours of athlete competition. Improper technique when tackling with the crown of the helmet is the most common cause of catastrophic cervical spine injury in football players. Functionally one-eyed athletes, defined as having best-corrected visual acuity worse than 20/40 in the poorer-seeing eye, are at an increased risk of blindness with sport participation (3,4).

Prevention of catastrophic injuries to the brain and cervical spine in athletes is difficult but strategies do exist. The Heads Up campaign teaches youth football players to see what they hit by keeping the head and neck in extension during tackling. Axial loading of a straightened spine by striking the opponent with the crown of the helmet is the most common mechanism for cervical spinal cord injury in football. Keeping the head up and eyes on the opponent allows the head and neck to maintain proper alignment and potentially allows the tackler to avoid a direct blow to the head. Although evidence is lacking, this technique may reduce mild traumatic brain injury in football players. No other studies have been able to significantly show reduction in mild traumatic brain injury. Helmets protect from fracture and other injuries to the brain. Mouth guards have been shown to prevent dental trauma in athletes. Eye guards approved by the American Society for Testing and Materials are mandatory if functionally one-eyed athletes participate in sport (3,4).

Heat Illness and Injury

Participation in sport and exercise in

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the heat may cause illness or injury. The risk increases when the ambient temperature rises in a setting of high humidity. The body uses many methods to maintain cooling during sport. Convection takes heat away from the body as cooler air blows over the skin. Evaporation of sweat also contributes to loss of heat from the body. These mechanisms can be overcome when the ambient air temperature is too high, when air flow is minimal and when humidity is high. These conditions can make it unsafe to participate in sport or exercise. Potential injuries associated with heat include muscle cramps, syncope and collapse, heat illness and heat stroke. In addition to environmental risk factors, intrinsic risk factors for heat illness and injury exist. Common risk factors include poor acclimatization to the heat, deconditioning, dehydration, medical conditions and certain medications (5).

The etiology of muscle cramping associated with exercise in the heat is unknown. There is an association with muscle cramps and poor conditioning and acclimatization, dehydration and recent injury. Heat syncope is thought to occur in association with vasodilation in the lower extremities with pooling of blood in the veins, dehydration, and prolonged standing or sudden changes in posture. The body temperature remains normal, and a hot environment is not necessary for this condition to occur. Heat exhaustion is a constellation of signs and symptoms including elevated body temperature of less than 104 F, thirst, heavy sweating, tachycardia, and hypotension. The athlete may be somewhat confused or have headache but no other central nervous system signs will be present. Mild damage to the liver and kidneys may occur. Lastly, heat stroke includes the symptoms of heat exhaustion but the athlete's skin may be dry, as cooling mechanisms have begun to shut down. The heat stroke victim will have central nervous system signs ranging from stupor and lethargy to seizures or coma. The core body temperature in heat stroke will be greater than 104 F (5).

Prevention of heat injury starts with the sporting environment. Athletic events should be held in areas with shade and good air flow, and be avoided in the mid-day when the sun is at its hottest. Utilizing a heat index chart or wet bulb globe temperature index, when available, can help one decide if the environment is safe for participation. Preventative strategies against intrinsic risk factors include good nutrition and pre-hydration. The athlete should gradually acclimatize to exercise in the heat over a period of 1 to 2 weeks. Scheduled water and electrolyte containing beverage breaks should be frequent and mandatory. Medications, such as diuretics, antihistamines and anti-depressants may increase the risk of heat injury and athletes using these medications should be monitored carefully. Additionally, obesity, diabetes and conditions of the blood, such as sickle cell disease and sickle cell trait increase the risk of injury. Athletes suffering these conditions should avoid exercising in extremes of heat and humidity (5).

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Preserving Your Microbes: The Key in Preventing Fecal Transplantation

By Scott Milton, MD

As the theme of this edition of *Panhandle Health* is Preventive Medicine, I had to really think about how I would spin fecal transplantation as "preventive". In fact, when you really think about it, fecal transplantation is the last option for recurrent severe colitis caused by the toxins produced by *Clostridioides difficile (C. diff)* All other options have usually been exhausted, and our patients usually have suffered for months with debilitating diarrhea and all the miseries that accompany severe *C.diff* colitis. Can anyone think of anything more counter-intuitive than trying to regain one's health by ingesting poop? Well, in this article, I will argue that the prevention of *C. diff* colitis is accomplished by preventing the loss of our "good bacteria". I will also discuss some facts about the human microbiome and how modern medicine is likely altering the relationship between humans and the microbes living on and in them. I will also discuss the fecal transplantation program at NWTH, started last year, and the criteria we use in selecting patients for fecal transplantation.

The Human Microbiome

Here's some food for thought. There are probably ten times the number of bacteria living in us and on us than the total number of cells that make up our bodies! Further, our human genome contains around 23,000 genes while the genetic material of our microbiome is estimated at 2 million! Now that is something! So what are we really? And how does this relationship work to keep us healthy? Truly our understanding of this relationship is in its infancy. I would also argue that our understanding of the impact of "Modern Medicine" on the ancient relationship between humans and their microbes is small but growing. And, as our knowledge grows, more and more evidence suggests that the microbiome of humans living in developed countries is diminishing. More importantly, this degradation may very well be associated with the rise in many diseases we encounter much more frequently in our daily practice such as diabetes and obesity. More specifically, the use of antibiotics, especially early in life, could very well predispose an individual to developing diseases such as diabetes and obesity. Even certain surgeries, such as Caesarean section, may degrade our microbiome.

All living things have a microbiome. The relationship of our microbiome is an ancient one that evolved as humans evolved, and this relationship between humans and their microbiome was shaped by many events that have occurred over thousands of years. Think about it: epidemics never occurred in hunter gatherer societies, as there were not enough individuals to sustain the epidemic. However, with the rise in human population, epidemic diseases such as the plague and influenza emerged and have been problematic ever since. The recent Ebola outbreak in Central Africa likely is heavily influenced by the dense population that now exists in those areas. Clearly the success of the human race is a two-edged sword as these diseases could only evolve through population growth. Pathogens have evolved along with the rise in population and success of the human race.

But not all pathogens are the same. Some pathogens, like measles, are highly infectious but must have susceptible individuals to infect during the epidemic.

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Other pathogens like TB and varicella can use latency to cause disease individuals decades later. Clearly it is advantageous to the pathogen to master this skill, but the pathogen is also affected by the host immune system. The immune system of the host cannot completely eradicate the pathogen, allowing it to live on in a more dormant form, only to emerge later in life, and infect other susceptible hosts.

Helicobacter pylori

Another pathogen is even more interesting and complicated in its relationship with healthy humans. *Helicobacter pylori* has inhabited the human stomach since ancient times. This organism is clearly associated with peptic ulcer disease and gastric cancer. Great efforts are made to identify and eradicate this organism from the stomach. However, it appears the lack of this organism causes increased risk of esophageal disease, such as reflux or even Barrett's esophagus. This relationship between this particular bacteria and humans illustrates the complex and dynamic interaction between humans and their microbiome.

Antibiotics and *Clostridioides difficile*

As we know, antibiotics can be life-saving and are critical to the advancement of many other areas of modern medicine such as surgery. Antibiotics are used to prevent infections prior to or during surgery. All modern hospitals have protocols that outline which antibiotic to use and when to use them before and during a surgical procedure. Antibiotic protocols also exist for pregnancy, and clearly are beneficial in reducing post-delivery infections to mother and infant. These practices have been used for decades, and hospitals are graded partly by the adherence to these protocols.

As illustrated in my example of *Helicobacter*, antibiotic use can have unintended consequences that may not be immediately apparent. There is growing evidence that antibiotics, especially when used early in life, may at least in part be responsible for many of our more common modern medical diseases such as obesity and diabetes. How can this be?

The answer likely lies in the degradation of our microbiome. Studies have shown that individuals with obesity and diabetes are more likely to have a less diverse fecal microbiome. Autoimmune disease, also much more common in developed countries, seems to be linked with the less diverse microbiome we find in the modern world. And it seems that antibiotics used early in life, just as our own individual microbiome is forming, have the greatest impact on an individual's risk of developing obesity, diabetes and the like.

C.diff colitis is unfortunately a common illness in our community. This disease occurs as a result of an overgrowth of this toxin-producing bacterium and injury to the colon. The risk for contracting this disease is clearly associated with antibiotic use. Surgical procedures also are a risk factor as well as previously having the illness. The use of proton pump inhibitors is also associated with C.diff. All hospitals have programs that actively monitor these risks, and our community is no different. I currently serve on Antibiotic Stewardship committees at all the hospitals in this community, and I believe progress has been made to reduce

the burden of C.diff on this community. Infection control committees are also very important in this role.

Ironically, the only FDA approved treatments of C.diff are antibiotics. Two, oral vancomycin and fidaxomicin, a newer non-absorbable macrolide, are currently recommended. It should be noted that metronidazole is no longer recommended as an option. Success rates for these drugs are around 50-70%. Fecal transplantation, although not FDA approved, has been shown to be perhaps an even more effective treatment option.

Typically, patients with recurrent C.diff are referred to our team at NWTH having been treated multiple times with the standard treatment regimens. I require that they have received and failed fidaxomicin in almost all circumstances. Other signs of active C.diff such as leukocytosis, abdominal tenderness and positive stool toxin assay are required in addition to debilitating diarrhea. Our patients sign a waiver stating they fully understand this is a non-FDA approved treatment option. We use a company, Open Biome, as the supplier of our transplant material. This company has acquired, through donors, a large bank of fecal matter that is stored and then shipped to us in capsules. These capsules are delivered either via EGD or colonoscopy. Around 30 capsules are delivered to the gut at a time. So far, we have performed 9 transplants with one failure. This seems to be a fairly typical success rate as studies suggest a success rate of 80% or better.

This review would not be complete without a brief discussion of probiotics. Probiotics are now heavily marketed as having multiple benefits including restoring immune health and many gastrointestinal ailments. These claims are not well substantiated by scientific evidence. treating, there are some newer studies that suggest probiotics can be beneficial in reducing antibiotic associated diarrhea (2). Our experience with using probiotics in hospitalized patients at NWTH support this finding. We currently suggest the use of probiotics in most patients prescribed antibiotics in our hospital.

In summary, C. diff colitis is common and a striking example of an illness caused by a disturbance in the microbiome. Restoration of a healthy microbiome via fecal transplantation seems to be an effective, non- FDA approved treatment option. Maintaining a healthy microbiome in this day and age is challenging as modern medicine and population growth exert forces never seen before on us and "our bacteria". Also, it appears that antibiotics, especially when used early in life, may increase the risk of developing diseases such as diabetes, obesity and some autoimmune diseases

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Salk and Sanbin: The History of the Polio Vaccine

by Rouzbeh K. Kordestani, MD, MPH

"An ounce of prevention is worth a pound of cure."—Ancient proverb.

Poliomyelitis Virus (PV) is an enterovirus that attacks the nerve fibers in a human being. The viral infection results in lower motor neuron damage. As the virus invades and begins to destroy the nerve fibers, neurological defects begin to appear. These can be seen as peripheral nerve impairments, such as the inability to walk, to stand, to grasp things with one's hands or even in some cases to breath. The poliovirus exists in three different "wild" subtypes—PV1, (Mahoney), PV2(Lansing), and PV3(Leon). The origin of this virus and its subtypes is unknown. However, it is well documented that the disease is spread between primates through contact and through the gastrointestinal pathway(s).

Historical evidence shows that PV has been present for centuries. As populations have grown, the virus and its spread have begun to take hold. In 1894, the first outbreak was documented in Vermont. Then, in the early 20th century, a significantly higher number of cases of PV were noted. Epidemic level exposures were noted in the mid-20th century. In the United States alone, in the early 1950's, 25,000 new cases were diagnosed annually. In 1952, during an outbreak of the virus, a total of 58,000 cases were recorded. Of these new cases, approximately 3,200 individuals died from the disease and its complications. Because of the heavy toll of life incurred, the United States along with the other industrialized countries began to invest heavily in research with the hopes of finding a cure.

Immunization

The immunization against polio is regarded as the first vaccine immunization used in humans. The immunization process begins with an immunogen. An immunogen is thought to be a segment of a cell or a biological marker that causes an immune response in a human being or primate. An immunization in similar fashion is a directed exposure of the immune system to an immunogen effecting a response and helping to develop a protective reaction against future exposure(s).

The initial work of vaccines for polio was conducted by Dr. Komen in Philadelphia and Dr. Brodie in New York City. Their early vaccine prototypes were in part constructed with live strains of polio. They had some success. But when Drs. Komen and Brodie presented their findings at the annual meeting of the American Public Health Association in November of 1935, they were ostracized. In each of their studies, several children had contracted polio and had been adversely affected--a few had even died. Even though their work showed promise, because of the severe complications and the deaths seen, their results and their vaccine prototypes were put aside, and their research was forcibly abandoned. This unexpected backlash proved to be a dramatic setback for polio vaccine research. Unfortunately, because of the harsh reaction seen to the works of Drs. Komen and Brodie, much of the ongoing research efforts had to be hidden. This was the case until 1953 with Jonas Salk.

Salk and Sabin

Dr. Jonas Salk was a researcher at the University of Pittsburgh working on a polio vaccine using an inactivated strain of the virus (IPV). In 1952, his team developed the first effective vaccine, an inactivated strain of PV. Salk announced its arrival in 1953. In early 1954, the first large trials of the Salk vaccine began in the U.S. Within a year, almost a million children were enrolled and given the vaccine. The initial data showed that the Salk vaccine was 60% effective against PV1 and 90% effective against strains PV2 and PV3.

In 1955 the Salk vaccine was licensed. Soon, entire regions of the United States were overrun with children's immunization campaigns. A mass campaign headed by the March of Dimes in 1956 helped to inoculated hundreds of thousands of individuals. Directly as a benefit of this campaign, the annual number of polio cases fell from 43,000 new cases to fewer than 6,000 cases in 1957. The benefits continued, as much of the population was soon inoculated. By the early 1960s, only about 200 PV cases were recorded nationally.

While the Salk vaccine was being tested in the United States, two other scientists (Drs. Sabin and Koprowski) were working hard to find a more efficient polio vaccine. Since syringes and trained labor were needed to apply the Salk vaccine, and either intravenous or intramuscular was the method of application, there were significant additional costs associated with the Salk vaccine. This was not the case with the oral vaccines being developed by Drs. Sabin and Koprowski. Sabin and Koprowski were working on an oral type of live but attenuated viral vaccination (OPV) that could be easily and cheaply administered to large masses of people without the need for syringes and the knowhow of injections. This method of vaccine seemed more prudent and effective, since the poliovirus was known to invade the oral and GI mucosa. Unfortunately, because the United States was already fully committed to the Salk vaccine and its trials, Drs. Sabin and Koprowski found little interest or room to conduct their research efforts at home. For that reason, they looked elsewhere. Sabin completed his trials in Russia/Soviet Union while Koprowski completed her work in the Congo and Poland.

By 1957, Dr. Sabin had developed a trivalent vaccine, with parts of each polio wild type strain. This made his oral therapy (OPV) incredibly effective against all three subtypes of the virus. Soon after its development, it was used across several countries with tremendous success.

In 1959 alone, a total of ten million children were immunized against polio in the Soviet Union using the new Sabin oral vaccine.

In 1961, the Sabin vaccine replaced the Salk vaccine in the United States as the vaccination of choice to be administered to children and adults alike. It was found to be not only more effective, but less costly.

Complications seen with the vaccine (s) and its development

In 1955, soon after the Salk vaccine was licensed for production, the Surgeon General received reports of patients contracting polio from the vaccine. A careful study of the cases showed that Cutter Pharmaceuticals was at fault. A similar number of cases and complications were also seen with the vaccine strains developed by Wyeth. After careful study, it was discovered that the strains used by these two manufacturing groups were not properly inactivated. There were hundreds of cases of polio contracted from the vaccinations. While the Surgeon General and the health care services quickly rectified this problem, the public confidence had been affected. This series of complications led to a decrease in the voluntary vaccination rates seen around the country. It also affected patients' confidence in the drug, making room for a possible alternative.

Similar to the Salk vaccine, the Sabin vaccine has had its share of complications. The major complications seen with the Sabin vaccine (OPV) were vaccine associated paralytic poliomyelitis (VAPP) and vaccine derived poliovirus strains (VDPV). Since the attenuated virus had very little divergence from the original polio strain (about 1%), reversion back to the original strain is very much a possibility. During viral progression and replication in the tissues, the OPV strains can go through common genetic and nucleotide changes reactivating the virulent capability of the original virus.

The World Health Organization (WHO), and Polio after 1987

A global initiative to eradicate polio was begun in the 1980s by WHO and multiple other world health agencies. The initiative chose to use the less costly Sabin-Chumakov oral polio vaccine. The initiative was worldwide and had a great deal of penetration.

Even with world-wide efforts, however, outbreaks have been documented. In 2013, for example, the WHO warned of an outbreak in Syria. With the war effort there and a breakdown of routine immunizations and a lack of effective sanitation, PV was documented in significant numbers.

Similar outbreaks have been noted in many countries in Africa. Most often these outbreaks are related to the lack of proper immunizations against the disease due to a lack of concentrated health efforts. Exposure to the virus due to problematic water supply and sanitation has also been seen as an essential component of the recent epidemics. In some other countries, religious and political barriers have led to the crippling of the WHO efforts. In countries such as Pakistan and Cameroon, Muslim religious leaders have advocated a stance against the vaccine thinking that the vaccination is meant to sterilize the young men of the population. This is in part due to political and religious mistrust. The lack of effective immunizations in these regions has in turn led to a resurgence of polio.

Conclusion

The efforts of Drs. Salk and Sabin (and Koprowski) among many others have shown that vaccinations for diverse processes and diseases can do much to save the human population from epidemic diseases. The efforts of these researchers have saved millions of lives and untold billions of dollars in medical costs. It is with this thought that we, as a society, realize that we spend far too much in treatment and far too little in prevention. With new diseases such as Ebola and swine flu on the horizon, it behooves us to keep an eye on preventative research efforts. In the future, our salvation may be in vaccinations and immunizations. Our hope needs to rely more on prevention than on treatment. In this way, truly, an ounce (in terms of tens of dollars) of prevention will be worth a pound (or billions of dollars) of cure.

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by Tarek Naguib, MD, MBA, FACP

A Bad Measles Year *CDC* (06/01) – A total of 981 individual cases of measles have been confirmed in 5 months since January. This is the greatest number of cases reported in the U.S. since 1992. The majority of people who got the infection were unvaccinated!

Texas is among the states that have reported cases to CDC. The others are Arizona, California, Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, Missouri, New Mexico, Nevada, New Hampshire, New Jersey, New York, Oklahoma, Oregon, Pennsylvania, Tennessee, and Washington.

Prostate Cancer Stats! *Ann Intern Med* (06/04) – Prostate specific antigen (PSA) is a controversial test that shows potential prostate cancer. USPSTF recommends men 55-69 to be tested but decision should be done on individual basis. Stats as follows: Each 1000 men checked above 55 will yield 240 positive tests out of which 100 will get a positive biopsy for cancer of the prostate. Out of the 100 men with positive biopsies, 80 will choose surgery of them 50 will have erectile dysfunction, 15 urinary incontinence, and 5 will die anyways from prostate cancer eventually. What makes it more confusing is that 20-50% of men with positive biopsies for cancer prostate will never have problems from it untreated if it remains untreated.

Bike Commuting Rank *Texas Med* (06/01) – The highest ranking city in Texas in bicycle commuting is Austin which is ranked number 18 in the nation. Texas ranks No. 41 in the nation in bicycle commuting.

Hand Sanitizer Combats Sickness in Daycare *JAMA* (12/25/2018) – A hand-hygiene program in day care centers and homes reduced the incidence of respiratory infections, sick days, and antibiotic prescriptions as indicated by a trial published in *Pediatrics*.

Balance Exercises Prevented Falls *JAMA* (12/25/2018) – A study of balancing exercises (twice weekly tai chi) was performed in 670 persons older than 70 who had previous falls or had impaired mobility. A net of 31% less falls were noted among the study group as compared with those who did multimodal exercises (balance, aerobics, strength, flexibility).

Shift of Hepatitis A Trends *JAMA* (12/25/2018) – Large outbreaks of acute hepatitis A in California, Kentucky, Michigan, and Utah that predominantly affected homeless persons or drug users signal a shift of the trend of this disease spread. Vaccinating this population is seen to be the next step to control hepatitis A spread.

Increase in Firearm Homicide Trend *JAMA* (12/25/2018) – The trend of firearm related homicides has increased lately to 4.9 per 100 000 population from 4.4 and represents an increase in 43 of the 50 major metropolitan areas in the country.

Vaping during Pregnancy *JAMA* (04/09) – Vaping or e-cigarettes contain nicotine that can damage the fetus' developing brain and lungs. Women have reported using e-cigarettes during pregnancy; seven percent used it at any point around the time of pregnancy and 1.4% during the last 3 months of pregnancy.

Asthma Drug Back OTC *JAMA* (08/12) – Primatene Mist, the over-the-counter inhaler for asthma is back to the shelves according to FDA. The inhaler was removed in 2011 due to its deleterious effect on the ozone layer that is mitigated now.

Opioids for Non-Cancer Pain *JAMA* (08/12) – In a meta-analysis of studies including over 26,000 persons, the benefit of opioid vs non-opioid pain medicines may be similar

High Folic Acid in Pregnant Women Who Smoke *JAMA* (05/28) – Women who were active smokers of less than 21 weeks pregnancy were counseled against smoking and randomized to 2 groups of 4 mg (high dose) and 0.8 mg (standard dose). A total of 345 women were included in the study and the group that had high dose folic acid had 35% less chance of fetal growth restriction. The study needs further confirmation.

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UPCOMING EVENTS 2019

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Sept. 13-14
Hyatt Lost Pines
Austin Area, TX

TMA Advocacy Retreat
Dec. 6-7
Omni Barton Creek
Austin, TX

Managing a Neonate Born to a Mother with Zika Infection During Pregnancy

by Luis Ruiz, MSIV; Dr. Anders Leverton, PGY2; Mubariz Naqvi, MD
Texas Tech University Health Sciences Center Amarillo Department of Pediatrics

Introduction

Considered by many as the newest TORCH infection (1), Zika virus has received much notoriety due to its rapid spread across continents as well as the potentially devastating effects it can have on a developing fetus. Even in areas where the virus is not prevalent, it is important that health care providers understand how to properly manage neonates born to mothers with a history of Zika virus infection during pregnanc. This report presents some of the key facts currently known about Zika virus, as well as how to properly manage a newborn with a maternal history of Zika infection.

Zika virus information

As the Zika virus was not identified until 1947, much remains to be studied about it, but with the recent outbreak a great deal of information has been discovered. In the United States more than 2,000 pregnancies have already been complicated by Zika infection, and of those over 100 have resulted in transmission to the fetus. Expectant mothers have the potential to be infected by mosquitoes and contact with infected body fluids, especially through sexual contact. Zika viral RNA has been found in human semen up to 188 days after the infection has resolved. Once infected, the mother's symptoms are typically quite mild, similar to other TORCH infections. One in five infected mothers are asymptomatic; but potential findings in the mother include a maculopapular rash, fever, conjunctivitis, and arthralgias. Screening is essential for mothers with any signs of the infection as well those at risk of exposure before and during pregnancy, either through living in an area where Zika virus has been found in mosquitoes, or through sexual contact with anyone who lives in or frequently travels to areas with a risk of Zika infection (2) (**Image 1**). If a mother meets any of these criteria, serum IgM testing is recommended three times during pregnancy. It is also important to note that Zika infection during pregnancy is not a contraindication to breastfeeding once the child is born (2).

Similar to TORCH infections the effects on the fetus can be devastating. More severe effects include loss of pregnancy (9 such cases in the U.S.) and well-known microcephaly (**Image 2**), though ventriculomegaly is a more common finding. Other findings include intracranial calcifications, facial disproportion, spasticity, seizures, contractures, eye abnormalities, deafness, Guillain-Barré syndrome, and small for gestational age infant (3).

Case Report:

An 18-year-old G2P1001 female, whose care was originally managed in Mexico, then at an outside provider, was referred for higher-level prenatal care due to history of Zika infection diagnosed in Mexico at 15 WGA. The patient had one

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Image 1

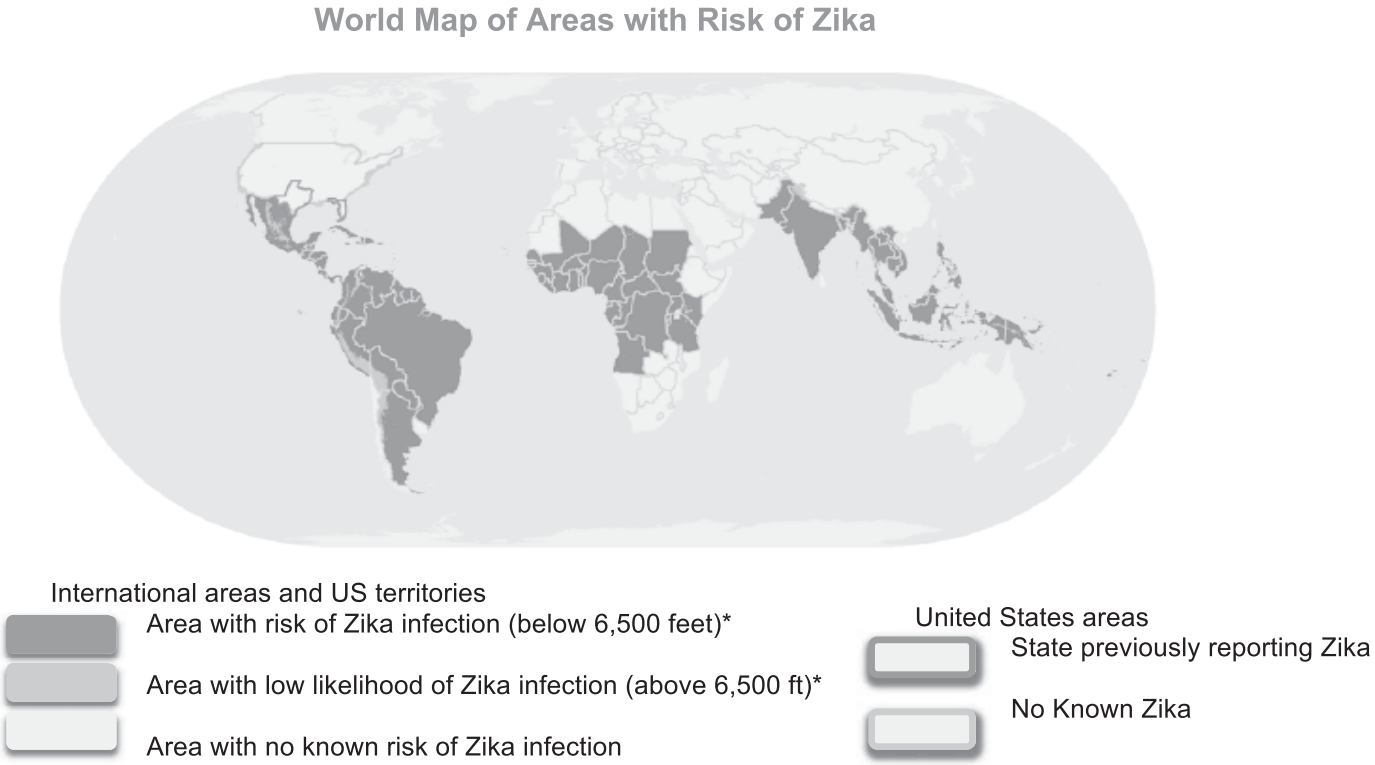
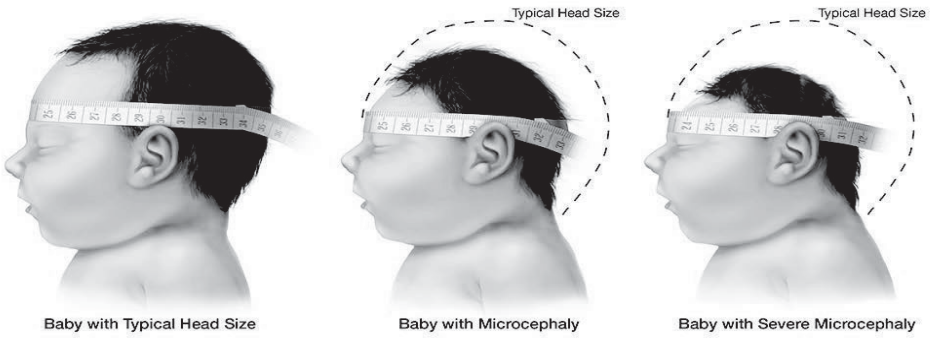


Image 2



visit with the high-risk obstetrics clinic. The patient was not retested for evidence of Zika infection per recommendation from Department of Public Health. No abnormalities on were found on a 37-week fetal ultrasound. The mother had a repeat cesarean section at 39 weeks. Maternal complications included: O positive blood type, cholestasis of pregnancy, fatty liver disease, impaired glucose tolerance, insufficient weight gain, maternal obesity, gestational hypertension, repeat cesarean, forceps assist delivery, and limited prenatal care. The term AGA female was born at 39 1/7 WGA with Apgar scores of 8 and 9. Her vitals were temperature of 36.8 Celsius, heart rate 156 beats per minute, and respiratory rate of 66 respirations per minute. Pertinent labs include a blood type of O+, direct antibody test negative, hemoglobin and hematocrit 17.2 g/dL and 51% respectively. She was formula-fed, by choice, without difficulty. The newborn had good urine output and stool production. Measurements included length 50 cm (50th percentile), weight 3.42 kg (45th percentile), and head circumference 35 cm (47th percentile). Physical examination of the child was unremarkable except for hypermelanosis of the lower back and hair noted on pinnae. A postnatal head ultrasound was negative. A standard ABR newborn hearing screen was passed on first day of life. Zika & flavivirus serum IgM, Zika virus serum and urine NAA were all negative. Appointments with PCP as well as pediatric ophthalmologist were arranged. The child was released prior to results of Zika lab testing.

Discussion

Understanding the diagnostic workup of this case comes down to understanding the viral tropism of Zika for fetal neurological tissue (3). While serum lab testing is the gold standard of diagnosing Congenital Zika Syndrome (CZS), other tests can detect signs of infection much sooner while awaiting results. The foundation of the workup is a complete physical exam, especially the neurological component. Microcephaly is key physical finding for CZS, but as stated earlier its absence does not rule out CZS. Aiding in diagnosis is the ophthalmologic examination. Ocular abnormalities can be detected early and these lesions do not progress over time, aiding with early detection (4). The ophthalmologic exam may be the only clinical finding that demonstrates manifestation of disease. Next is the postnatal head ultrasound, which is necessary even if all prenatal ultrasounds are benign, as complications such a microcephaly can occur after a neonate with CZS has left the uterus (3). Along the same lines, a standard newborn hearing screen rules out congenital deafness. As all testing came back benign, the child and mother were sent home before Zika virus serum and urine testing results were back, as management would not have changed regardless of the results. According to current guidelines, the only additional requirement beyond routine childcare at that point was scheduling an appointment with a pediatric ophthalmologist before discharged, and this was arranged, along with an appointment with a PCP for the child.

Conclusion

Likely the first and only example of a neonate born to a mother with Zika infection during pregnancy in Amarillo, this case illustrates a local example of how to properly care for a newborn in this situation, as well as the key information that a mother should know. Physical manifestations as well neurological sequelae were thoroughly ruled out before discharge. Proper follow up was arranged and discussed with the patient's primary care physician. The mother was personally informed of the lab results by phone as soon as they were available, and unnecessary time in the hospital was avoided for both individuals.

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Measles (Rubeola) The 9 Day Fever

by Tarek Naguib, MD, MBA, FACP

Why Measles?

Although endemic measles was declared eliminated from the US (i.e. indigenous disease transmission was interrupted), outbreaks continue to take place. The United States is again experiencing a large multi-state measles outbreak this year.

981 cases of measles have been confirmed in 26 states in 5 months, the greatest number of cases reported in the U.S. since 1992.

Historically, measles, which remains untreatable, has killed millions of people across the globe.

What is Measles?

Measles is a viral illness that comes with fever, rash, and symptoms that include cough, runny nose, and pink eye. It usually presents in someone who has had contact with an infected person. Immunocompromised patients may deceivingly exhibit little or no rash. The average incubation period for measles (from exposure to fever) is about 10 days. The rash that lasts for about 6 days usually follows the appearance of fever by 3 days, hence the name 9 day fever.

The disease that may be self-limited but can occasionally cause severe complications including brain involvement (encephalitis) and death.

Where did the name Measles come from?

The name of measles is probably derived from the Middle English "meseles" which describes the rash spots and, later on, after measles was well recognized, the word "measly" was derived, meaning small and inconsequential, perhaps as small as the rash spots. The virus that causes measles is called the rubeola virus.

How do I suspect Measles?

Suspect measles when fever and rash emerge in a person who has recently come from an infected area or has been in contact with a person recently diagnosed with measles or rash.

How to diagnose Measles?

There is a blood test that is performed by the CDC laboratories to diagnose the disease. However, the appearance of rash after fever development is suggestive. The presence of Koplik spots (small white spots on the inside of the cheeks) in this context is diagnostic.

How is Measles transmitted?

The transmission of the virus through infected respiratory secretions (saliva, sputum, and mucus) causes the disease. The mode of transmission is person to person through cough and sneezing particles that enter the body through the eyes, nose, and mouth. The virus can survive for 2 hours outside the human body and suspended in the air, and 90% of people close to the infected person become infected unless immune

How do doctors treat Measles?

There are no curative medications for the illness. Therefore, the treatment is largely supportive by giving nutrition, intravenous fluids, and antibiotics for any secondary bacterial infections that may develop.

How can I help prevent Measles?

Make sure that your children have received MMR (measles, mumps, rubella) vaccine among other scheduled vaccines. Persons who were born prior to 1957 are immune by virtue of having been exposed the disease in their childhood. However, younger individuals are at risk unless vaccinated. The vaccine is very effective in preventing the disease. There is no credible scientific evidence that the MMR vaccine contributes to the development of autism.

Practice hygiene prevention including careful hand washing and avoid contact with persons who have symptoms of disease.

Based in part on information from the CDC:
http://www.cdc.gov/measles/about/transmission.html
http://emergency.cdc.gov/han/han00376.asp


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